DACEL

Sustainable Health Care Waste Management in Gauteng

Pilot Project

Report on the selection of Improved Equipment

at

Leratong Hospital & Itireleng Clinic

December 2002

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Abbreviations

CEO	-	Chief Executive Officer
DoH	-	Department of Health
DACEL	-	Department Of Aggriculture, Conservation, Environment and Land Affairs
DANCED	-	Danish Co-operation for Environmental Development
GDoH	-	Gauteng Department of Health
HCW	-	Health Care Waste
HCRW	-	Health Care Risk Waste
HCGW	-	Health Care General Waste
HCWM	-	Health Care Waste Management
HIV	-	
OHS	-	Occupational Health and Safety
OH&SA	-	Occupational Health and Safety Act
PPE	-	Personal Protective Equipment
POPS	-	Plaster of Paris
RFQ	-	Request for Quote
SABS	-	South African Bureau of Standards
CTA	-	Chief Technical Advisor
TB	-	Tuberculoses
Um	-	Micron
VAT	-	Value Added Tax
WMS	-	Waste Management System

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EXECUTIVE SUMMARY

The Gauteng Provincial Government, Department of Agriculture, Conservation, Environment and Land Affairs (DACEL) together with the Gauteng Department of Health (GDoH) have embarked on a comprehensive programme to improve the standard of Health Care Waste Management in the Province. This initiative was financed by the Danish Co-operative for Environmental Development and is executed by RAMBØLL of Virum, Denmark.

Two pilot sites selected to trial and test an improved waste management system for public health institutions in Gauteng are Leratong Hospital in Krugersdorp and Itireleng Clinic in Soweto.

Leratong Hospital is an acute care hospital comprising 706 beds with a staff complement of 929. Itireleng Clinic is a community centre with an outpatient and 24 hours maternity unit that serves a population of approximately 100,000 and has a total staff complement of 89 provincial workers.

A survey was conducted at both sites to ascertain the status quo at the two institutions. Two separate survey reports detail the findings from these surveys. Some of the critical issues raised included:

- Cardboard boxes were unsuitable as they absorbed moisture and did not protect the transporters and incineration staff from needlestick injuries. They are also environmentally unfriendly and not cost effective
- Sharps containers and plastic liners were of inferior quality and unsuitable for the containment of infectious waste
- Segregation was not carried out well due to non availability of correct coloured liners; using the same type of container for different categories of waste; incorrect sizing and placing of containers; insufficient supply of containers; lack of monitoring and enforcement of colour coding standards; lack of supervision and mentoring; lack of education and training; negligence and attitude on the part of health care workers.
- Inadequate internal transporting equipment was supplied
- Manual handling problems experienced when transporting the waste to the incinerator
- Treatment plant did not meet the requirements of the proposed HCWM Regulations
- Personal Protective equipment not always provided and is inappropriate
- There were no documented policies and procedures for waste management at the institutions

This report details the process that was followed for the selection of equipment for the new improved waste management system to be tested. This process included:

- Linking in with the vision and strategy for Gauteng within the frames and principles of the National Waste Management Strategy.
- Involving all the stakeholders. viz. The GDoH, DACEL, CEO and Staff at Leratong and Itireleng, Consultants
- Using agreed decision criteria of being safer, more affordable, environmentally friendly and with sufficient capacity to sustain the system

- Following an agreed decision making process that included representatives on the pilot project steering committee, the tender committee and GDoH Forum.

The design of the new system was influenced by the results of the daft feasibility study for Sustainable Health Care Waste Management Scenarios for Gauteng, Sept. 2002 where this study strongly indicated that the cardboard boxes were environmentally unfriendly and unsafe for workers. Reusable containers were preferred to reduce the emissions to atmosphere.

Various options for reusable containers were considered and at a meeting held on 12th September between the consultants and DACEL, it was decided that a dual test of the 770 Wheelie bin / liner system and the stackable boxes be recommended to GDoH. The main objective was to develop and test two improved and safer waste management systems for Leratong Hospital and one improved system for Itireleng in order to:

1. conduct a comparative analysis between the two systems
2. inform the tender specifications process
3. test the assumptions made in the feasibility study
4. test the code of practise, training and awareness material developed

These recommendations were presented to GDoH on …… and at the completion of the signed agreements between the stakeholders, the pilot project would commence.

The two systems to be introduced are the locally manufactured and cheaper 770 wheelie bin / liner system and a two-size stackable box system. Wherever possible, the systems shared some common aspects such as the sharps containers and speci-cans. Both systems have a red and black colour coding and the sizes of the liners are also standardized wherever possible.

Segregation at generation is critical to the success of both systems. The HC Waste is divided into two main categories of HC Risk Waste and HC General Waste. The HC Risk Waste was segregated into the categories of sharps, infectious waste, anatomical waste and expired medication. The laboratory and blood bank were contracted out and therefore did not form part of the pilot project. There was no radioactive or cytotoxic waste.

The two systems comprised a combination of reusable containers with disposable liners and containers. Red liners of different sizes and thicknesses are used in a selection of these standardized containers, baskets and stands.

The 770 Wheelie bin / liner system has specially designed and manufactured stands to hold custom sized red liners up to 80 micron thickness. The smaller red liners, when full are closed and placed into the larger red liners. When full, these larger liners are then closed and placed into the 770 wheelie bins for transportation to the central storage area.

The stackable box system has two sizes (50 litre and 100 litre) of containers positioned at the generation source and contains customized red liners of up to 60 micron. Once the waste has been deposited inside the containers, it is not removed again until it reaches the treatment plant. The containers are collected in a custom built trolley for transportation to the treatment plant.

In both systems, the reusable containers (770 wheelie bin, and stackable boxes) are taken off the site where they are emptied, cleaned and sanitized before returning to the institution. A scale was installed at each institution to weigh the waste before leaving the sites.

The transport vehicle is fitted with a mechanical tail lift designed to lift both the 770 wheelie bin and the cage trolley with the stackable boxes. A mechanical lifting device is also fitted to the incinerator for the lifting of the 770 wheelie bin. The stackable boxes are to be emptied manually onto the conveyor belt feeding the incinerator.

Costs for the purchase of equipment was estimated at a total of R700,000 and included the reusable and disposable containers, the liners, design manufacture of the roto-moulded stackable boxes, cage trolleys, tail lifts and scales.

The equipment was procured using the acceptable three quote system. Formal RFQ's were sent out and the adjudication was conducted by the CTA in conjunction with the consultants. Formal orders were placed by the CTA.

The monitoring and evaluation frame work is designed to use both qualitative and quantitative methods of monitoring. The research components for the pilot test will be:

Component 1: System and equipment performance
Component 2: Capacity Building
Component 3: Segregation.

1. BACKGROUND

1.1 History

The Gauteng Provincial Government, Department of Agriculture, Conservation, Environment and Land Affairs ("DACEL"), together with the Gauteng Department of Health (GDOH), have embarked on a comprehensive programme to improve the standard of Health Care Waste (Medical Waste) Management in the Province.

This programme includes the project titled: "Sustainable Health Care Waste Management in Gauteng", which is financed by the Danish Co-Operation for Environmental Development ("DANCED") and executed on behalf of DACEL by the Danish consultants RAMBØLL, of Virum, Denmark.

An essential task in improving waste management at health care institutions in Gauteng is to design an improved system of containerisation of waste for public health institutions in Gauteng. For this reason, two pilot sites have been chosen to test new equipment and operational systems.

The two pilot sites selected to carry out the tests are:

- Leratong Hospital in Krugersdorp
- Itireleng Clinic in Soweto

1.2 The two pilot sites

Leratong

The Leratong Hospital is situated on the outskirts of Kagiso 2 near Krugersdorp in the Gauteng Province of South Africa. The site is situated on the corner of Randfontein and Adcock Roads. Postal address is Private Bag X 2058, Krugersdorp 1740.

The hospital is sited on land that belongs to the Gauteng Provincial Government. The hospital serves a wide spectrum of the population from the surrounding suburbs of Krugersdorp, Randfontein, Roodepoort, Kagiso, Chamdor, Dobsonville and Soweto, Magliesburg, Mudersdrift and Fochville.

The general layout of the main part of the hospital consists of a central passageway. Four parallel buildings link into the passageway on either side. There are three levels, a ground floor, 1st and 2nd floors. There is a nursing college situated on the northwest corner of the site. The main manager's block is above casualty at the entrance of the hospital and the accounting section is housed in a building opposite the main nursing college on the northwest side. There is a mortuary, stores, linen and kit room. The kitchen is situated below the nursing college. An incinerator is housed near the workshop and boiler house in the southwest of the site, but is no longer in use.

Leratong hospital consists of 706 Beds with an average occupancy of 85%. There is a total staff of 929.

Itireleng

The Itireleng Clinic is situated in Dobsonville near Krugersdorp in the Gauteng Province of South Africa. The site is situated in on the corner of Roodepoort and Stele Roads, Dobsonville.

The Clinic is run by the Gauteng Department of Health and is housed in a building belonging to the Johannesburg Local Municipal Authority. Both the Provincial and Local Authority share the same premises.

The Clinic serves a total population of approx. 100,000 from the surrounding suburbs of Dobsonville, Dobsonville Extension 1, 2 & 3, Doornkop, Durban Deep, Braamfisherville, Slovoville Kagiso and Meadowlands Zone 9.

The layout of the clinic is a single storied building. The main entrance to the Clinic is the outpatient unit with a large waiting room. The clinic section is open from 08h00 – 16h00

The new Maternity section has an antenatal section, an exercise section, isolation room, preparation room, delivery room, post natal room and first stage room. There is also a photo-therapy area. The maternity section is a 24 hour clinic that caters for 15 stay over patients.

The services offered by the clinic are primary health, out patient, maternity, HIV testing and counselling, TB management, Diabetes Support Group, Epileptic Support Group and HIV Support Group. Two doctors consult from the premises.

The Clinic runs as an outpatient unit and has a total staff complement of 89 on the Provincial side.

1.3 Survey Report findings

A survey was conducted at both institutions during March 2002. Detailed survey reports for both institutions are available. For simplicity and a greater understanding of the issues involved, a summary of the findings from both of these survey reports is given here where they relate to the equipment used and the systems to support the use of the equipment.

Description of the situation at the pilot sites at the time of the surveys

Leratong Hospital Overview: Leratong Hospital had prior to the pilot project a functional waste management system in place. Attempts were made to separate the waste into health care risk waste and health care general waste. A colour-coding system of red for infectious waste and black for general waste was in use. Confusion was created by the use of a 40 litre thin micron transparent liner for both HCRW and HCGW. In addition, inferior quality sharps containers and 140 litre cardboard boxes with red liners were used to store and transport the infectious waste.

Cardboard boxes with red liners are kept mainly in the sluice rooms for infectious waste. Sharps containers with ill-fitting lids are used for needles and clinical glass. Speci-cans are used for the collection and disposal of placentas and other small

anatomical waste. These are taken to the mortuary until collected by the service provider.

Red liners with an unspecified micron thickness were used in a variety of other containers. Thin transparent liners were also used in the containers and stuck to the nursing trolleys with tape.

The general waste was placed into a variety of containers with either black or transparent liners. Waste is stored in a variety of places such as the sluice rooms, the passage-ways or in the unit.

The collection of the waste is carried out by the cleaning department where the full bags and boxes are placed in the passageways for removal two or three times daily. The trolley used for transporting the waste to the Central Storage Areas is old and generally overloaded. Sharps are taken on a smaller trolley by the nursing staff to the central storage area.

The Central Storage area is used for the collection of plastic bottles, food, cardboard boxes and sharps containers. The building is well ventilated.

The HCG waste is placed in a 28 cubic metre skip outside the main central storage area.

The Service Provider removes the infectious waste and sharps and transports it for incineration at Klerksdorp, Pikitup or Sanumed incinerators. The Mohale Municipality removes the HCG waste for disposal at landfill.

The Buying Department is responsible for the procurement of all the equipment for waste. There is a stock control system in place. However because of periodic lapses, the heads of the department tend to stockpile on boxes, sharps containers and plastic liners.

Itireleng Clinic Overview: The health care waste management system at Itireleng often falters because a management system has never been introduced to sustain the system. Poor performance was found in the segregation of waste, housekeeping standards, supervision and enforcement as well as the procurement of equipment. Waste is not properly containerised as there are insufficient liners and containers provided. Roles and responsibilities are inadequately delegated and problems often arise because there is insufficient hand-over when individuals are sick or off duty. Knowledge and awareness with regard to waste is low and problem solving capabilities are weak.

Critical Issues and Problem areas identified to be addressed by the pilot projects

The following critical areas were identified in the two survey reports[1].

[1] JM 02-05-09 Pilot Project Survey Report, Itireleng and JM 02-04-19 Pilot Project Survey Report, Leratong

Segregation

It is essential that segregation of waste at generation be correctly carried out. At present this is poorly done in all areas. This can be attributed to a number of factors that are discussed in more detail in the Survey Report. These include:

- The non availability of the correct colour liners
- Same type of containers used for risk and general waste
- Incorrect sizing and placing of containers causing incorrect containers to be used
- Insufficient number of containers
- Lack of monitoring and enforcement of colour coding standards
- Lack of supervision and mentoring
- Lack of education and training
- "Negligence" and "attitude" on the part of health workers

The results of the composition study carried out in July 2002 have indicated:

- 86.7% cardboard boxes contained misplaced general waste
- 5% cardboard boxes contained sharps
- 26.7% sharps containers contained infectious waste and HCGW
- 12% sharps containers contained infectious waste
- 25% of the black HCGW bags contained infectious waste.

Equipment – Colour coding

The colour coding of red for HCRW and black for HCGW cannot be adequately enforced due to the frequent non-availability of the correct colour of liner and the introduction of a transparent liners that are interchangeable for both categories of waste. These two factors contribute to the mixing of waste both into the cardboard boxes for incineration and into the black bags for removal by the municipality.

Equipment - Containers:

Containers provided for the management of both HCRW and HCGW management are of poor quality and ill suited for the task. There is no standardisation and the range and size of containers that includes plastic bins, wire baskets, pedal bins, and regular use of different sizes of cardboard boxes, supported and un-supported liners. In the hospital the colour of the liner rather than the container is the differentiating factor as to where waste should be disposed.

There are many problems with the 140 litre cardboard boxes, particularly when wet waste is placed into them. The liners are sometimes misplaced and the moisture soaks into the boxes, causing them to collapse. Boxes are frequently overfilled, resulting in difficulty with removal and the collapse of the boxes when stacked.

Equipment - Liners:

Except for those provided inside the cardboard boxes, the liners used are unsuitable for all types of waste. There are no specifications for the purchasing of liners such as micron thickness, volume, type of material, colour coding, marking etc. for the category of waste that they are to contain. The feasibility study indicated that re-usable containers are more environmentally friendly. (DACEL – Scenarios for Sustainable Health Care Waste Management in Gauteng – a Feasibility study, May 2002)

Equipment - Trolleys:
There is no adequate equipment for the internal transporting of waste in both the clinic and the hospital. There are no trolleys provided at the clinic and various means are used to transport the boxes. In the hospital, there is no means of transport from the ward areas to the central passageway. Here the trolleys used to transport to the central storage area are rusty with no protection on the sides.

Procurement of Equipment:
Problems are experienced with procurement that frequently leaves the hospital and clinic staff unable to adhere to the colour coding and segregation codes because of a shortage of the correctly coloured liners. Stock levels are not properly controlled leading to stock piling in some areas and lack of stock in other areas and in the main stores.

Storage Areas
The intermediate storage areas at the clinic are very small and crammed with other equipment. In the hospital, the intermediate storage areas (sluice rooms) are small and overcrowded. They are positioned generally in the middle of the ward area. The passageways are used for a temporary storage area so that the large trolleys do not have to enter the wards. The boxes and bags are therefore carried to the passageway. There is easy access by the general public and there is no security for the waste left here.

The central storage area at the hospital is large enough to contain the quantities and well situated for removal by an external service provider. There is no security provided. There is no central storage area at the clinic.

The Warehouse in the hospital for the storage of stock is overcrowded and the storage practices are unsafe and cluttered. The ward store areas are various and in some places there is no place to store the equipment.

External Transportation
The service providers provide the external transportation from the installations to the treatment facility. The transport of infectious waste is defined in the Draft Regulations for the Control of Environmental Conditions Constituting a Danger to Health or Nuisance. This draft regulation requires that transport vehicles for medical waste shall be lockable and inter alia should be terminally insulated and capable of maintaining a refrigerated transport temperature < 4 degrees
SABS code 0248 requires that the manual handling of waste materials are minimised.

Treatment
The waste is presently treated by incineration either at Sanumed (Roodepoort, Gauteng) or at Klerksdorp. (North West Province). Neither of these incinerators meet the requirements of the proposed Gauteng Health Care Waste Management Regulations expected to be promulgated in 2003 or the Gauteng HCW Management Policy endorsed by the Gauteng Legislature November 2001. Also these plants would, if applied today, not be able to receive a positive Record of Decision by DACEL unless advanced flue gas cleaning was introduced for the incinerators. It should be noted that the proposed Gauteng Regulations specify that waste from Gauteng cannot be treated at any plant that does not comply with the

requirements even if the actual plant is not located in Gauteng and, hence, not fall under the jurisdiction of DACEL.

Occupational Health and Safety

Protective Equipment: The system for the issue and use of personal protective equipment/clothing (PPE) is inadequate. No training is carried out on the use of protective equipment.

Manual Handling: The manual handling of the cardboard boxes is a problem, particularly when overfilled. Filled boxes are carried, pushed or pulled to the point of collection. There they are loaded onto a trolley that is often heavily overloaded with cardboard boxes and bags of general waste.

Stacking and Storage Practices: The stacking and storage practices for both the consumable equipment and the full containers are not safe nor are they adequately controlled. The stock levels are not monitored closely enough resulting in lapses in the provision of equipment

Infection Control and Hygiene Standards

The Infection Control committee is presently operating at a level where nosocomial and communicable diseases are monitored and some recording takes place. The present system of mass dressings compromises the infection control standards.

Policies and Procedures

There is no formal institutional waste management policy in place at Leratong or the Clinic. The procedures that are presently documented are fragmented and generally not well managed.

2. INTRODUCTION

2.1 Scope of this report

This report deals principally with the process for the selection of the equipment for the new waste management system. It details the types of equipment recommended, the estimated budget for the equipment and outlines the monitoring and evaluation framework to be adopted for the pilot test. The detail of the capacity building aspects and training are dealt with in a separate Capacity Building report.[2]

2.2 The original pilot project objectives

During the original planning stages of the pilot project the following main objectives were set:

- To develop an improved waste management system at the two pilot sites
- To informing the Tender Specifications for the DoH
- Develop and test HCW management guidelines
- Test the waste information system.

[2] NC 02-07-17 Capacity Building Pilot Sites V06

The pilot project was also formed to inform the broader project of the realities of the health institutions to be fed back into the overall waste management strategy for Gauteng.

3. THE SELECTION PROCESS FOR IMPROVED EQUIPMENT TO TEST

The selection of improved equipment for the new Waste Management System was made in partnership with the staff at the two institutions, the consultant team, representatives from DACEL and GDoH.

3.1 The areas of focus in the selection of improved equipment

The main focus in the selection of equipment was to provide:

1. Safer and environmentally friendly equipment
2. Improved transportation of waste through the supply of better equipment
3. Ensure a more environmentally friendly treatment of the waste

Although the focus was on the health care risk waste, good segregation of the HCRW from the HCGW can only be achieved through provision of containers for both the risk waste and the general waste. It is therefore necessary for the pilot project to also include aspects of the general waste stream.

3.2 The process followed in the selection of improved equipment

The process for the selection of improved equipment to test included:

- linking in with vision and strategy
- involving all stakeholders,
- using clearly defined decision criteria based on agreed principles,
- following an agreed decision making process

Linking in with the waste management vision and strategy in Gauteng

The Vision in the Strategy requires that:

…..within the frames and principles of the National Waste Management Strategy, to facilitate the establishment of:

- *An environmentally sustainable*
- *Financially viable*
- *Occupationally healthy and safe*
- *Institutionally feasible and*
- *Operationally practical management system*

For health care risk waste (HCRW) in Gauteng, covering all health facilities in the province, addressing the short, medium and long term needs.

Involving all the stake-holders

Several stakeholders are involved in the final decision on the optimum system to be introduced for all provincial health care facilities in Gauteng. These are as follows:

- The Gauteng Department of Health carries the responsibility to ensure that the wastes generated within their hospitals and clinics are disposed of in a safe and environmentally friendly manner. Their buy-in is therefore critical to this process as the sustainability of the system introduced, particularly with regard to affordability, rests with this department. Final approval must be obtained before the testing of the new system can commence. It is this department that will float the tender specifications for the equipment.

- The Department of Agriculture, Conservation, Environment and Land Affairs have a responsibility to ensure that the waste is treated and disposed of in an environmentally friendly manner. They are therefore responsible for ensuring that the waste is transported and treated correctly.

- The Management and Staff of Leratong hospital and Itireleng Clinic will be testing the feasibility of the new system for eventual application and roll out into the other 28 hospitals and > 400 clinics. Their input and participation in the decision is valuable to ensure that the system is operational and practicable.

- The full consulting team employed by RAMBØLL play a collective role in advising and directing the process to ensure that the decisions taken are legally compliant and meet the occupational health, safety and environmental aspects.

Using agreed decision criteria

Decision criteria were defined with the input from all the stakeholders to facilitate the process for decision making.

The following decision criteria were agreed and recommended by the consulting team in consultation with DACEL.

The four critical criteria to be considered are:

- The system must be safer
- The system must be affordable to Department of Health
- The system must meet the requirements of being environmentally friendly
- There must be sufficient capacity in place to sustain the system.

These four critical criteria were discussed and expanded on during workshops held with the Waste Management Committee at Leratong Hospital and the clinic.

The following key principles were selected by the waste management task teams at both Leratong and Itireleng as important when determining an improved waste management system.

1. Health Care Waste Management forms part of the overall National Waste Management Strategy and cognisance must be given to the legal framework

presently existing in South Africa. This strategy states that all generators of waste have a duty to care and be responsible for the hazardous waste generated within their areas. The concept cradle to grave is also entrenched into the legislation and includes minimisation of waste at source, collection at source, recycling, transportation, storage, destruction and final disposal.

2. The local management of health care waste at the facilities must form part of a multi disciplinary approach with interaction at all levels. An Institutional framework approach that includes responsibilities, the quality and quantity of staff, the existing skills as well as the equipment is essential for the successful sustainability of the waste management system

3. Segregation at source is a key requirement in this process. The provision of sufficient colour coded and labelled equipment will ensure that this is carried out as efficiently as possible. The minimum handling of waste will reduce the exposure of workers to infection and injury.

From these discussions detailed working guidelines were agreed and used as a baseline for the selection of the improved equipment. These can be found in Annexure 1 – Working Principles.

Following an agreed decision making process

Although DACEL is driving the project with the funding provided by the Danish Government, the Gauteng Department of Health are the key decision makers on what system to introduce into the pilot test sites.

A process was established with input from representatives of all the stakeholders at the Project Steering Committee level as follows:

- Representatives on the pilot project steering committee
- Representatives on the tender committee
- DoH Forum comprising a broad spectrum of persons from the regional and institutional levels.

Formal agreements have been signed by Director of GDoH as well as with the CEO's at the two facilities.

Regular Consultant meetings and discussions were held during the design stage of a new waste system.

3.3 The decision to test two systems at the Pilot Sites

The design of a new waste management system was influenced by the results of the feasibility study.[3] This study strongly indicated that the cardboard boxes presently used were environmentally unfriendly and unsafe for the workers, especially those working off the site. Another important factor arising out of this report was that re-usable containers were preferred to reduce the emissions to atmosphere.

[3] Draft Feasibility Study for Sustainable Health Care Waste Management Scenarios for Gauteng, Sep 2002

The options initially presented by the feasibility study centered round the use of 240 or 660 litre wheelie bins. The decision to include stackable boxes into the Feasibility Study was made at a meeting of the consultant team on 7th August 2002.

Four options for new equipment for health care risk waste to be tested were presented at a meeting on 9th September 2002 with the consulting team and DACEL. These options were:

1. Trolley / 240 wheelie bin - In this option, open stands with thick liners are placed in the intermediate storage areas. Large cage trolleys are used to collect the closed plastic liners for transport to the central storage area where they are transferred into the 240 wheelie bins for transport off the site.

2. 240 wheelie Bin – This option used 240 wheelie bins placed in the sluice rooms and waste collected from the smaller containers was placed into the wheelie bins. These are then wheeled full from the sluice rooms to the central storage area for transport off the site.

3. 660 wheelie bin – this system made use of the open stands in the sluice rooms where waste is collected from the smaller baskets or containers. When full, the closed plastic liners are placed directly into the 660 wheelie bins for transport to the central storage area. The 660 wheelie bins are only used for transporting and are taken into the ward areas.

4. Dual Wheelie bin – the 240 wheelie bins are used in the sluice rooms where the heavier wet infectious waste was generated. In other areas stands and liners are used. Both the 240 and the 660 wheelie bins leave the site with the waste.

In all these options, the reusable containers leaving the site are cleaned at the treatment plant and returned to the facilities. The consumable items such as sharps containers and specicans were the same for all options.

In addition to the four options above, a proposal was put forward that a surrogate test be conducted on the use of the stackable boxes that are presently being used in other hospitals. Appendix 2 contains more detail about this proposal.

A comparison of the weaknesses and strengths of these options against the critical decision criteria are described in Annexure 3.

A subsequent consultant / DACEL meeting was held on the 12th September after the results of the feasibility study into stackable boxes found that these boxes could prove to be the most cost effective option. At this meeting the consultant team agreed to recommend a dual test of a wheelie bin system and the stackable boxes to the GDoH. The stackable boxes would be manufactured according to the specifications determined by the consulting team.[4] A comparison of the two new systems to be tested is contained in Appendix 4.

[4] JM 02-09-13 Consultants Minutes 4 VO1

3.4 Revised objectives of the pilot test based on the dual system test

Arising out of the decision to test not one system, but two, the objectives of the pilot test were revised. The main objective was to now **develop and test two** improved and safer waste management systems for Leratong Hospital and one improved system for Itireleng Clinic, in order to:

1. Conduct a comparative analysis between the two systems
2. Inform the tender specifications process
3. Test the assumptions made in the feasibility study
4. Test the code of practise, training and awareness material developed

The two new waste management systems include both the health care risk waste and the general waste.

3.5 Presentation of recommendations to DoH

A presentation on the recommendations was made to the Senior Management Meeting of the Department of Health chaired by Dr. Rispel, the Head of Department on the 15th October 2002. At the meeting the following key recommendation were presented:

- **Recommended testing of two "best options":**

  Testing of both the 770 litre wheelie bin *and* a set of reusable plastic boxes in different departments at Leratong Hospital

  Testing of the same set of reusable plastic boxes throughout Itireleng Clinic

- **Recommended 770 litre Wheelie Bin System :**

  HCRW is segregated at source using a number of receptacles. Sealed bags are collected and placed in the wheelie bin together with sealed sharps containers etc.

  Pro: Easy and safe transport. Environmentally friendly and cheaper

  Con: Re-introduction of plastic liners may be seen as a step backwards and is a potential safety concern segregation is not improved

- **Recommended reusable container system:**

  HCRW is at source placed in final puncture proof container and never exposed again.

  Pro: Addresses all needle stick concerns, environmentally friendly and cheapest

  Con: Leads to manual handling of numerous items and requires trolley/pallet systems

- **"Tendering" of participation as Treatment Plant for Pilot Testing**

3.6 Preconditions for implementation

Some preconditions for the implementation of the recommendations were necessary to ensure commitment and participation of all the stakeholders. At the meeting on 15th October 2003 the following preconditions were agreed:

- **Minimum endorsements needed for Pilot Projects**

1. An Endorsement of process for selecting treatment plant for Pilot
2. Endorsement of PP System by DoH and Institution Managers to allow procurement to start
3. The signing of PP Agreement with all parties (DoH, Institutions, Buhle, treatment plant, DACEL & Rambøll). Including i) ownership, ii) DoH inputs, iii) Project inputs, iv) Service Provider input, v) liabilities).
4. DoH Commitment to continue PP Activities until new tender period commences
5. Appointment of HCWM Officer & Assistant at/by pilot institutions

- **Preliminary Recommendations for Improved HCW Tenders**

1. A separate tender for supplying disposable containers for Gauteng;
2. Collection and transport of HCRW separate from treatment and split according to the three DoH Regions;
3. Contracts for HCRW treatment and disposal coincide with one or more of the demographic boundaries. Backup agreements with other treatment at facilities;
4. Contract periods of 3 or 5 years with the option to extend the contract to 5 years;
5. Tenders for reusable container systems only (alternatives?);
6. GSSC appointed to undertake the tender letting as well as the management of the contracts after award;
7. The contract for HCRW management remain separated from that of HCGW management and silver recovery, recycling etc.;

- **Minimum endorsements needed re. HCRW Tender**

1. Agree to extend existing contracts/new tender for approx. 6 months *(before end October)*
2. Ensure minimum stock taking before transition to new tender period (plan now)
3. Involvement of GSSC
4. Agree to final tender document and service delivery specifications (when drafted)
5. Agree on Auditing and Contract Monitoring System (e.g. with GSSC + tech. forum)

3.7 Agreements Signed

A special Pilot Project Agreement was entered into by all involved parties being:

1. Head of Department of Health

2. Management of Leratong Hospital
3. Management of Itireleng Clinic
4. Management of Buhle Waste (Transporter having the current service contract for HCRW Services)
5. Chief Technical Advisor of the Gauteng HCW Management Project (Funding the pilot activities via an entrusted DANIDA grant)

This Pilot Project Agreement determines, among others:

1. Billing principles during the Pilot Period
2. Start and end of pilots
3. Roles and responsibilities of each party
4. Payments and resources to be provided by the parties
5. An option for extension of the pilot projects beyond the first 6 months

In addition to this Pilot Project Agreement a particular agreement between Buhle Waste (transporter) and Enviroserv (Sanumed) has been facilitated by the Project that specifies, among others:

1. Waste from the pilot projects must be brought for treatment at Enviroserv's incinerator at Roodepoort
2. A fixed price per kilogram of waste to be used for billing between Enviroserv and Buhle
3. Duties of Enviroserv, including cleaning and disinfection of reusable containers and conduction of some swap tests as well as the availability of a fitted bin lifter and bin washing system
4. Duties of Buhle waste, including collection times, use of equipment, availability of truck fitted with a lifting tail gate, reporting etc.

These agreements are being sought to be extended to allow the pilots to continue until the anticipated roll-out of the new tender around December 2003 - February 2004.

The selection of the two pilot sites was endorsed by the Head of Department in 2002 in a separate agreement.

4. THE TWO IMPROVED EQUIPMENT AND OPERATIONAL SYSTEMS

The decision to develop and test two improved and safer waste management systems at Leratong and Itireleng would have a greater impact on the selected pilot sites than only testing one system throughout. In developing the two systems, some thought was given to reducing the impact wherever possible. Some aspects were common to both systems viz. The sharps containers and the separation of the glass vials. Both systems were based on a dual colour scheme of black for general waste, and red for the health care risk waste. Wherever possible, the same sizes were used for the liners. A locally made 770 Wheelie Bin was made available that was cheaper than the 660 imported one.

4.1 Overview of the two systems

Outline of the two systems

The test sites for Leratong hospital will have approximately 50% of the hospital on the 770 wheelie bin system and the other 50% on the stackable box system. Itireleng will be equipped with the stackable boxes only.

Segregation at generation is critical to the success of both the systems. The HCR waste is segregated according to the categories of

1. sharps,
2. infectious waste,
3. anatomical waste
4. expired medication

The two systems to test have a combination of reusable containers and liners that are both economical and flexible. Red liners of different sizes and thicknesses are used in a selection of standardised containers, basket and stands.

Environmentally friendly re-usable standardised roto-moulded red containers in two sizes will be manufactured for the stackable box system. Wall and trolley mounted baskets and stands will be manufactured to engineering drawings and positioned as close as possible to the generation of the waste.

Disposable containers made of the more environmentally friendly polypropylene or polyethylene plastic will be used for the disposal of sharps. The containers are to be rigid and puncture proof with tightly fitting lids. The dyes are not to contain heavy metals. The same sharps container will be used in both systems.

The anatomical waste will be contained in 10 litre disposable containers and stored separately in the Mortuary of the hospital or in small refrigeration units placed in Maternity.

All intermediate storage areas in the places using the *770 wheelie bin system* will be equipped with 110 litre liners supported by custom-built stands for the disposal of the general infectious waste. The smaller liners in baskets at the points of generation, when full, will be securely closed using a rubber band and placed inside the larger containers. When ¾ full, the larger liners in turn will be securely

fastened using rubber bands, and placed inside the 770 wheelie bin for transportation to the central storage area.

All intermediate storage areas in the areas using the *stackable box system* will be equipped with a 50 or 100 litre box. The liner used in the 25 litre box on the nursing trolley or positioned in a bracket on the wall will be tied with an elastic band and placed inside the 50 or 100 litre box in the storage area. When the larger boxes are ¾ full, they will be closed and replaced with another container. The stackable boxes will be collected in a custom built trolley and transported to the central storage area. This trolley will contain a maximum of 800 litres made up of a combination of the 50 and 100 litre stackable / nestable boxes and will be sealed for transportation off the site.

The sharps containers will be placed inside the 770 wheelie bin or the 100 stackable boxes for transportation to the central storage area.

Glass vials will be separated out and the quantities recorded and weighed for analysis. Investigation will be done into the recycling of the glass vials. The alternative is to dispose of to landfill.

The Central Storage Area will house the full 770 wheelie bin and trolleys with stackable boxes to await transport off the site.

The Service Provider, using a custom-built transportation truck with a mechanism for loading the bins and stackable boxes, will transport the waste to the treatment plant. The full bins and stackable boxes, when removed, will be replaced with cleaned and sanitised bins ready for deployment back into the hospital. All the health care risk waste transported off the site will be contained and sealed inside the wheelie bins that will be mechanically emptied thus meeting the requirement of no contact for the handlers.

Comparisons between the two systems

The table below gives the comparison between the two systems against the key components of containerisation, internal collection and transport, storage, external transport, and treatment.

Key Components	770 Wheelie Bin/liner System	Stackable Box System
Sharps containerisation	A rectangular plastic sharps containers, supported in brackets, with a horizontal loader. Both wall-mounted and nursing-trolley-mounted brackets deployed.	
Containerisation Vials and Glass bottles	A 10 litre cylindrical plastic specican with a firmly fitting lid	
Containerisation of long sharps	**A 70 cm tall cylindrical plastic container with vertical loader**	
Containerisation of specimens, placenta and other anatomical waste	Human Tissue (placentas etc) will be contained in a 10 litre cylindrical plastic specican with a firmly fitting lid Larger anatomical waste will be double bagged in a plastic liner and placed inside the wheelie bin form removal.	Human Tissue (placentas etc) will be contained in a 10 litre cylindrical plastic specican with a firmly fitting lid Larger anatomical waste will be placed into a dedicated 50 or 100 litre containers, labelled and removed separately.
Containerisation of general infectious waste at point of generation	12 litre Pedal bins, kick about trolleys, Nursing Trolley 30 litre baskets and small 30 litre wall baskets with fitted red liners are	12 litre Pedal bins, Kick about trolleys, Nursing Trolley 30 litre bin on a bracket and 30 wall mounted bins, fitted with red liners of 50 microns.

Key Components	770 Wheelie Bin/liner System	Stackable Box System
	varying micron thicknesses – 50-60 micron.	
Containerisation of Health Care General Waste at point of generation	Pedal bins and small 30 litre wall mounted baskets fitted with black liners of 30 micron	
Containerisation of infectious waste at Intermediate Storage Areas	110 litre stands fitted with red liners of 80 micron	50 or 100 litre plastic boxes fitted with red liners of 50 microns
Containerisation of Health Care General Waste at Intermediate Storage Areas	110 galvanised stand or 110 litre black bin with fitted black liner of 30 micron	
Collection from point of generation	Liners from smaller containers to be closed with rubber bands and placed into larger liners in the Intermediate Storage areas of corresponding colour – red or black Larger liners when full are closed with rubber bands	Red liners from the 30 litre boxes, kick about trolleys and pedal bins to be closed with rubber bands and placed into either 50 or 100 litre boxes. Full boxes are closed with lid. Black liners from the closed with rubber bands and placed into larger liners on stands or into black bins.
Internal transportation of HCRW to Central Storage Area	Full and sealed large red liners from wall mounted racks to be collected in 770 Wheelie Bins. Full wheelie bins to be locked and transported to central storage area Sharps containers and specicans with vials and bottles to be placed inside the wheelie bins for transportation off site.	Full and sealed 50 or 100 litre stackable boxes to be collected in custom built trolley (8 x 100 litre capacity), trolley locked and transported to the central storage area ready for transpiration off site. Sharps containers and specicans with vials and bottles to be placed inside the 50 or 100 litre box for transportation off site.
Internal Transportation of HCGW to Central Storage area	Sealed black liners transported in a 660 wheelie bin to the central storage area for transfer into the skip.	
Final receptacle at Central Storage Area awaiting off-site transportation	All HCRW to be placed in 770 wheelie bins, including closed sharps containers and specicans with vials and bottles All HCGW to be placed into the Skip supplied by Local Municipality and transported to a landfill site.	All HCRW to be placed into 50 and 100 litre stackable boxes, including closed sharps containers and specicans with vials and bottles and boxes stacked into lockable custom built trolley All HCGW to be placed into the Skip supplied by Local Municipality and transported to a landfill site.
Waste Storage Building	Large building for the storage of both 770 Wheelie Bins and Lockable custom built trolleys. Area to be regularly treated for vermin and vectors	
Sealing of containers for HCRW transported off-site	Wheelie bins are sealed using Cable tires or similar through a hole drilled through the lid and the main body of the bin.	Trolleys to be locked
Collection Vehicle for HCRW	Truck to be fitted with a mechanical lifting tail gate (supplied by the Project). Wheelie bins and trolleys are wheeled onto the lifting tailgate, and after lifting the tailgate wheeled in to the truck where they are fastened.	
Treatment plant for HCRW	Incineration will be used for the destruction of the HCRW	
Washing and return of emptied wheelie bins	The Treatment Service Provider will wash the bins and trolleys for recirculation.. The transport Service Provider shall collect cleaned wheelie bins, boxes and trolleys to be returned to the Pilot sites for subsequent filling.	

Allocation of equipment for the two systems at Leratong Hospital

At Leratong hospital the decision of what sections would trial the wheelie bin system and the stackable boxes was taken in conjunction with the Leratong Waste

Management Team. With a few exceptions, the division was made mainly on the ward numbers with wards 1-16 on the stackable boxes and wards 17-25 on the wheelie bins system. The areas that generate large quantities of waste or have specialized functions were divided equally between the two systems to try to get as equal a distribution of the total waste between the two systems as possible.

The following allocations were made:

Stackable Boxes	Wheelie Bin /Liner system
Wards 1,2,3,5,6,7,10,11,12,16	Wards 4,15,17,19,20,21,22,23,24,25
Adult ICU	Paeds ICU
Casualty & Foyer	Operating Theatre
Out patient	CSSD (Theatre and Ward)
Pharmacy	Renal
Physiotherapy	x-Ray
Kit room	Occupational Therapy
Poly Clinic	Mortuary

For Itireleng Clinic it was decided to only the stackable boxes as the 770 wheelie bins would be too large for the quantities of waste generated. A list of the equipment requirements is contained in Appendix 5.

4.2 Segregation

Strict segregation of waste at source is the key to the success of the systems. Although the microns for the liner-based system will be increased to provide a greater degree of protection in the case of mis-segregation, it is essential that the focus for coaching and training must be on segregation. Recycling of cardboard, paper, glass, food and silver will be encouraged provided that there is a reliable collection.

4.3 Colour Coding and Labelling

The colour coding will be:

- Red for infectious and anatomical waste
- Black for general waste.

Wherever possible, these colours will be used on the containers but in most instances it is the coloured liner that will distinguish the different categories.

The Labelling will be as follows:

Each 770 Wheelie bin and custom built trolley will be uniquely numbered with an aluminium plague. Wheelie bins will be prefixed with WB.. and the Trolleys with CT. Drawing of the label is found in Appendix 6.

Each Stackable Box will have a unique number pressed into the side of the container using heated number dies. In addition each box will be embossed with the hazardous waste sign. Drawing of sign is found in Appendix 6.

A decal to be stuck onto the side of the sharps containers will be printed and must be affixed by the stores personnel prior to distribution of the container.

4.4 Types, Sizes and Quantities of Equipment

The following tables detail the types, quantities and usage for the equipment in each system for Leratong and the stackable boxes for Itireleng.

			Quantity		
			Leratong		Itirel.
Disposable containers	**Colour**	**Placing/Use**	**Wheelie B**	**Box**	**Box**
8 litre sharps	red	All needles, blades and other sharp objects	960	660	166
70 cm tall sharps	red	Tro-cathatheters and other long sharp objects	5	29	
10 litre specican – anatomical	red	Placentas and other human tissue		480	156
10 litre specican – bottles and vials.	red	Bottles and vials	348	468	288
Liner	**Colour**	**Placing/Use**	**Bin**	**Box**	**Box**
46 x 54 @ 50 micron	Red	Placed in pedal bins, kick about trolleys	11,592	13,944	
56 x 66 @ 60 micron	Red	Placed in Nursing Trolley baskets, wall mounted baskets and 30 litre boxes.	12,096	9,744	6,384
75 x 95 @ 80 micron	Red	Placed in stands in intermediate storage areas for bags from smaller containers	8,736		
75 x 95 @ 50 micron	Red	Placed inside 50 litre boxes for all types of infectious waste. Can be used at point of generation or in intermediate storage area		3,192	2,184
100 x 95 @ 50 micron	Red	Placed inside 100 litre box for all types of infectious waste.		3,360	336
46 x 54 @ 30 micron	Black	Placed in pedal bins and other containers for general waste	(59,760)	(59,760)	
56 x 66 @ 30 micron	Black	Placed in wall mounted baskets for general waste	(67,200)	(67,200)	
75 x 95 @ 60 micron	Black	Placed in stands or black bins for general waste	(6, 720)	(6,720)	

			Leratong		Itirel.
Reusable Containers	**Colour**		**Wheelie B**	**Box**	**Box**
770 Wheelie Bin	Red	Kept at Central storage. Used to transport the waste from intermediate storage areas to central storage. Also used to transport the waste off the site	20		
100 litre roto-mounted box + lid	Red	At Intermediate storage area with red liner. Full, closed smaller liners from pedal bins, kick about trolleys and 30 litre bins are placed into this box. Liner closed with rubber band when full and container		148	14

		sealed with lid.			
50 litre roto-mounted box + lid	Red	At point of generation or at intermediate storage area with red liner. When full, liner closed with rubber band and container sealed with lid.		144	91
30 litre Addis bin	Grey (note: red was not available)	At point of generation supported in bracket on wall or nursing trolley with red liner		50	10
12 litre pedal bin	White/grey	At point of generation and fitted with red or black liner. Used for both infectious and general waste	Hosp. to provide		0
Kick about Trolley	Stainless steel	Used in theatre, maternity, ICU and renal with a red liner for infectious waste	Hosp to provide		Clinic to Prov.
			Leratong		**Itirel.**
Other Equip	**Finish**		**Liner**	**Box**	**Box**
110 litre stand	Electro galvanised	In intermediate storage areas with red or black liner for smaller full closed bags from containers at point of generation.	40 (14)	(14)	
30 litre wall basket	Electro galvanised	Placed on walls with red or black liners at point of generation	15 (169)	(170)	(64)
Nursing Trolley Basket	Electro galvanised	Placed on Nursing Trolley with red liner for general infectious waste	19		
Nursing Trolley Bracket	Electro galvanised	To support the 30 litre bin on the nursing trolley		20	10
Wall Bracket	Electro galvanised	To support the 30 litre bin on the wall		25	
Sharps Wall Bracket	Powder coated	To support the 8 litre sharps container	34	47	22
Nursing Trolley Sharps bracket	Electro galvanised	To support the 8 litre sharps container on the nursing trolley	19	20	10
Nesting Wire Cage Trolley	Electro galvanised	To transport the stackable boxes from the intermediate storage area to the central storage area. They are also taken off the site.		12	4

4.5 Specifications for Containers and Equipment

Equipment specifications are an essential part of the waste management system to ensure that the correct quality of equipment is purchased. Well defined specifications in line with both national and international standards will be tested during the pilot project. The information gained will inform the tender specification process for the GDoH.

The detailed drawings for all the containers, stands, baskets and brackets are given in Appendix 7.

4.6 Storage Areas

Intermediate Storage Areas for Waste
The intermediate storage areas are used to temporarily store the waste before transportation to the central storage area. Easy access to the area for the ward or unit staff is necessary. The sluice rooms can be used for this purpose where large enough.

Waste should not be allowed to accumulate in the ward areas and a routine programme will be devised for the regular collection and storage in the intermediate storage area.

Central Storage Area:
The Central Storage Area at Leratong is a brick building that is presently large enough to contain the anticipated number of 770 wheelie bins and stackable boxes. A daily collection during the week is preferred. There should be sufficient space available to accommodate a weekend accumulation. The area is presently accessed by a ramp. Security arrangements will be improved to limit access of unauthorised persons. Anatomical waste will be stored in the mortuary until it is collected.

4.7 Transportation

Internal Transport:
The transportation modus operandi for the two systems are different.

Stackable Boxes: A custom built nesting wire caged trolley of approximately 1 x 1,3 x 1,5 m high, and able to contain 8 x 100 litre stackable boxes, will be manufactured for the transportation of the stackable boxes.

770 wheelie bin system: The liners from the stands will be securely fastened using elastic bands and placed inside the 770 wheelie bins. The wheelie bins will be fasted using a cable tie system for transportation off the site.

Both the caged trolley and the 770 wheelie bin will be taken off the site and clean ones returned.

Internal collection of HCRW is presently carried out three times daily. The time schedules will be revised to synchronise the collection of the waste from both systems and ensure that the waste is correctly weighed and stored awaiting collection by the transporter.

External Transport:
The vehicles for the transporting of the waste are not fitted to lift the wheelie bins or cage trolleys. A mechanical lifting mechanism to accommodate the size of wheelie bins will need to be devised and manufactured to reduce the manual handling of large bins. The efficiency of the trucks will be improved if a system of stacking can be introduced.

4.8 Treatment

The HCR waste will be incinerated at an incinerator situated off the site. The local authority will transport the HCG Waste to landfill.

4.9 Occupational Health and Safety Aspects

Issue and Wearing of Protective Clothing
Protective equipment such as rubber nitrile gloves, latex gloves, masks etc will be made available. A code of practice will be drawn up for the issue and use of protective clothing. Coaching, supervision and enforcement will be required to ensure that all personnel wear the protective clothing.

Manual Handling Techniques
Manual handling will be reduced by the introduction of trolleys and wheelie bins to transport the waste. The weight of the large liners should not exceed 10 kgs/bag. The wetter and heavier waste in the stackable box system will be placed into the smaller 50 litre boxes and should also not exceed 10 kgs/box.

Lifting techniques will be coached and codes of practice written for the correct lifting techniques and use of the trolleys.

General Housekeeping and Hygiene Standards
Hygiene standards can be improved with the introduction of a coloured-coded system for cleaning, and training in the effective use of chemicals. (This is outside the scope of this project.) Coaching, supervision and enforcement will be required to ensure that better housekeeping and hygiene standards are adhered to.

Occupational Health
The prophylactic and emergency treatment for the exposure to blood–borne pathogens as a result of the handling of the waste will be considered and managed in accordance with the existing procedures.

4.10 Infection Control

The hospital has an Infection Control committee to address the infection control standards and codes of practice. The cleanliness of the containers will be of prime importance during the pilot test. The washing and return of the reusable containers will be closely monitored for bacteria and virus contamination.

4.11 Organisation and Responsibilities

The purpose of introducing a new management structure is to strengthen institutional capacity to manage waste better. Therefore all departments will be given clear roles and responsibilities. The relationship to existing committee structures will be defined. The existing committees with some relationship to waste management are understood to be:

- Emergency action committee – updating disaster plan
- Occupational Health and Safety Committee – Report monthly to CEO and hospital management.

Proposed new organisational structure has been detailed in the capacity building report[5]

4.12 Code of Practise Booklet

A code of practise booklet was compiled and introduced as part of the capacity building plan[5]

4.14 Operational Systems

The implementation of new equipment can only be successful if supported by operational systems. The following documentation systems will be introduced:

- Bi-weekly order of consumable items from the central warehouse using the existing VA2 ordering forms
- Stock control limits set for each department to ensure proper control of stock levels in each unit
- Monitoring of the usage of the stock though bi-weekly reports
- Weighing and documentation of the waste leaving the site with relevant signatures
- Collection and internal transportation routines and time schedules
- Documentation for the collection of health care risk waste from the units
- Documentation of all anatomical waste to the mortuary and when collected by the service provider
- Log sheets for the transporting of waste
- Regular inspections and reports on progress
- Incident Reporting

5. BUDGET ESTIMATES FOR EQUIPMENT

Reducing the overall costs of HCWM for the DoH was a key decision criteria in the selection of equipment for the two systems. Detailed estimated quantities together with the costs were compiled for the two systems for both Itireleng and Leratong. These may be found in a separate file.[6]

5.1 Summary of estimated costs for Leratong and Itireleng

The total cost for the equipment for Leratong and Itireleng for a period of 24 weeks was calculated as follows:

	Leratong	**Itireleng**	**Total**
HCRW	403,246,52	62,276.29	465,522.82
HCGW	136,755.33	13,449.42	150,204.75
Sub total	***540,001.85***	***75,725.72***	***615,727.57***
VAT	75,600.26	10,501.50	86,201.85
TOTAL	**615,602.11**	**86,327.32**	**701,929.43**

[5] NC 03=2 ……
[6] JM 02-10-02 Equipment Inventory and budget test combined VO7

It should be noted that these costs include considerable expenses for long-time durable items such as the bin lifters and lifting tail gate provided for the two external service providers as well as the durable containers, stands, racks etc.

5.2 Actual Costs of equipment at the placing of orders for Leratong and Itireleng

A summary of the actual costs are shown in Appendix 9.

	Leratong	**Itireleng**	**Total**
HCRW	414,522	56,893	471,415
HCGW	106,309	11,385	117,694
Sub total	***520,831***	***68,278***	***589,109***
VAT	72,916	9,559	82,475
TOTAL	**593,747**	**77,837**	**671,584**

The allocation of costs for capacity building and training is given in the Capacity Building Report. The total capacity building budget is approximately R340,000 and includes the training course development

5.3 Allocation of Costs

The Project would be financing all the equipment for the health care risk waste. An allocation of the costs to be borne by the DoH is mainly for the health care general waste. The DoH would finance the new pedal bins and would be responsible for a portion of the black liners for the general waste. The total allocations per sector were estimated at R781,400 from the project funds and R155,000 for the DoH. The project would also finance the full capacity building and training budget for the pilot project period.

6. PROCUREMENT OF EQUIPMENT

6.1 Process followed for the selection of suppliers

A three quote system was followed. Formal RFQ'S (requests for quotes) were sent out to a minimum of three suppliers for the consumable equipment, reusable boxes, stands, brackets and cage trolleys. Adjudication of the quotes was conducted by the CTA in conjunction with the consultants. Formal orders were placed with the chosen suppliers by the CTA. Examples of the RFQ's and orders are found in Appendices 10, 11 and 12.

6.2 Equipment Suppliers

The suppliers for the equipment are as follows:

Equipment Supplier	**Type of equipment**
Plastic Omnium	770 litre wheelie bin
Pioneer Plastic	100 L roto-moulded box + lid 50 L roto-moulded box + lid
USABCO	30 L Addis bin

Namron Enterprises	Galvanised baskets and brackets
Ladder & Trolley Mart	Nesting wire cage trolley for box system
Trek Scale	Scales
Namron Enterprises	Sharps containers
ClinX Waste	Tall sharps container
Plastica Film Extrusions	All sizes of liners

6.3 Placing of orders, delivery of equipment and storage requirements

Ordering and delivery

Formal orders for equipment placed by the project leader (CTA) on behalf of DANCED with the above companies together with expected delivery dates for completion by the end of January 2003. A summary of equipment ordered, expected delivery dates and supplier details are found in Appendix 13.

Storage requirements

On delivery, the equipment must be safely stored in the hospital warehouse to await distribution to the units. The baskets and bags are to be fixed to the walls and the reusable containers entered into the temporary stock records of the hospital before the testing begins. In order to ensure sufficient space is made available, an estimation of the storage space required has been tabled in Appendix 14.

7. ASSUMPTIONS

This Waste Management System has been drawn up to provide a sustainable waste management system for Leratong Hospital. During the process of selection and planning for the new systems, certain assumptions were made as follows:

1. The level of commitment and support of the senior management and staff of the hospital will be maintained for the full duration of the pilot project.
2. The Provincial Department of Health finds a workable solution with respect to the on-going procurement of consumables, budget estimates; capacity provided etc. that will ensure sustainability of the new waste management system.
3. There will be full co-operation from the service providers and agreement will be obtained on the suspension or revision of the existing contracts.
4. Money will be available for the provision of equipment for the test period will be available
5. The tender specifications will be aligned with the outcome of the pilot project to ensure long term sustainability and roll out of the system
6. The Service Providers will be encouraged to take a greater role and form a partnership with their clients that will ensure long term sustainability of the system
7. The manufacture of the required equipment will be done in time for the testing

8. MONITORING AND EVALUATION OF THE PILOT TEST

A monitoring and evaluation framework for extracting the experiences and learning lessons from the pilot projects is outlined in a separate document.[7] For completeness, some extracts from this report are summarised here.

8.1 The purpose of the research

The purpose of the research to be conducted during the pilot test is to compare and contrast the implementation and running of two health care waste management systems based on the use of reusable containers both within the health care facilities, off-site with the service provider and at the treatment facility.

The results of the first three months of the research will be used to inform the tender specifications by the beginning of May. The research will continue for the second three months until the end of the test period in June 2003 and the final results will be used to inform the guidelines and strategy.

8.2 The test period

The test period at the pilot sites starts in January 2003 at Leratong Hospital with the first training session planned for 23th January 2003.) The stackable boxes are to be introduced first, followed a maximum of two weeks later with the 770 wheelie bin. The stackable boxes are planned to be introduced into Itireleng Clinic early in February. The test period at both pilot sites is 6 months with the test period due to finish at the end of June 2003.

8.3 The tender specifications

During the pilot test, the draft tender specifications for the health care risk waste contract will be written. In order for these specifications to be finalised, it is essential that the specifications for equipment and for training are refined and are in keeping with the results of the pilot test. The award of the new tender is due to take place in July 2003 with implementation to be follow in the second half of 2003. The Department of Health will need to make a decision about the preferred equipment early in May.

8.4 Monitoring of the System

The monitoring of the system will be continuous throughout the 24 week period both on-site and off-site. Both qualitative and quantitative methods of monitoring will be used. The qualitative research will involve focus group discussions, observations and key-informant interviews with important role players. Physical inspections using checklists and questionnaires will be conducted. The quantitative research will involve time-logs/report forms, incident analysis, laboratory results, detailed cost estimates, weighing and quantities and the information obtained from the waste composition studies.

8.5 The research will be divided into three components:

[7] JM 02-10-03 Monitoring and Evaluation Framework for pilot project VO4

Component 1 – System and equipment performance
Component 2 – Capacity Building
Component 3 – Segregation
(Details of each component are found in the full monitoring and evaluation framework document.)

9. REFERENCES:

1. Draft Feasibility Study for Sustainable HVW Management Scenarios for Gauteng, September 2002
2. JM 02-05-09 Pilot Project Survey Report, Itireleng
3. JM 02-04-19 Pilot Project Survey Report, Leratong
4. NC 02-07-17 Capacity Building Pilot Sites V06
5. JM 02-09-13 Consultant's Minutes 4 V01
6. JM 02-10-03 Monitoring and Evaluation Framework for Pilot Project V04
7. Draft Regulations for the Control of Environmental Conditions constituting a danger to health or nuisance
8. SABS 0248 Handling and disposal of waste materials within health care facilities
9. Minimum Requirements for the handling, classification and disposal of hazardous waste – Department of Water Affairs and Forestry, Second Edition 1998

Annexure 1:

Working principles used as a guideline by the Waste Management Task Teams when discussing and selecting the new improved equipment

- Health Care Waste Management must be driven by a high level hospital committee that includes Occupational Health and Safety, Infection Control and Senior Hospital Management
- Health Care Waste Management must have a hospital policy with roles and responsibilities clearly defined
- The Service Provider must be viewed as a partner and be contracted to assist with auditing, multi disciplinary training, provide information on quantities and weight, suitable equipment, washing and sanitising and general consultancy
- There must be an efficient procurement process that is not only cost driven but considers all safety and health risk factors and environmental aspects through a tender document that details minimum technical specifications and provides guidance for procurement personnel.
- An efficient equipment distribution and accounting system including a formal stock piling policy for central storage, any forward storages and in-the-ward-storages will be introduced to reduce excessive stock piling in these areas while ensuring that sufficient stock is present at all times.
- Standardised equipment (colours, types, and sizes) will be applied throughout although cognisance will be given to the special needs of individual units
- Colour Coding for waste management will be confined to two main colours - red and black
- Where possible and practicable, dedicated intermediate and central storage areas that can be secured will be provided for HCRW and HCGW
- Equipment must be available from suppliers at relative short notice and at suitable and predictable prices, hence, South African suppliers only are assumed.
- Re-usable equipment will be used wherever possible to reduce the effect on the environment through disposal of consumable items
- Where possible, containers will be sized according to the requirements of a daily collection so as to minimise accumulation of waste and facilitate handling
- Sharps containers will be sized to ensure that filling time does not exceed 2 weeks to avoid accumulation of dust.
- Standard precautions for infection control will be applied wherever they impact directly on the safe disposal of waste.
- Where possible cost savings will be encouraged
- Recycling will be applied wherever practicable and financially possible to minimise the waste and save costs
- Protective clothing will be provided according to best practicable safety and legal requirements.
- The hospital will provide on-the-job training, supervision and awareness activities to support behaviour change for better segregation

Annexure 2:

Proposal for the testing of equipment as presented at the Meeting on 9th September 2002

The Proposed New Equipment to Test

At the time that the proposals were put forward the option of stackable plastic boxes was not available for consideration. The options put forward were therefore based on wheelie bins and liners. Two colours – red and black are proposed. Smaller standardised containers and liner holders placed at the various points of generation are collected and placed into larger holders and wheelie bins positioned at the intermediate storage areas. Internal transportation is provided for by trolleys or wheelie bins. The wheelie bins for HCRW are transported off the site and the waste processed at an Incineration plant. Sanitation of the wheelie bins will be carried out off the site and the Service Provider will return the clean bins.

Options

Four options have been considered for HCRW:

1. Trolley/240 Wheelie Bin
2. 240 Wheelie Bin
3. 660 Wheelie Bin
4. Dual Wheelie Bin

One option has been proposed for HCGW and Recycling

Detailed comparisons of the HCR systems against the critical decision criteria are contained in annexure to this document. Also included is a preliminary budget for each option. A comparative summary is given below.

Option	Safer (Weaker aspects only highlighted)	Affordable to DoH (Prelim. Est. calculated for 6 mths.)	Environmentally Friendly
Trolley/240 Wheelie Bin	Exposure to the waste is increased as the dry infectious waste in liners is transferred into a trolley and then again into a 240 wheelie bin at the central holding area Liners do not provide protection against the mis-segregation of sharps. Transportation of 240 wheelie bins requires a lifting device at both the truck and incinerator	This option is the most affordable at a total estimated cost of R371, 000.00 This is 13 % cheaper than the recommended dual system option	All the systems meet the requirements for minimum specifications of containers for incineration and the use of reusable containers reduces the burning. The same treatment plant will be utilised for all four options.

240 Wheelie Bin	Manual handling is reduced as only the dry infectious waste liners are handled once when placed directly into the 240 wheelie bin inside the sluice room. Liners do not provide protection against mis segregation of sharps Lifting devices required at both the truck and at the incinerator. A greater number of 240 wheelie bins in circulation raises a security concern	This option is marginally more expensive at R391, 000.00 This represents an increase of 6% on the trolley system	
Option	Safer (Weaker aspects only highlighted)	Affordable to DoH (Prelim. Est. calculated for 6 mths.)	Environmentally Friendly
660 Wheelie Bin	Manual handling is increased as sealed liners for both dry and wet waste are carried to the corridor to place into a 660 wheelie bin as concerns are raised on cross infection should the larger bins be transported from ward to ward. Liners do not provide protection against the mis-segregation of sharps Lifting devices required at both the truck and at the incinerator to manage the full estimated weight of the 660	This option is presently the most expensive option at R457, 500.00. This represents an increase of 23 % on the trolley system	
Dual Wheelie Bin	Manual handling is reduced as only the dry lighter infectious waste is handled and carried to the corridor to place into a 660 wheelie bin. Liners do not provide protection against the mis-segregation of sharps The lifting devices on the truck and at the incinerator must be able to process both sizes of wheelie bins. Utilisation of the available space in the truck will be undermined with the transportation of both sizes of wheelie bin.	This option is calculated at R457, 500.00 and is 13% more expensive than the trolley system.	

The way forward.

All the options have some weaknesses around the manual handling and exposure to the waste. The 660 wheelie bin option is presently the most expensive and there are marginal decreases through from the dual wheelie bin, 240 and trolley options. The environmental impact is met in all the options.

There is no clear indication from the information available that favours one option over the others. Also the system will need to address the requirements of a wide range of institutions from very small clinics to very large acute care hospitals and size will play a part in the selection of the most suitable solution. For example, the 660 wheelie bin will not be feasible for a small clinic.

Although the equipment is an important element of a sustainable system, it cannot operate in isolation and will require a sound management system and capacity building programme to support it.

The sub-consultant team also believe that there are several factors presently impacting negatively on the progress of the pilot project.

1. The exclusion of the stackable plastic boxes in the decision
2. There is no mandate for the consultants to consult with a high level forum of DoH/Dacel representatives
3. No clear indication of how the roll out issues will be handled

Recommendations

In view of the above, we propose the following:

Opportunity to Test the equipment

In view of the factors discussed and the restrictions mentioned above, it is the recommendation of the Sub-Consultant team that the pilot period be used as a test only – either in the whole hospital or in selected sections – for the period of 6 months to determine the feasibility and functionality of the 660 against the 240 wheelie bins in the South African context. We therefore recommend that the Dual Wheelie Bin System be tested.

Monitoring and Evaluation Forum

At the same time, we recommend that the CTA establish a monitoring and evaluation forum to collate objective information from other hospitals that are presently using the stackable plastic box system and any other reusable system, other than cardboard boxes, that is presently being used in South Africa.

High Level DoH/Dacel Forum

We also recommend that the CTA and Dacel establish a high level forum of DoH/Dacel personnel to review the capacity building recommendations, results of the pilot test and make decisions on how the pilot project will inform the Strategy, Guidelines and the Tender Specifications.

This body will also make decisions on the best solution for a sustainable system for the DoH, will ensure the necessary action in the DoH to implement capacity building recommendations and will provide the platform from which the roll out into the other institutions can be planned.

Service Provider Forum

The capacity building report argues that an effective partnership with the Service Provider is an essential part of developing capacity for a sustainable system. We therefore recommend that the CTA set up a Service Provider Forum to work alongside the other recommended bodies to give input and determine effective ways to strengthen the service presently provided.

Refer to the graphic representation of the recommendations for the Pilot Test.

Prepared by Janet Magner and Nancy Coulson
Dated 9th September 2002

Appendix 3: Weaknesses and Strengths of Critical System Elements in the options presented

System Element	Strengths	Weaknesses	Proposed Solution	Comments
Removal of Cardboard Boxes	• Reduces environmental impact	• Reintroduction of cardboard boxes if new system not sustainable until tender specifications are applied • Versatility in terms of shape and size of cardboard boxes is lost.	• Budget application the period Mar – Sept 2003 (Tender Specifications applied in Sept 2003) • Practicality of plastic boxes assessed in feasibility study	
Reusable containers manufactured according to minimum specifications	• Reduction in environmental impact • Containers designed to meet the needs of the user	• Specifications of equipment are required and enforcement contracted into all service provider contracts. • Availability of suitable providers in S.A.	• Tender specifications are written and applied by September 2003 • Investigation into suitable manufacturers / service providers in S.A.	
Liners on stands (small and large) for intermediate storage of waste	• Affordable • Practical – smaller and lighter with easier handling • Reduced possibility of theft • More collection points can we established with smaller stands	• No improvement on the cardboard boxes in terms of exposure to risk waste • Double handling of liners from holders into trolley and then into wheelie bins • Relies on the continuous supply of suitable strength and size of liners • Relies on a secure technique for the closing of the liners	• Improved and strict segregation of waste applied • Investigate trolley system and routine that will reduce the double handling • Budget and Procurement policies in place to ensure continuous supply of liners • Closing mechanisms tested during the test phase	A control system in place to train, coach and enforce good segregation practices.
Wheelie Bins for wet waste and as storage for dry infectious waste and sharps	• Reduction in burning of cardboard and resultant reduction on environmental impact • Minimises manual handling during transport and treatment • Minimises exposure to risk for handlers as in rigid containers • Minimises exposure to sharps as containers are placed inside the wheelie bins for transport	• Logistics of handling a large number of wheelie bins in the hospital • Mechanical lifting devices required on transportation trucks • Lifting devices required at the Incinerator • Accountability for the wheelie bins on and off the site • Theft of wheelie bins	• Assessment on the viability of the wheelie bins in terms of handling and routines • Budget approved for mechanical lifting devices for transportation trucks and incinerator • Agreement reached on the accountability for wheelie bins – hospital / transporters / treatment • Take out insurance or build shrinkage into budget	

		• Additional storage space required • Hygienic condition of the wheelie bins must be maintained	• Budget for the partitioning of dedicated areas and/or the building of additional storage areas • Cleaning facility is established off site for the cleaning of the bins – Accountability for the cleaning of the bins is built into the contract	
Trolleys provided for transporting the liners	• Reduces the manual handling and ergonomic aspects • Reduces the exposure to the risk	• Storage for the trolleys •	• Provide practical and ergonomically approved trolleys • Agreement on budget estimates and accountability	
Nursing Trolley for dressings and injections	• Encourages segregation at source • Reduces exposure of risk waste to patients and visitors	• Does not encourage good infection control standards	• Assessment of the nursing trolley to find the best solution that will address the IC principles • Budget in place to adapt the nursing trolleys to fulfil the combined purpose of both a dressing and injection trolley	Existing trolleys utilized
Two waste streams – HCRW and HCGW	• Encourages good segregation practices	• Requires additional smaller containers and liners for risk waste containment • Requires the provision of containers for General Waste	• Accountability for the provision of containers for General Waste agreed. • Budget requirements agreed	May have phase out the existing bins through a controlled system on condemning and repurchasing
Dedicated Safe Storage Areas	• Security if assured • Minimises exposure to general public • Hygienic conditions are continuously maintained	• Additional expense • Non-availability of areas to dedicate to storage	• Agreement on budget estimates and accountability	May have to compromise on what presently exists
Protective Clothing	• Reduces the exposure to risk	• Continuous provision of the correct type of PPE	• System established for the identification and procurement of PPE. • Accountability for the provision of PPE agreed • Training, coaching and enforcement for the wearing carried out regularly	
Recycling	• Reduces the quantities of general waste • Encourages segregation • Saves on costs for disposal of waste • Generates revenue	• Additional containers required for disposal of items • Contracts with Service Providers required for the regular removal of the items	• Investigate reputable recycling service providers	

Appendix 4: Comparison of the Two New Systems against the Key Decision Criteria

Key Criteria	Supporting Criteria	770 wheelie bin system	Stackable boxes
Safer	Containers and equipment to minimum specifications	Minimum specifications for the baskets, containers, and stands supplied. Liners made to minimum requirements for durability, strength and environmental friendly disposal.	Stackable boxes are made to minimum specifications for durability and strength
	Minimise Manual Handling	Some improvement internally with use of wheelie bins for the wet waste. External handling will only be improved with the provision of a mechanical lifting device	Some manual handling still required Cage Trolley necessary to transport the stackable boxes
	Encourages Segregation	An assortment of brackets, stands and baskets at point of segregation will encourage segregation. Better positioning of holders for ease of use	Three sizes of stackable boxes positioned at point of segregation will encourage better segregation.
	Incorporates Colour Coded and labelling	Colour coding and labelling easily applied, but relies on the correct coloured liner being used.	Colour coding and labelling of boxes will be easily identified and applied
	'No-touch' policy applied	The smaller liners are handled by removing and placing into the larger liner in the sluice rooms. Ease of changing of liners as and when required. The 770 wheelie bins used externally ensure that the waste is not touched when transported off the site. Sharps containers are placed inside the 770 wheelie bin. A mechanical lifting device at the treatment plant will ensure that the waste is tipped into the treatment plant.	There is no handling of the waste. When the boxes are full, they are closed with a lid and sealed. Another box used in its place. There is no exposure to the waste. The boxes taken off the site are properly sealed and handling of waste is eliminated.
	Minimises exposure to risk waste	Liners leave some exposure to needlestick injury if incorrectly segregated Partly addresses exposure to risk waste with better sharps containers Sizing of containers can be done according to the volume in the area.	There is a minimum exposure to risk as waste is safely stored in rigid containers and sealed. No exposure to needlestick injuries when handled
	Contained at point of generation	Waste is contained at source in liners in baskets on the nursing trolley, on the walls, on the stands on the floor. Sharps containers better positioned	Waste is contained well at source on the Nursing Trolley, containers in brackets and containers standing on the floor Sharps containers are better positioned.
	Safe storage practices	Better storage facilities for the intermediate storage areas will be addressed only if dedicated storage areas are built. There is still an element of exposure to risk posed by the liners on stands.	Containers themselves are storage vessels. Sluice room space can be better utilised as containers are stackable.
	Protective Clothing supplied and used	Can be provided and used according to the risk.	Can be provided and used according to the risk

	Includes Infection control standards	There is no need to clean the 770 wheelie bin on the site as it will be returned clean. Cleaning is reduced as liners are disposed of. It is only necessary to clean the 770 wheelie bin off the site.	Infection control standards are applied. Containers sanitised off site. The boxes are more susceptible to microbiological contamination, especially around the lids and due to handling while in transport.
	Customised to specific requirements	Customised needs are addressed in so far as varying sizes of basket and stands are provided.	Customised needs are addressed in s far as varying sizes of containers are provided.
Environmentally Friendly	Cradle to grave concept applied	The liners are environmentally friendly burning. Reduction in use of cardboard.	Re-usable containers are environmentally friendly.
	Reduced burning by use of re-usable containers	Re-usable containers used reduces burning	Reusable containers used reduces burning
	No PVC or heavy metals in the burning	Reusable containers reduce heavy metal exposure. Liners and disposable containers are made of acceptable materials.	Reusable containers reduce heavy metal exposure. Liners and disposable containers are made of acceptable materials.
	Legally compliant treatment	No improvement during the pilot project unless treatment plant is fully compliant	No improvement during the pilot project unless treatment plant is fully compliant
Affordable to DoH	Limiting numbers of types of containers	An increase in the number of containers to meet the disposal at generation. Decrease in the types of containers used through better segregation	Numbers of containers can be increased or decreased according to need at short notice Limited range of containers
	Cheap vs cost effective	Liners are cheaper than containers and the use of the larger wheelie bins are expected to be more cost effective	The use of the stackable boxes is expected to be cheaper than the existing methods.
	Equipment available locally	770 wheelie bins are manufactured locally	Stackable boxes will be designed and manufactured locally.
	Economy of scales applied	Not presently part of the new system as only a pilot test	No presently part of the new system as only a pilot test
	Standardisation of types and sizes	Standardised containers used for both risk and general waste	Standardised containers used for both risk and general waste
Sufficient capacity to sustain system	Management Control system that encourages enforcement of standards.	Control system to be introduced	Control system to be introduced
	Resolves Procurement issues – minimum tender specs/availability	Will be addressed in the short term during the pilot. Tender specifications and roll out to be addressed after the pilot test	Will be addressed in the short term during the pilot. Gender specifications and rollout to be addressed after the pilot test
	Institutional ordering and distribution refined	Will be handled in the short term by the project	Will be handles in the short term by the project
	Encourages Service Provider partnership	Service Providers to be included in the pilot test	Service Providers to be included in the pilot test
	Training and Awareness addressed	Will be addressed in the pilot	Will be addressed in the pilot test

Appendix 5: List of Equipment Requirements for the two systems

Stackable Box System			Wheelie Bin – Liner System		
Equipment on site					
Nesting wire cage trolleys 110 litre roto-moulded red box with lid 50 litre roto-moulded red box with lid 30 litre Addis bin with N.T./ wall bracket 12 litre pedal bin 30 litre chromed wall baskets Wall or NT brackets for sharps Kick-about trolleys			770 Wheelie Bins 110 litre galvanised stand 30 litre Chromed Nursing trolley basket 12 litre pedal bin 30 litre chromed wall baskets Wall or NT brackets for sharps Kick-about trolleys		
Equipment off site					
Bin lifter at treatment plant Bin washing equipment at treatment plant Lifting tailgate on transport truck Scale			Bin lifter at treatment plant Bin washing equipment at treatment plant Lifting tailgate on transport truck Scale		
Consumables					
Disposable containers 8 litre red sharps containers 70 cm tall sharps containers 10 litre specicans (anatomical) 10 litre glass vial containers			***Disposable containers*** 8 litre red sharps containers 70 cm tall sharps containers 10 litre specicans (anatomical) 10 litre glass vial containers		
Risk Waste Liners					
Size of Liners:	**Colour**	**Placing**	**Size of Liners:**	**Colour**	**Placing**
Small 46 x 54 @ 50 um	Red	Pedal bins Kick-about trolleys 10 litre specican	Small 46 x 54 @ 50 um	Red	Pedal bins Kick-about trolleys 10 litre specican
Medium 56 x 66 @ 60 um	Red	30 litre boxes on nursing trolley or wall mounted	Medium 56 x 66 @ 60 um	Red	Nursing trolley baskets Wall mounted baskets
Large **thin** 75 x 95 @ 50 um	Red	Placed inside 50 litre boxes for all types of infectious waste. Can be used at point of generation or in intermediate storage area	Large **thick** 75 x 95 @ 80 um	Red	Large Stands
Extra large **thin** 100 x 95 @ 50 um	Red	100 litre box .			
General Waste Liners					
46 x 54 @ 30 um	Black	Pedal bins and other small containers for general waste			
56 x 66 @ 30 um	Black	Wall mounted baskets for general waste			
75 x 95 @ 60 um	Black	Large stands or black bins for general waste			
Other Items					
Closing Device: Elastic bands size 34 or 35 for closing the liners ***Protective Equipment***: Nitride gloves for handling waste – General Assistants Latex gloves – Nursing					

APPENDIX 6(A): Label embossed on the side of the stackable boxes

Appendix 6 (B) : Sticker for Sharps containers

Decals for sharps containers

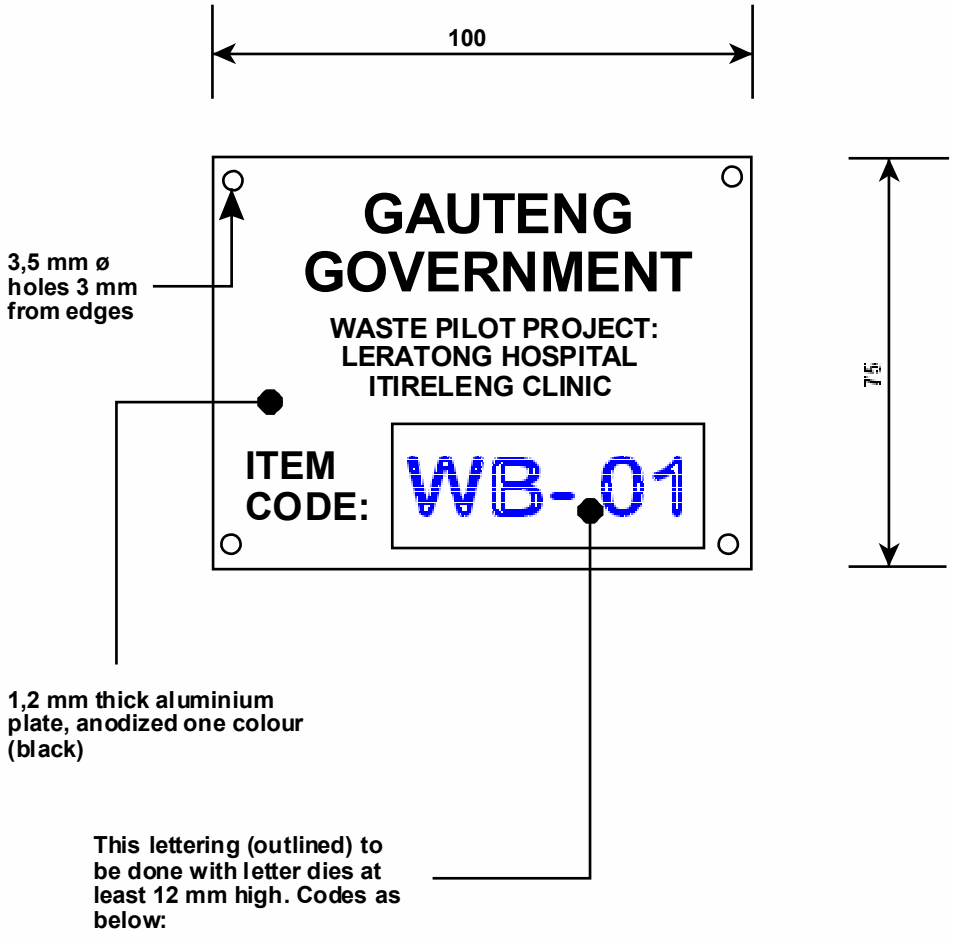
Notes:

- **Overall decal size 160 mm wide by 150 mm high**
- **Printing red on white background**
- **Backing paper to be slit for ease of removal**

JC 03-01-17 Sharps Signage 01.wpg

APPENDIX 6(C): Plaques for the Cage Trolleys and 770 Wheelie Bins

ALUMINIUM PLAQUES FOR HCRW PILOT EQUIPMENT



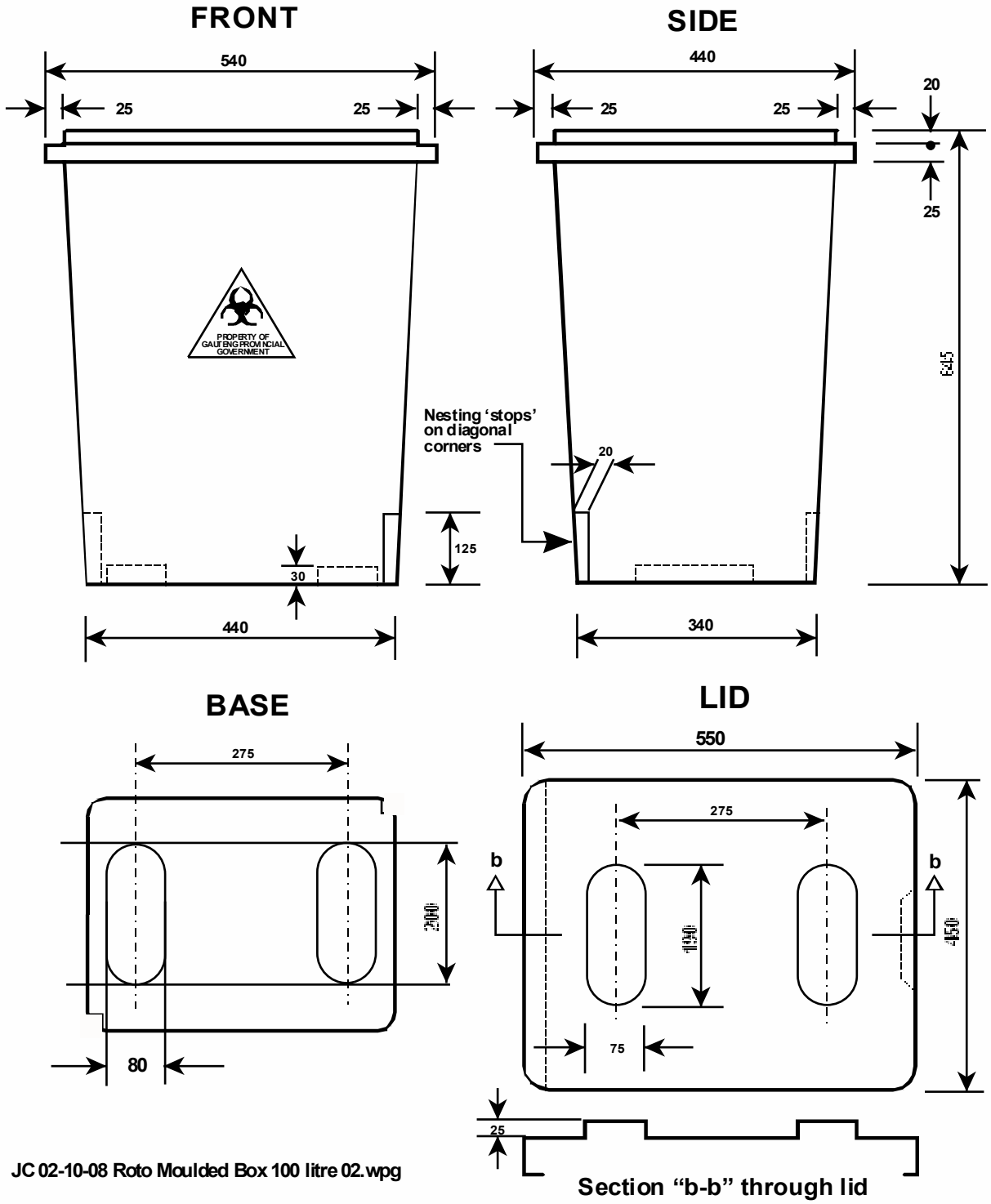
WB-01 to WB-20

CT-01 to CT-16

APPENDIX 7 (A)

100 Litre Roto- moulded box for HCRW

Outside dimensions, in millimetres

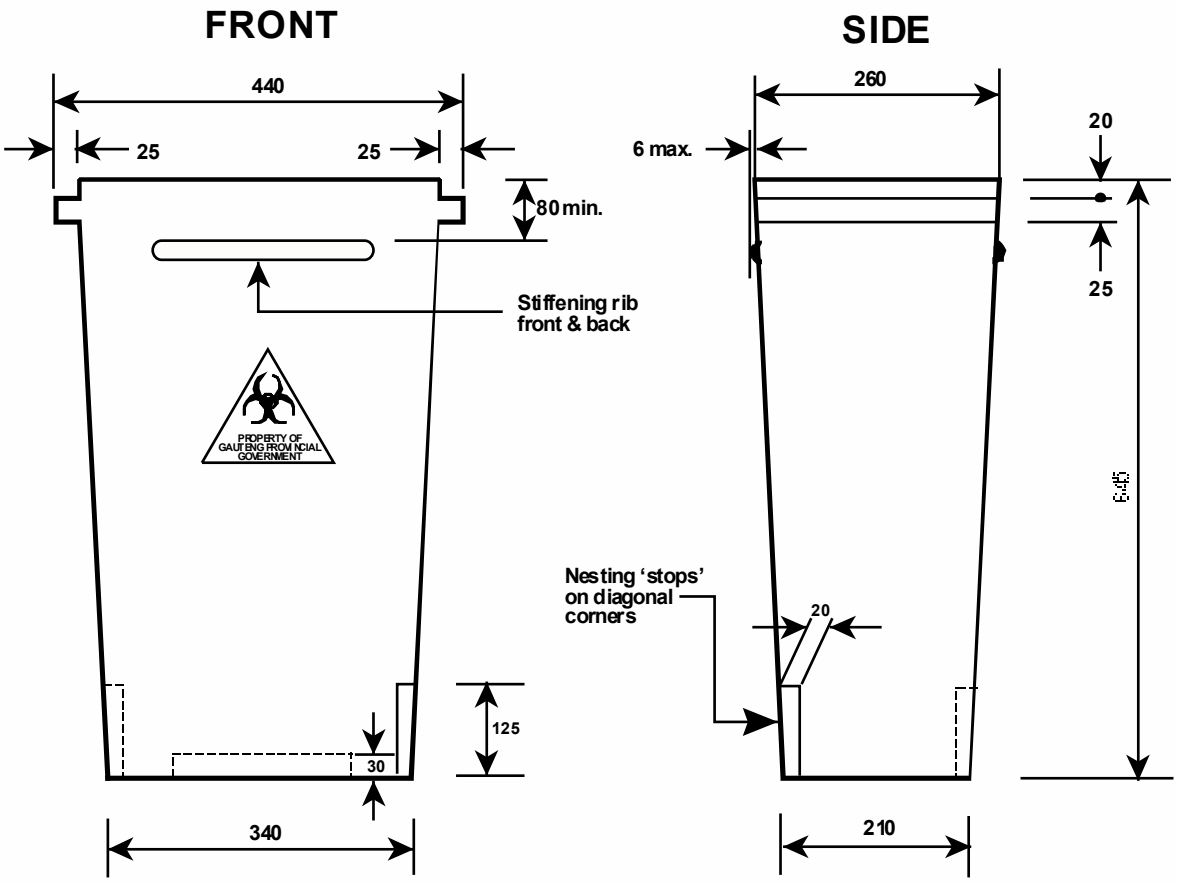


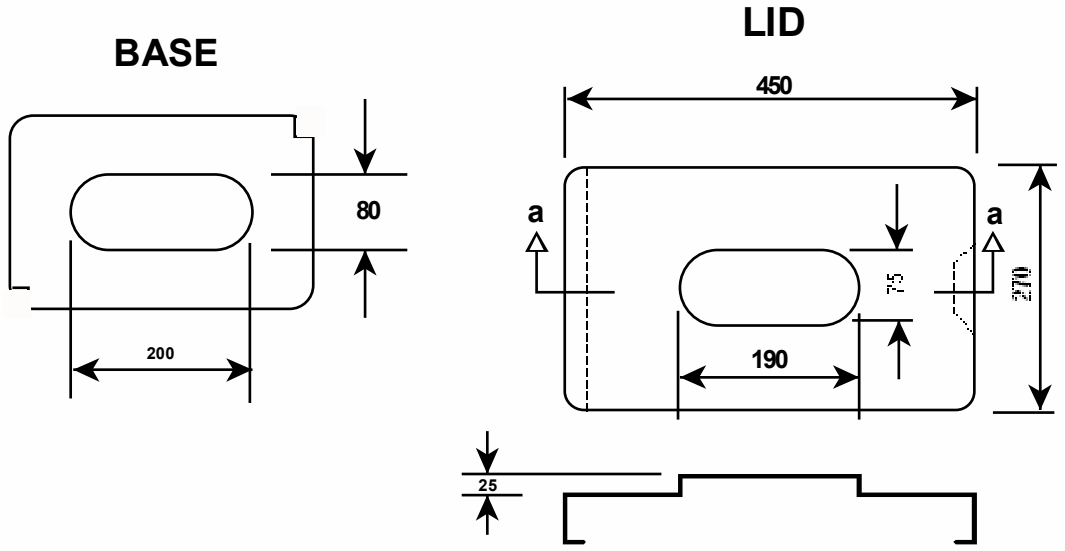
JC 02-10-08 Roto Moulded Box 100 litre 02.wpg

APPENDIX 7 (B)

50 Litre Roto- moulded box for HCRW

Outside dimensions, in millimetres





JC 02-10-08 Roto Moulded Box 50 litre 01.wpg

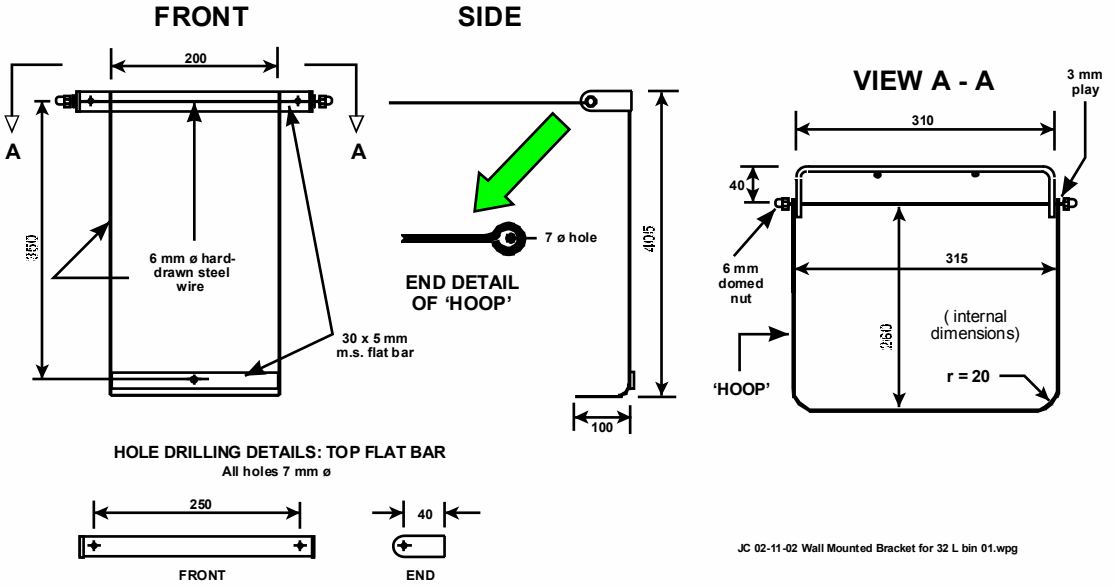
Section "a-a" through lid

APPENDIX 7 (C)

WALL- MOUNTED BRACKET FOR 32 L BIN

All dimensions in millimetres

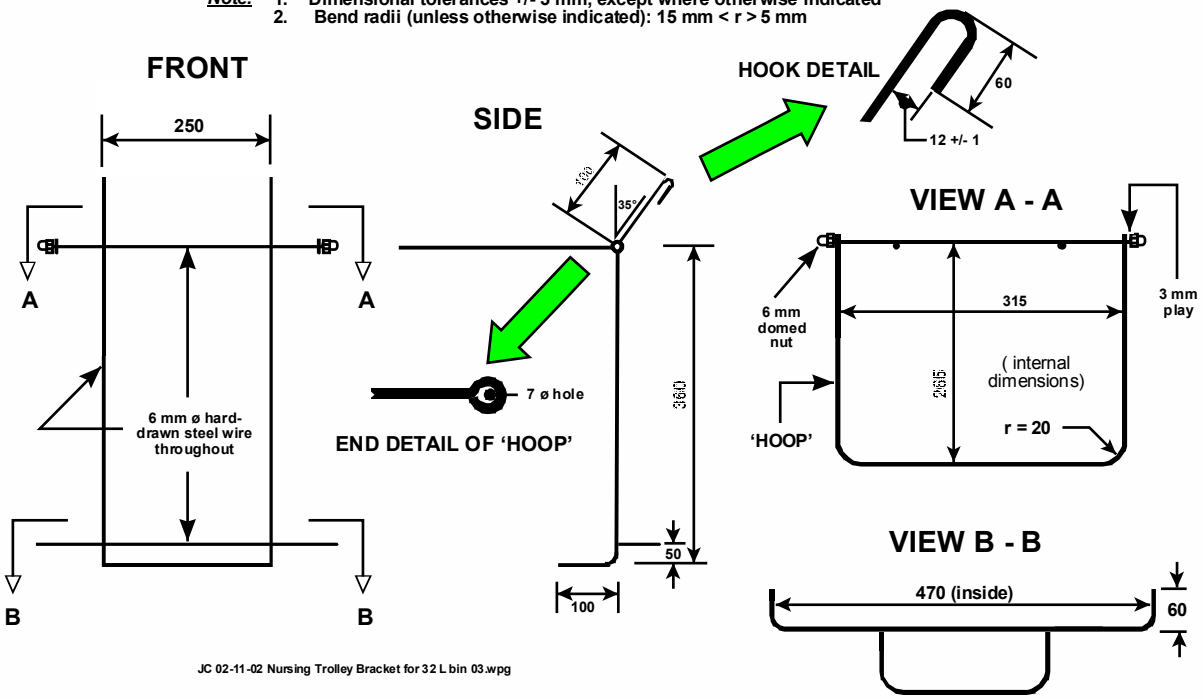
Note: 1. Dimensional tolerances +/- 3 mm, except where otherwise indicated
2. Bend radii (unless otherwise indicated): 15 mm < r > 5 mm



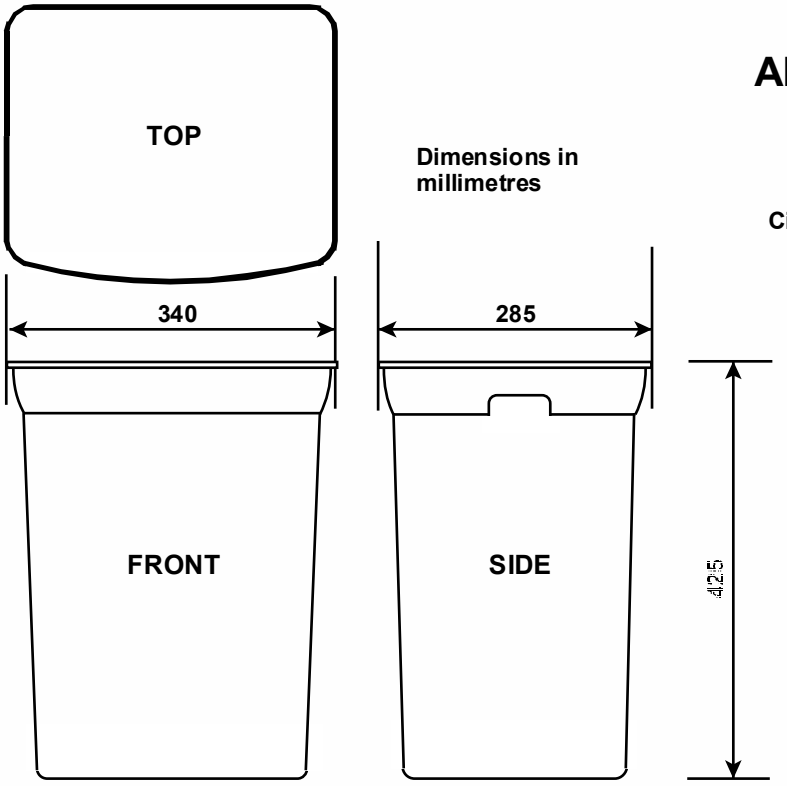
NURSING-TROLLEY BRACKET FOR 32 L BIN

All dimensions in millimetres

Note: 1. Dimensional tolerances +/- 3 mm, except where otherwise indicated
2. Bend radii (unless otherwise indicated): 15 mm < r > 5 mm



APPENDIX 7(D)



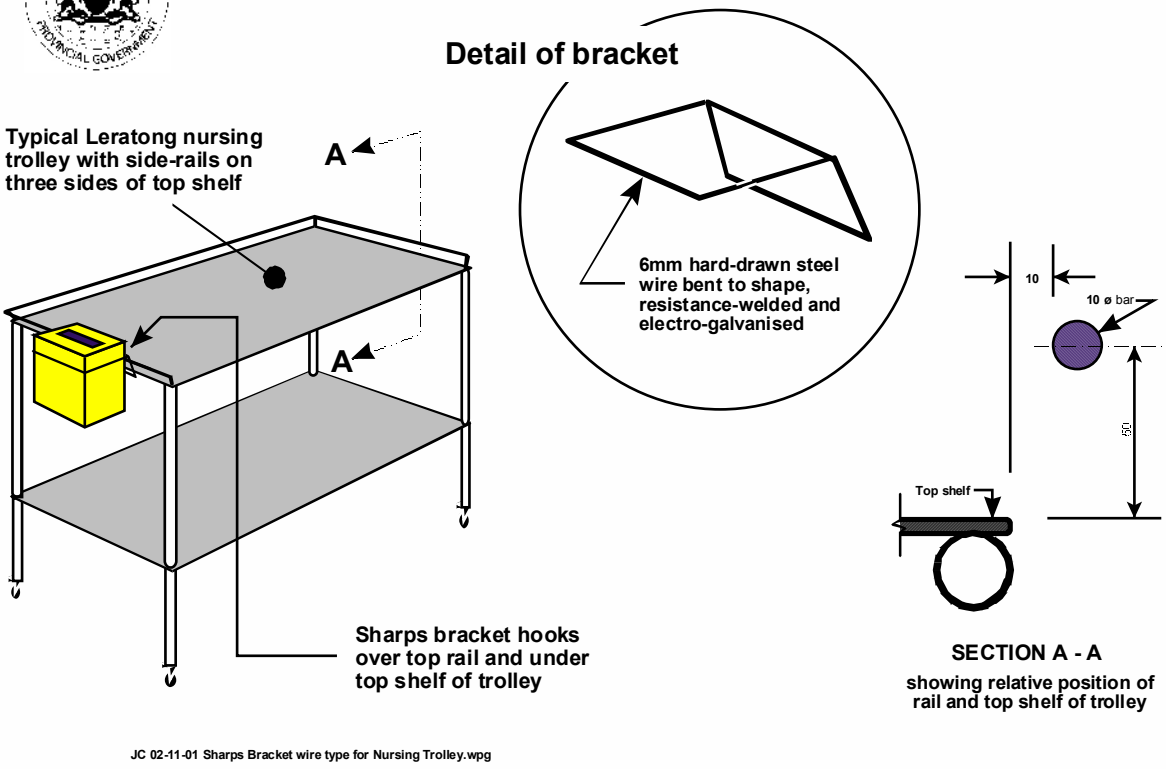
Dimensions in millimetres

ADDIS 32 Litre Bin

Material: Polypropylene
Thickness: 1,7 mm
Mass: 0,8 kg
Circumference of top: 113 cm
Liner size: 56 x 65 cm

APPENDIX 7 (E)

SHARPS CONTAINER BRACKET FOR NURSING TROLLEY



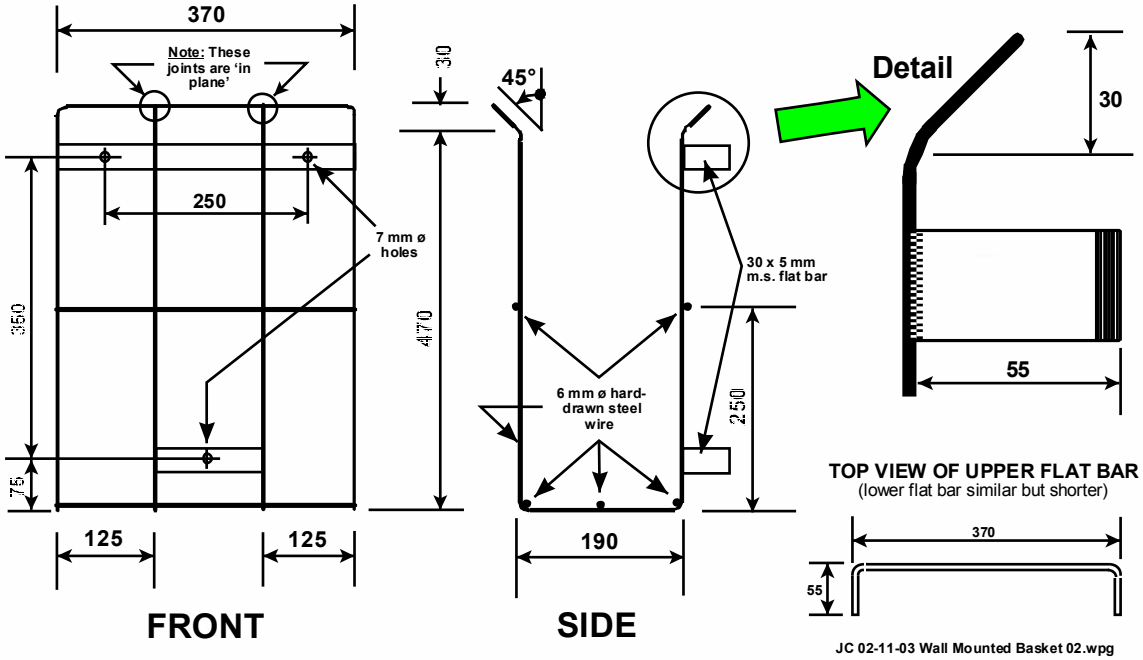
JC 02-11-01 Sharps Bracket wire type for Nursing Trolley.wpg

APPENDIX 7 (F)

WALL- MOUNTED BASKET FOR HCRW BAG

All dimensions in millimetres

Note: 1. Dimensional tolerances +/- 3 mm, except where otherwise indicated
2. Bend radii (wire & flat bar): 15 mm < r > 5 mm

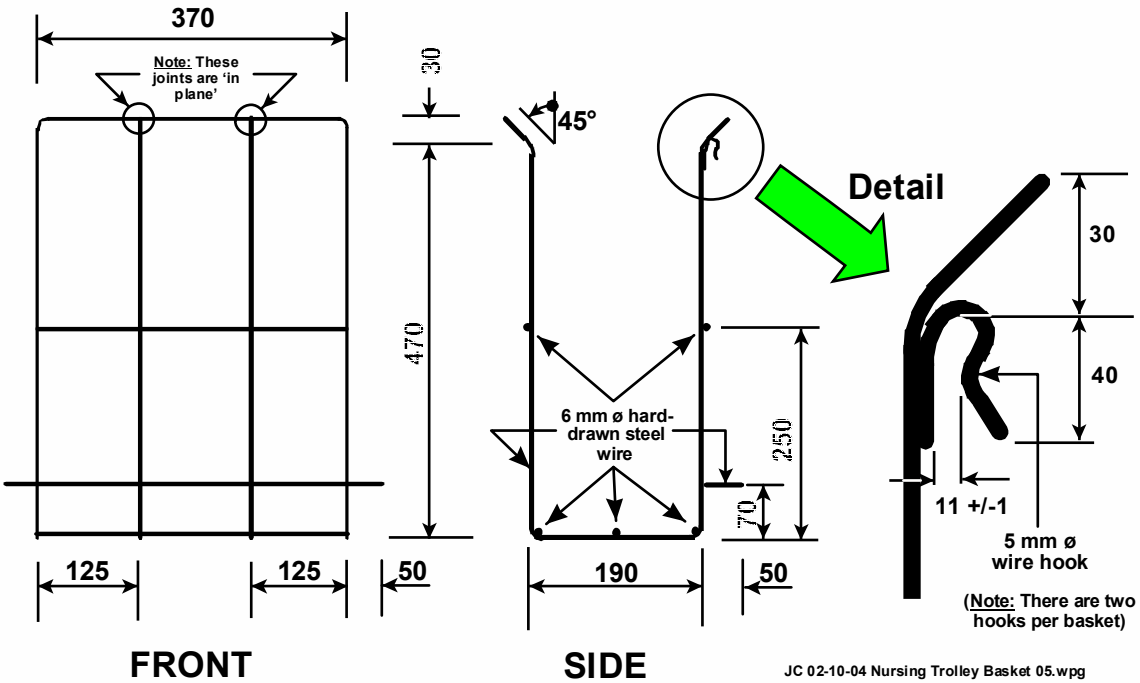


JC 02-11-03 Wall Mounted Basket 02.wpg

NURSING-TROLLEY BASKET FOR HCRW BAG

All dimensions in millimetres

Note: Dimensional tolerances +/- 3 mm, except where otherwise indicated

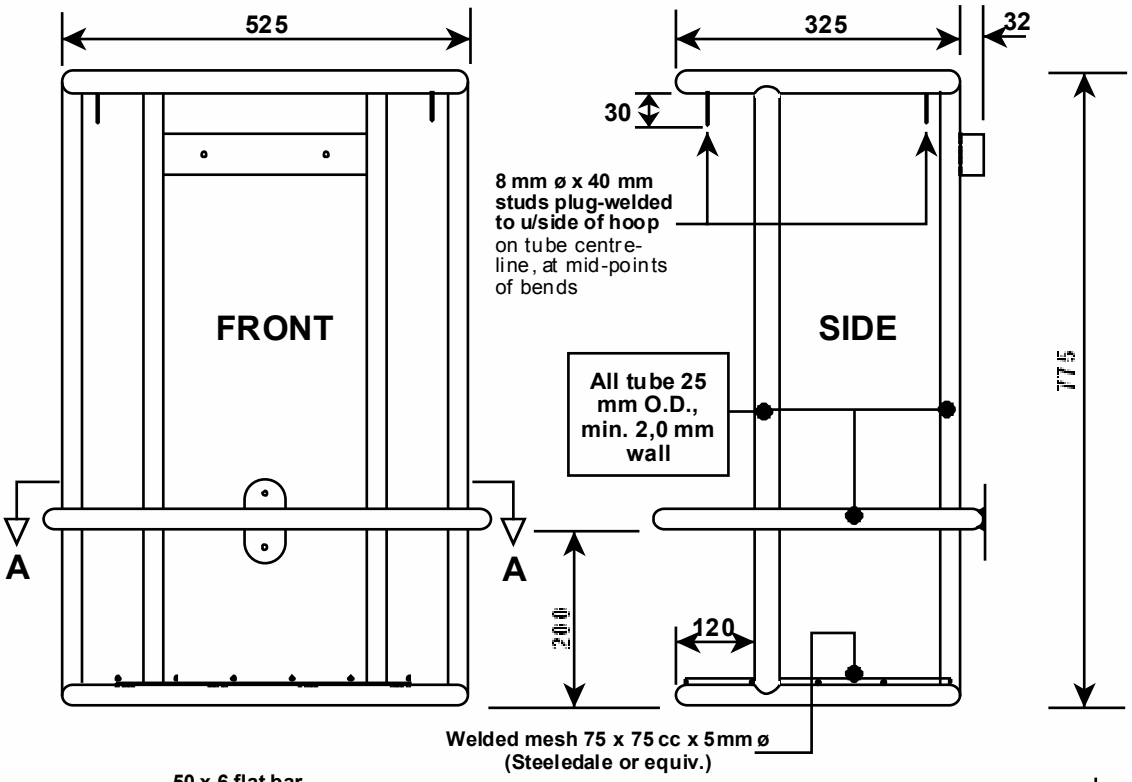


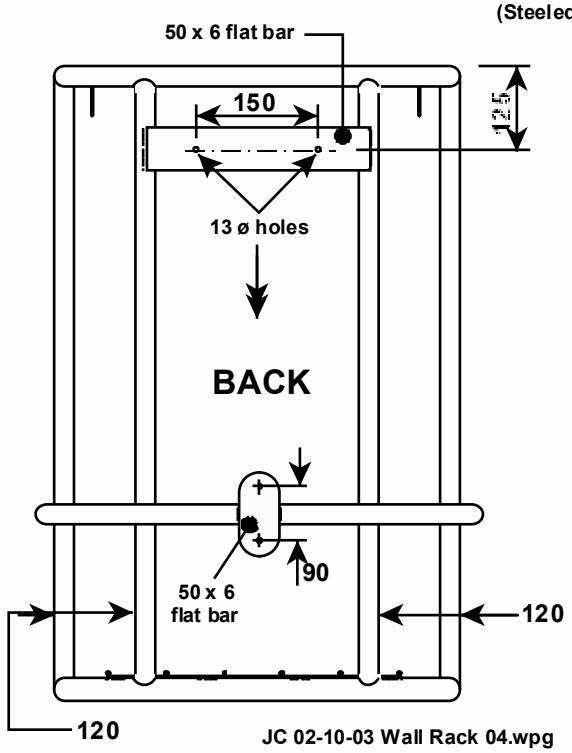
JC 02-10-04 Nursing Trolley Basket 05.wpg

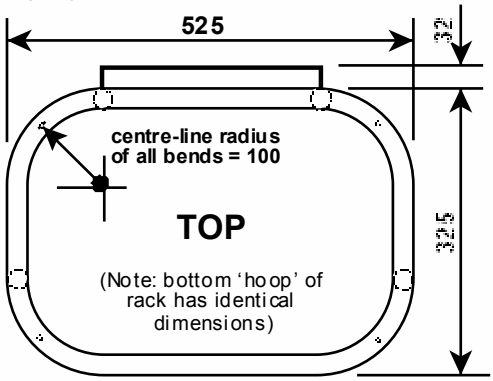
APPENDIX 7 (G)

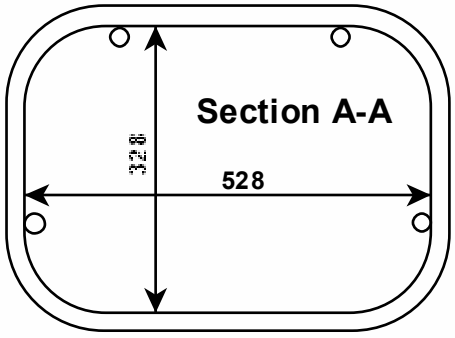
WALL- RACK FOR HCRW BAG

All dimensions in millimetres









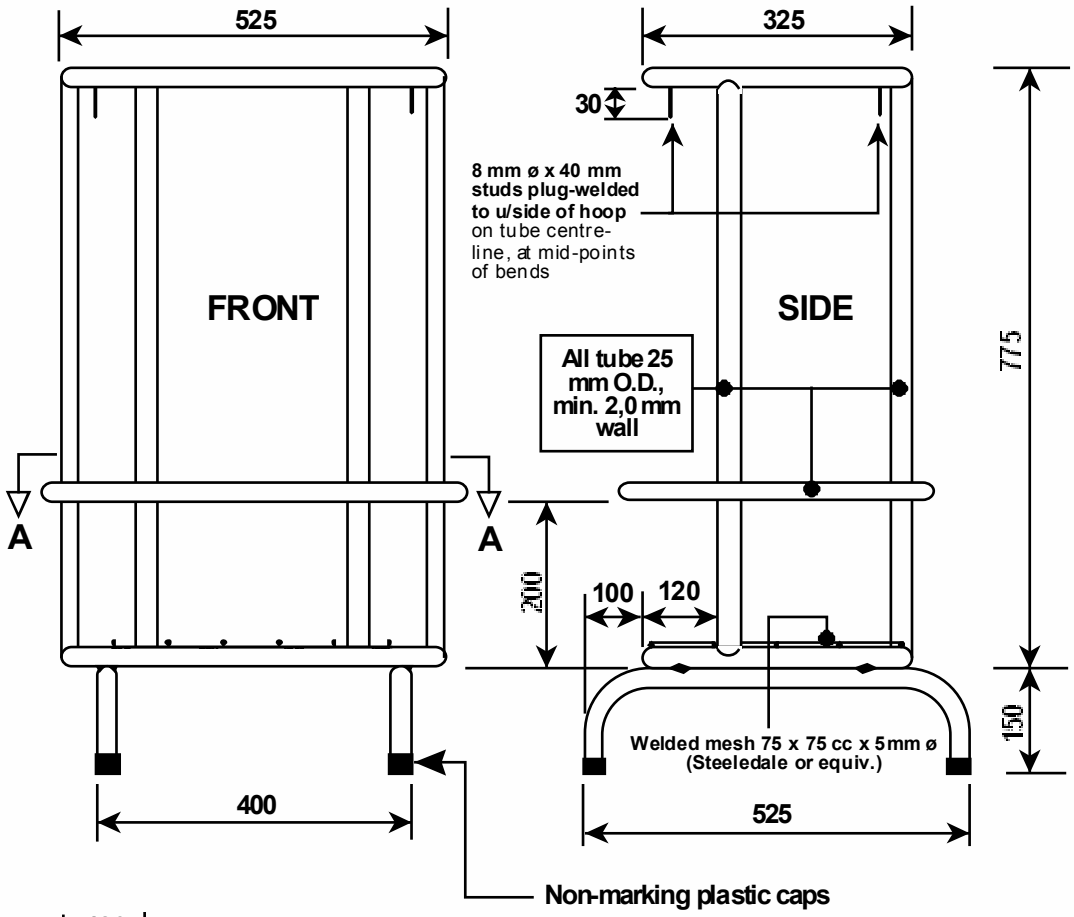
JC 02-10-03 Wall Rack 04.wpg

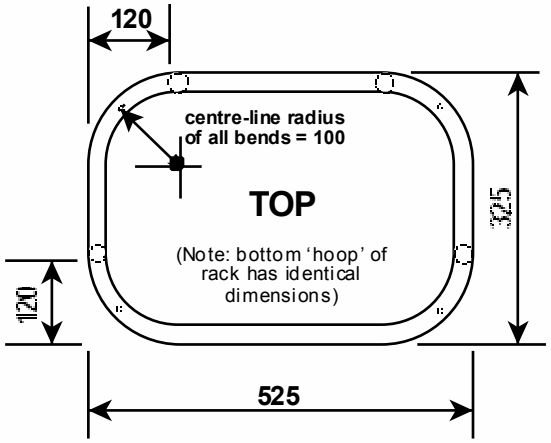
APPENDIX 7 (H)

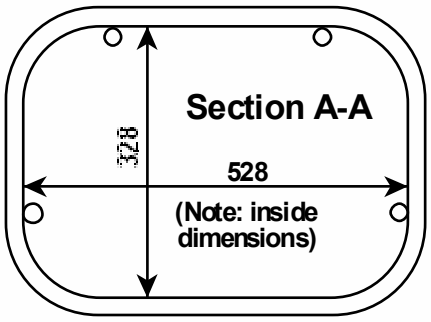
FREE-STANDING RACK FOR HCRW BAG

All dimensions in millimetres

Note: **Dimensional tolerances +/- 3 mm**



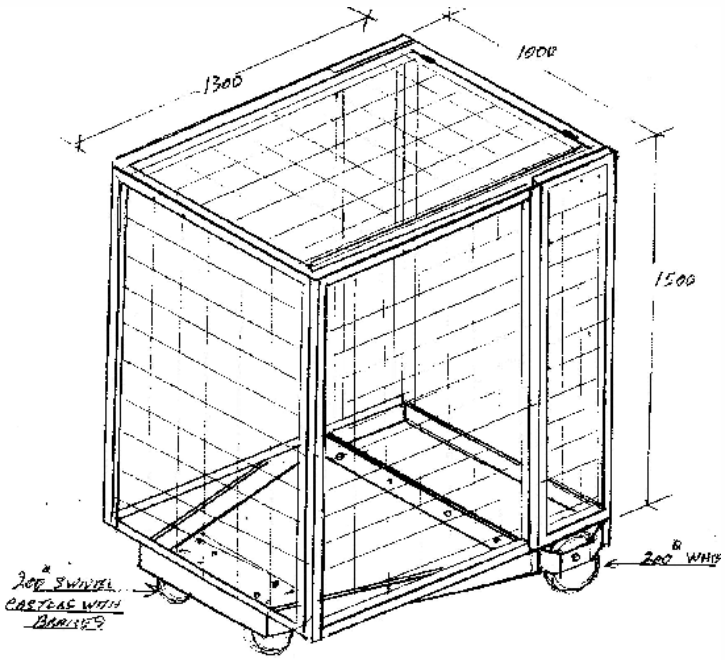




JC 02-10-03 Free Standing Rack 01.wpg

APPENDIX 7 (I)

CAGE-TROLLEY FOR TRANSPORTING RE-USABLE PLASTIC BOXES

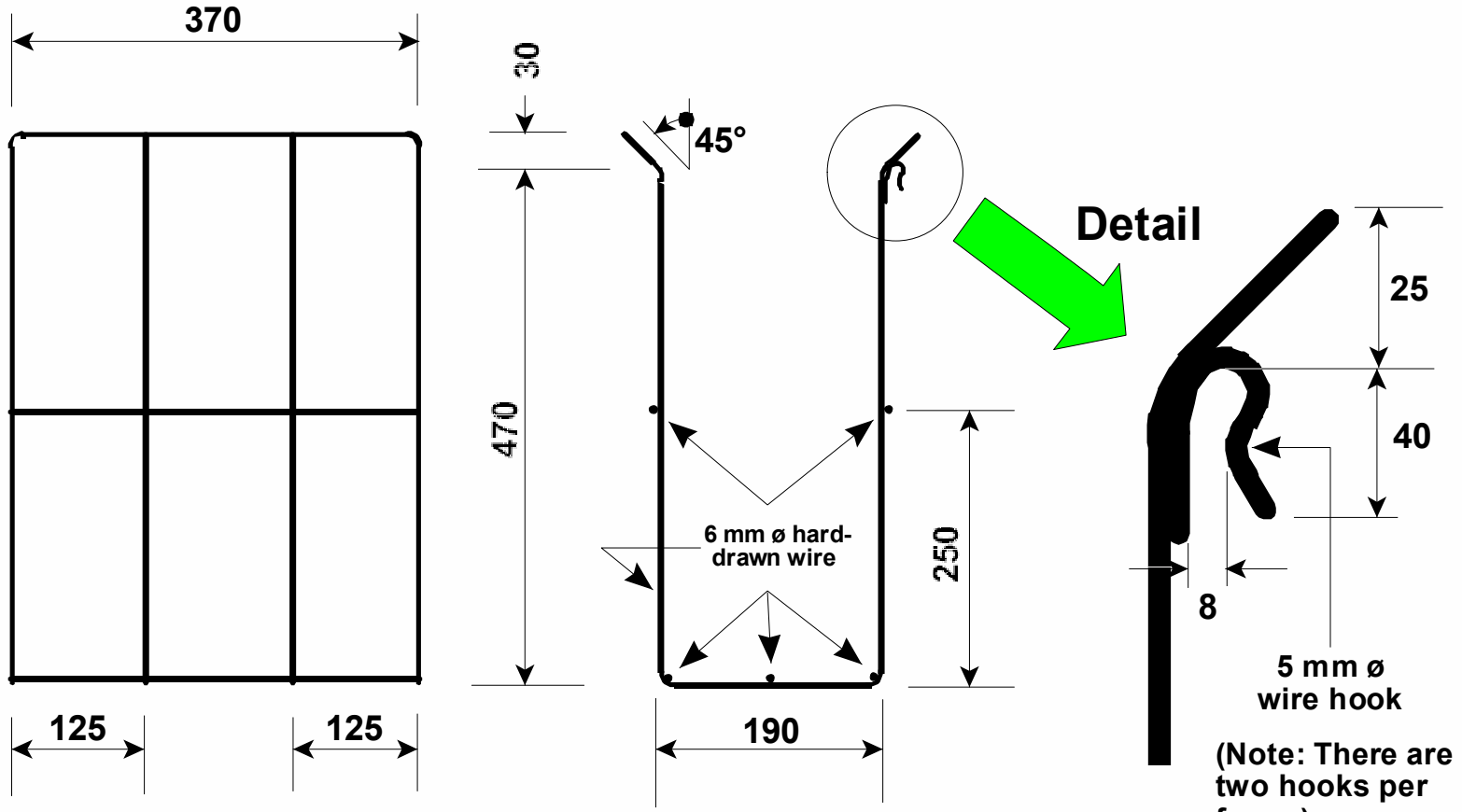


- cages can carry 8 x 100 litre re-usable boxes (or 16 x 50 litre re-usable boxes)
- cages are lockable
- sides, front, top and base fold inward so that trolleys can 'nest' for return journey to health-care facility

APPENDIX 7 (J)

NURSING-TROLLEY RACK FOR HCRW BAG

All dimensions are in millimetres

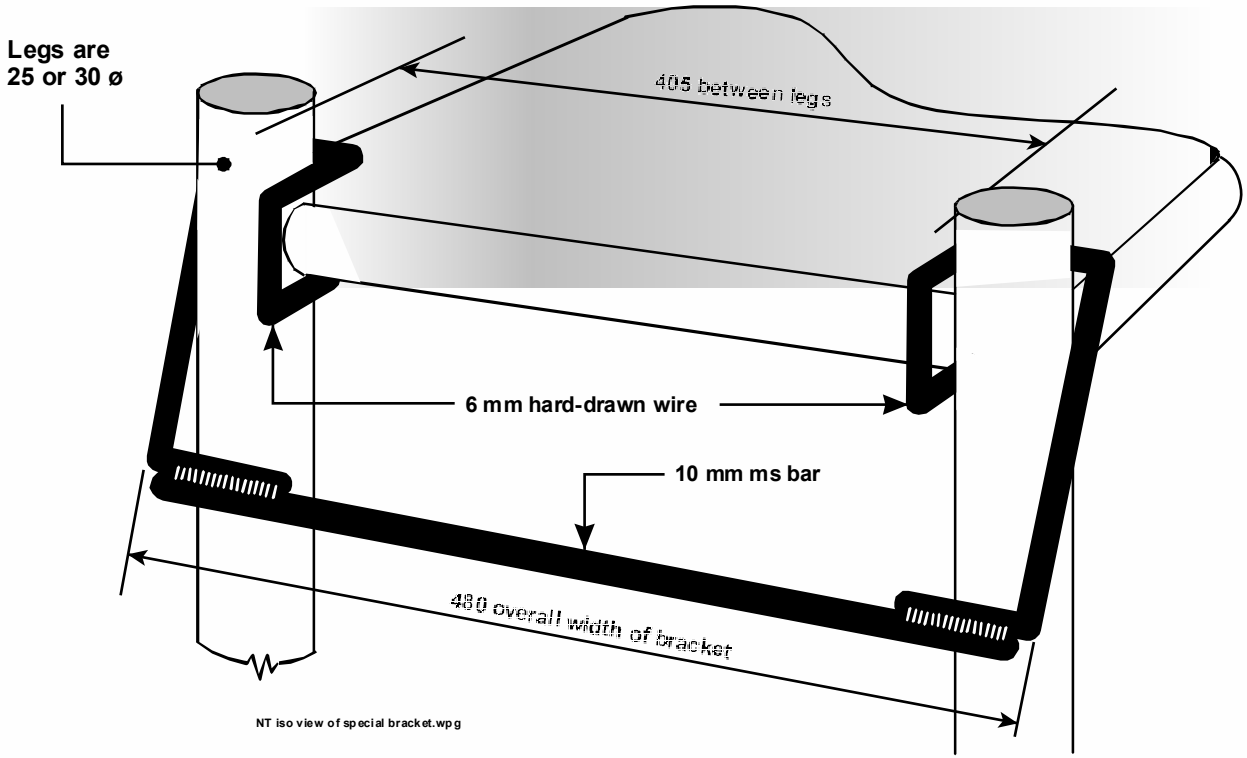


JC 02-10-04 Nursing Trolley Rack 01.wpg

APPENDIX 7 (K)

Isometric View of special bracket for nursing trolleys without rails

(to allow for attachment of HCRW 'basket')



APPENDIX 8: Summary of Estimated Costs for Leratong and Itireleng

Combined Costs for the Testing of Two systems - HCRW

Estimated Fixed Costs	Leratong	Itireleng	Total
Re-usable Containers	102,735.50	21,739.00	124,474.50
Equipment	63,700.13	16,360.00	80,060.13
Construction	163,000.00	8,000.00	171,000.00
SUB TOTAL	329,435.63	46,099.00	375,534.63
Estimated Recurring Costs	**Leratong**	**Itireleng**	**Total**
Disposable Containers	37,971.60	8,438.64	46,410.24
Liners	35,839.29	7,738.65	43,577.95
SUB TOTAL	73,810.89	16,177.29	89,988.19
TOTAL	403,246.52	62,276.29	465,522.82

Combined Costs for the Provision of HC General Waste Equipment

Estimated Fixed Costs	Leratong	Itireleng	Total
Equipment	44,527.40	6,600.00	51,127.40
SUB TOTAL	44,527.40	6,600.00	51,127.40
Estimated Recurring Costs			
Liners	92,227.93	6,849.42	99,077.35
SUB TOTAL	92,227.93	6,849.42	99,077.35
TOTAL	136,755.33	13,449.42	150,204.75

Summary

	Leratong	Itireleng	Total
HCRW	403,246.52	62,276.29	465,522.82
HCGW	136,755.33	13,449.42	150,204.75
Sub Total	540,001.85	75,725.72	615,727.57
VAT	75,600.26	10,601.60	86,201.86
Total	615,602.11	86,327.32	701,929.43

	RAND	DKK	Exch-rate
			0.75
Funding	533,333	400,000	
Budget	701,929	526,447	
		-	
Sub-total	701,929	526,447	
Contingency 10%	70,193	52,645	
Total	772,122	579,092	
Shortfall	-238,789	-179,092	

Appendix 9 (A) : Actual Cost Summary at purchase of material – Equipment Leratong and Itireleng

			Leratong				Itireleng			Overall Total	Unit Cost	HCRW Cost Leratong	HCRW Cost Itireleng	Total HCRW Cost	HCGW Cost Leratong	HCGW Cost Itireleng	Total HCGW Cost	Total Cost
Item		EQUIPMENT	Liner System	Box System	HCGW	Total	Box System	HCGW	Total									
1		770 L wheelie bin (red)	20			20			0	20	R 1,696.00	R 33,920	R 0	R 33,920	R 0	R 0	R 0	R 33,920
2		770 L wheelie bin (black)			0	0			0	0	R 1,696.00	R 0	R 0	R 0	R 0	R 0	R 0	R 0
3		100 L roto-moulded box + lid		146		146	14		14	160	R 275.00	R 40,150	R 3,850	R 44,000	R 0	R 0	R 0	R 44,000
4		100 L roto-moulded box lid only		15		15	1		1	16	R 55.00	R 825	R 55	R 880	R 0	R 0	R 0	R 880
5		50 L roto-moulded box + lid		130		130	91		91	221	R 190.00	R 24,700	R 17,290	R 41,990	R 0	R 0	R 0	R 41,990
6		50 L roto-moulded box lid only		14		14	9		9	23	R 35.00	R 490	R 315	R 805	R 0	R 0	R 0	R 805
7		30 L Addis bin		50		50	10		10	60	R 22.50	R 1,125	R 225	R 1,350	R 0	R 0	R 0	R 1,350
8		12 L pedal bin	27			27			0	27	R 200.00	R 5,400	R 0	R 5,400	R 0	R 0	R 0	R 5,400
9		Galv. Stand for 110 L liner	40		28	68			0	68	R 325.00	R 13,000	R 0	R 13,000	R 9,100	R 0	R 9,100	R 22,100
10		Chromed nursing trolley basket for 30 L liner	19			19			0	19	R 78.50	R 1,492	R 0	R 1,492	R 0	R 0	R 0	R 1,492
11		Chromed wall basket for 30 L liner	15		339	354		64	64	418	R 78.50	R 1,178	R 0	R 1,178	R 26,612	R 5,024	R 31,636	R 32,813
12		Chromed nursing trolley bracket for 30 L bin		18		18	10		10	28	R 67.50	R 1,215	R 675	R 1,890	R 0	R 0	R 0	R 1,890
13		Chromed wall bracket for 30 L bin		24		24			0	24	R 65.35	R 1,568	R 0	R 1,568	R 0	R 0	R 0	R 1,568
14		Wall bracket for 8 L sharps box	34	44		78	22		22	100	R 11.20	R 874	R 246	R 1,120	R 0	R 0	R 0	R 1,120
15		Nursing Trolley bracket for 8 L sharps box	19	20		39	10		10	49	R 66.50	R 2,594	R 665	R 3,259	R 0	R 0	R 0	R 3,259
16		Nesting wire cage trolley for box system		12		12	4		4	16	R 3,195.00	R 38,340	R 12,780	R 51,120	R 0	R 0	R 0	R 51,120
17		Bin lifter at treatment plant	1			1			0	1	144507.3	R 144,507	R 0	R 144,507	R 0	R 0	R 0	R 144,507
18		Bin washing equipment	1			1			0	1	R 0.00	R 0	R 0	R 0	R 0	R 0	R 0	R 0
19		Lifting tailgate to Buhle truck	1			1			0	1	R 31,000.00	R 31,000	R 0	R 31,000	R 0	R 0	R 0	R 31,000
20		Scale	1			1	1		1	2	R 8,000.00	R 8,000	R 8,000	R 16,000	R 0	R 0	R 0	R 16,000
21		Deep Freeze				0	1		1	1	R 2,500.00	R 0	R 2,500	R 2,500	R 0	R 0	R 0	R 2,500
22		Tape / wire dispensers	15			15	2	1	3	18	R 200.00	R 3,000	R 400	R 3,400	R 0	R 200	R 200	R 3,600
23		Box mould cost		1		1			0	1	R 2,900.00	R 2,900	R 0	R 2,900	R 0	R 0	R 0	R 2,900
24		Box signage/engraving		1		1			0	1	R 890.00	R 890	R 0	R 890	R 0	R 0	R 0	R 890
												R 357,167	**R 47,001**	**R 404,168**	**R 35,712**	**R 5,224**	**R 40,936**	**R 445,104**
		CONSUMABLES																
25		8 L sharps	960	624		1,584	166		166	1,750	R 9.40	R 14,890	R 1,557	R 16,446	R 0	R 0	R 0	R 16,446
26		Tall sharps	5	29		34	0		0	34	R 40.00	R 1,360	R 0	R 1,360	R 0	R 0	R 0	R 1,360
27		10 L specican - anatomical	0	480		480	156		156	636	R 0.00	R 0	R 0	R 0	R 0	R 0	R 0	R 0
28		10 L specican - glass	348	444		792	288		288	1,080	R 0.00	R 0	R 0	R 0	R 0	R 0	R 0	R 0
29	1	46 x 54 x 50 mic. (kickabout trolley)	11,592	13,944		25,536			0	25,536	R 312.50	R 7,980	R 0	R 7,980	R 0	R 0	R 0	R 7,980
30	2	56 x 66 x 60 mic. (30 boxes & baskets)	12,096	9,240		21,336	6,384		6,384	27,720	R 558.00	R 11,905	R 3,562	R 15,468	R 0	R 0	R 0	R 15,468
31	3	75 x 95 x 50 mic. (50 L box)		2,856		2,856	2,184		2,184	5,040	R 896.50	R 2,560	R 1,958	R 4,518	R 0	R 0	R 0	R 4,518
32	5	100 x 95 x 50 mic. (100 L box)		3,024		3,024	336		336	3,360	R 1,233.20	R 3,729	R 414	R 4,144	R 0	R 0	R 0	R 4,144
33	4	75 x 95 x 80 mic. Red (stands)	8,736			8,736			0	8,736	R 1,434.40	R 12,531	R 0	R 12,531	R 0	R 0	R 0	R 12,531
34	6	46 x 54 black30 micron (12 L Pedal or other)			119,520	119,520		0	0	119,520	R 177.70	R 0	R 0	R 0	R 21,239	R 0	R 21,239	R 21,239
35	8	75 x 95 black 60 micron (Hanging Bag)			13,440	13,440		0	0	13,440	R 1,019.60	R 0	R 0	R 0	R 13,703	R 0	R 13,703	R 13,703
36	7	56 x 66 black 30micron (Small Hanging Bag)			134,400	134,400		22,848	22,848	157,248	R 264.40	R 0	R 0	R 0	R 35,535	R 6,041	R 41,576	R 41,576
37		Adhesive Tape Rolls	480		24	504	480	24	504	1,008	R 5.00	R 2,400	R 2,400	R 4,800	R 120	R 120	R 240	R 5,040
												R 57,356	**R 9,891**	**R 67,247**	**R 70,597**	**R 6,161**	**R 76,758**	**R 144,005**
												R 414,522	**R 56,893**	**R 471,415**	**R 106,309**	**R 11,385**	**R 117,694**	**R 589,109**
											VAT			**R 65,998**			**R 16,477**	**R 82,475**
														R 537,413			**R 134,171**	**R 671,584**
																Contingencies	**10%**	67,158
																Sub-total	**Rand**	R 738,743
																0.8	**DKK**	590,994
																Budget	**DKK**	400,000
																Balance	**DKK**	-190,994

APPENDIX 9(B): Allocation of Costs

Allocation of costs for proposed Dual System							
At the Institutions	**HCRW**		**HCGS**		**Total Per Sector**		**TOTAL**
Consumables	**Project**	**DoH**	**Project**	**DoH**	**Project**	**DoH**	
Liners inclu. Seals	72,000		105,000	60,000	177,000	60,000	237,000
Sharps and speci containers	65,000				65,000	0	65,000
Sub Total	**137,000**	**0**	**105,000**	**60,000**	**242,000**	**60,000**	**302,000**
Durables							
Pedal Bins	31,000			95,000	31,000	95,000	126,000
Wheelie Bins	63,000		1,000		64,000		64,000
Racks for Nurse trolleys	77,000				77,000		77,000
Collection Trolleys	4,000				4,000		4,000
Wall brackets (Liners)	7,500		10,000		17,500		17,500
Wall brackets (Sharps)	3,000				3,000		3,000
Wall brackets (30 l)	11,500		94,000		105,500		105,500
Freezer (Itireleng)	5,000				5,000		5,000
Temporary Store (Itireleng)	30,000				30,000		30,000
Tape Dispensers	6,000		8,400		14,400		14,400
Sub Total	**238,000**	**0**	**113,400**	**95,000**	**351,400**	**95,000**	**446,400**
At Service Providers	**HCRW**		**HCGS**		**Total per Sector**		**TOTAL**
Durables							
Bin Lifters	105,000				105,000		105,000
Bin Washer	40,000				40,000		40,000
Lifting Tail-gate on truck	35,000				35,000		35,000
Scale	8,000				8,000		8,000
Sub Total	**188,000**	**0**	**0**	**0**	**188,000**	**0**	**188,000**
Total	**563,000**	**0**	**218,400**	**155,000**	**781,400**	**155,000**	**936,400**

APPENDIX 10: Example of RFQ – Sharps and specicans

TO:	**«company»**	FAX:	**«fax_no»**
ATT:	**«person»**	DATE:	**12 November 2002**
No. of pages including this cover:		3	

REQUEST FOR QUOTATION:
SHARPS CONTAINERS AND 'SPECICANS' FOR USE IN PILOT STUDIES AT CERTAIN HEALTH CARE INSTITUTIONS IN GAUTENG

Sirs,

The Gauteng Provincial Government, Department of Agriculture, Conservation, Environment and Land Affairs ("DACEL"), together with the Gauteng Department of Health (DOH), have embarked on a comprehensive programme to improve the standard of Health Care Waste (Medical Waste) Management in the Province.

This programme includes the project titled: "Sustainable Health Care Waste Management in Gauteng", which is financed by the Danish Co-Operation for Environmental Development ("DANCED") and executed on behalf of DACEL by the Danish consultants RAMBØLL, of Virum, Denmark.

In accordance with the project plan, alternative methods of containerisation of health care risk waste ("HCRW") and Health Care General Waste ("HCGW") have been evaluated during a Feasibility Study, and the intention is to test certain of these alternatives in selected Provincial health-care facilities by means of Pilot Studies.

Your firm is accordingly invited to quote for the supply and delivery of sharps containers and 'specicans' required for the Pilot Studies, as specified below. In the event of your quotation being accepted, a formal order will be placed on you by Rambøll.

. . . . . / 2

1. Items to be supplied

Note: Suppliers may quote for the supply of **any or all of items 1 through 4** below.

Item No.	Description	Capacity/ dimensions	Colour	Requirements	Approx. Quantity Reqd.
1	Sharps container	Approx. 8 litres	Red or white	1. Horizontal loading type. 2. Preferably rectangular in shape. 3. Refer also to paragraph 2 below.	1,800
2	Wall-brackets for sharps container	-	Red, white or chrome	1. Mild-steel wire/sheet construction. 2. Powder-coated or chromed finish. 3. Snug/secure fit around sharps container. 4. No sharp corners/edges.	110
3	Tall sharps container	Height min. 750 mm; capacity approx. 15 litres	Red or white	1. Refer to paragraph 2 below.	40
4	'Specican'	10 litres	Red or white	1. Round or rectangular 'bucket'-type container, complete with carrying handle. 2. Refer also to paragraph 2 below.	1,800

2. Container specifications (Items 1, 3 & 4 above)

2.1. Material to be rigid polypropylene or polyethylene plastic.
2.2. Body to be leak- and puncture-proof.
2.3. Lids to be securely fitting/sealing.
2.4. Containers to be spill/crack-proof if dropped.

Note: Suppliers may provide copies of test certificates relating to any of the attributes referred to above, if available.

3. Samples

Samples of each of the items offered (and alternatives, if applicable) to be delivered to:

Mr T Kristiansen
c/o DACEL
15th Floor, Glencairn Building
73 Market Street (between Joubert and Eloff)
Johannesburg

before 4:30 pm on Monday 18th November. Samples to be marked with the supplier's name.

4. Timing for delivery

4.1. Items to be delivered to Leratong Hospital, Krugersdorp and/or Itireleng Clinic, Dobsonville as requested by the project team according the following delivery schedule:

. . . . . / 3

Delivery No:	1	2	

Item Number	10th January 2003*	7th March 2003#	Total Quantity
1	600	1,200 +/- 25 %	1,800 +/- 17 %
2	110	-	110
3	20	20 +/- 25 %	40 +/- 13 %
4	600	1,200 +/- 25 %	1,800 +/- 17 %

* Latest date; suppliers may elect to make this delivery any time from 1 December 2002.
\# Latest date; this delivery may be made up to 10 days prior to this date.

5. Commercial Terms

5.1. Prices to be quoted per unit, exclusive of VAT, but inclusive of delivery.
5.2. Total order quantity may be up to 17% more/less than the figures stated in paragraph 1 above (ref. also paragraph 4.1).
5.3. Only firm prices, quoted in Rands, will be acceptable.
5.4. Validity of offer is to be at least 30 days.
5.5. Payment terms will be 30 days from date of delivery/invoice.
5.6. It is anticipated that orders in respect of the above will be placed on or before Friday 22nd November 2002.
5.7. Exact quantities for delivery number 2 will be advised on or before 21st February 2003.
5.8. A late delivery penalty of 20% of the unit purchase price per week (or part thereof) will be levied in respect of any items delivered after the due dates specified in paragraph 4.1 above.

6. Response

6.1. **Kindly fax you quotation by close of business on Friday 15th November 2002** to:

Att: Mr T Kristiansen

Rambøll

Fax. no. (011) 355-1663

6.2. A **copy** of the quotation should also be faxed to Mr. J. Clements on fax. no. (011) 447-7964.

7. Other Conditions

7.1. Rambøll reserves the right:
7.1.1. Not to accept the lowest, or any, offer.
7.1.2. To split the award of orders for items 1 through 4 (ref. paragraph 1) between more than one supplier.
7.2. In view of the provision contained in paragraph 7.1.2 above, suppliers may quote discounts applicable to various **total order values**.

Kindly address any queries in respect of the above to John Clements at the numbers/addresses appearing at the head of this fax.

Yours faithfully

John Clements

fax_no	company	person
031-700-5663	COMPASS WASTE SERVICES	JUDY du RANDT
012-546-0230	NAMRON ENTERPRISES	ROBBY MILLS
011-483-1759	MIRACLE MEDICAL	ANDREW PRUDHOE
011-314-3128	DISMED DIRECT	SALES

fax_no	company	person
011-792-7930	BINBEEZ	CLIFFORD DURRHEIM
011-902-9700	CLINX WASTE	KEVIN BOWMAN
011-894-3707	MEDICAL & AUDIOMETRIC SALES	IRENE HOLLAND
011-608-1160	KENDON MEDICAL	SALES

APPENDIX 11 – Example of adjudication report – tail lifts

P O Box 68524 Bryanston 2021
Tel. (+2711) 447-3864 · Fax. (+2711) 447-7964
Mobile: 082-334-1211
e-mail: johnc@ibex.co.za

01 December 2002

Rambøll,
c/o Gauteng Department of Agriculture, Conservation,
Environment & Land Affairs,
JOHANNESBURG

Att: Mr T Kristiansen

Dear Sir,

SUSTAINABLE HEALTH CARE RISK WASTE MANAGEMENT IN GAUTENG
ADJUDICATION REPORT IN RESPECT OF EQUIPMENT REQUIRED FOR PILOT STUDIES AT LERATONG HOSPITAL AND ITIRELENG CLINIC:

MANUFACTURE, SUPPLY AND FITMENT OF "TAIL-LIFT" TO HCRW TRUCK

8. EQUIPMENT TO BE SUPPLIED

One hydraulic tail-lift, to be fitted to service-provider's truck.

The tail-lift is to have a platform width equal to that of the vehicle, and a depth (front to back) of at least 1,5 m. Capacity to be at least 1 000 kg.

The tail-lift is required to lift the 770 litre wheelie-bins and 'rolltainers' onto and off the truck transporting them between health-care facility and treatment plant.

9. REQUEST FOR QUOTATION ("RFQ")

The following firms were approached telephonically, and invited to submit quotations:

Company	Person	Tel. number
JSJ TRUCK EQUIPMENT (RATCLIFF)	NIGEL BOWER	011-452-6596
SKY-JACKS	RON PANAINO	011-397-6594
600 GROUP	RONNIE BOYCE	011-394-1670

. . . . . / 2

10. ANALYSIS OF QUOTATIONS RECEIVED

The 600 Group advised that they no longer supply tail-lifts. Quotations were received from the other two potential suppliers. Copies of these quotations are attached as Annexures 1 and 2 respectively.

Both suppliers quoted on 'cantilever' lifts, which are attached to the rear of the truck chassis; although more expensive than a 'rail-lift' utilizing vertical rails attached to the truck body, there are numerous advantages to the cantilever lift, viz.:

- no relocation of the door hinges is required
- no rail protruding above the top of the truck body
- hydraulic opening (i.e. folding down/up) of platform
- more robust, due to attachment to chassis

The prices quoted were as follows:

Company	Price per unit (excl. VAT)
JSJ TRUCK EQUIPMENT (Ratcliff)	**R 31 000-00**
SKY-JACKS	**R 31 967-50**

The quotations are analysed below.

10.1. JSJ Truck Equipment (Ratcliff)

Terms forming part of their quotation include:

10.1.1. Lifting capacity is 1 500 kg
10.1.2. Manufacturing time: 3 days; fitment: 3 days
10.1.3. Price includes supply and fitment (at their works) but excludes VAT
10.1.4. Guarantee: one year; hydraulic cylinders and power-packs: 6 months
10.1.5. After-sales service: nationwide 24/7 service availability
10.1.6. Terms: 7 days from invoice

10.2. Sky-Jacks

Terms forming part of their quotation include:

10.2.1. Lifting capacity is 1 000 kg
10.2.2. Manufacturing time: 7 days; fitment: 3 days
10.2.3. Price includes supply and fitment (at their works) but excludes VAT
10.2.4. Guarantee: 12 months
10.2.5. Terms: not stated (30 days assumed)

10.3. Comparison of Quotations

JSJ Truck Equipment's (Ratcliff) offer is superior to that of Sky-Jacks in respect of:

- lifting capacity (1 500 vs. 1 000 kg)
- manufacturing time (3 days vs. 7 days)
- price (R 31 000 vs. R 31 967-50)

Sky-Jacks offers a better guarantee than JSJ (12 months vs. 6 months on cylinders + power-pack, 12 months on mechanical equipment).

Ratcliff is a UK brand, and has been in existence for many years. The Ratcliff unit is the market-leader in South Africa, and their service-availability is considered important in view of the fact that a breakdown of the tail-lift could put a truck out of action.

11. RECOMMENDATION

In the light of the foregoing, we recommend that an order be placed with Messrs JSJ Truck Equipment for the manufacture and fitment of a tail-lift, as follows:

JSJ Truck Equipment
Att: Mr N Bower
Fax. (011) 452-6530

In accordance with:

- **Our verbal request for quotation**
- **Your faxed quotation dated 13th November 2002**

Kindly supply and fit one 'Ratcliff' RL 1500 hydraulic cantilever tail-lift to Messrs Buhle Waste's Mercedes 'Atego' truck reg. KVB383GP. Platform size to be 1500 mm x body width.

Price (fitted): R 31 000-00 + R 4 340-00 VAT = R 35 340-00.

Terms: direct deposit into your account within 7 days of invoice (kindly provide us with you bank details).

Fitment: Kindly arrange with Maude Pakkies at Buhle Waste: tel. (011) 866-2316.

Kindly confirm receipt of this order by return of fax.

Yours etc.

We trust that the above meets with your approval.

Yours faithfully

John Clements PrEng.

J.S.J. Truck Equipment (Pty) Ltd.
[illegible]
Box 8532
[illegible] 1613
South Africa
Tel: (011) [illegible]
Fax: (011) [illegible]

Ratcliff

NEW RATCLIFF TAIL LIFT QUOTATION

CUSTOMER : RAMBOLL — Ref. No. JSJ 8479

ATTENTION : JOHN — Date: Wednesday, November 13, 2002

TEL. NO.: 082 334 1711 — FAX NO : 011 447 7964

RE: LIFT options for Mercedes Atego 1017 with van body. Reg. No. KVB383GP

Dear Sir.
I visited Buhle Waste and have measured their vehicle. I spoke with Maude and her manager and it would seem they want to load 3 x 1.38m long trolleys at one lift. The truck is 2 460m wide so I hope the width accepts three at a time.
If we use a normal rail lift the lift beam box will have to be protruding above the roof of the body to avoid the door catches. You will also need special swing door hinges. If you do not want to have the mechanism above the roof it will mean shortening the existing doors and installing a header.
The better option will be to install a cantilever lift, which is mounted on the chassis. This type of lift does not interfere with the doors at all. It has the added advantage of hydraulic opening of the platform and can tilt beyond the 90 degrees of a rail lift

RATCLIFF CANTILEVER LIFT MODEL	: RL 1500
LIFTING CAPACITY	: 1500 Kgs
UNIT WEIGHT	: 520 Kgs
POWER UNIT	: ELECTRO HYDRAULIC 12/24 VOLT
PLATFORM SIZE	: 1500 x width of body
UNIT PRICE	: R 28 900
FITTING CHARGE PER UNIT	: R [illegible]
TOTAL	: R 31 000

This price assumes fitment in our Johannesburg factory.

TERMS
Payment will be made within seven days of date of invoice

VAT
The above prices quoted do not include 14% VAT.

VALIDITY
The above prices quoted will remain valid for a period of 15 days from above date

ISO 9001 REGISTERED FIRM

Manufacturers of: Ratcliff Tail-lifts, Roll over Doors, Loadlock Securing Systems
Directors: [illegible]

02 17:17

MEASUREMENTS
I have the measurements and they will be filed with this quotation.

DELIVERY
Three days for fitting after three days manufacturing time.

GUARANTEE
All goods manufactured by Ratcliff are guaranteed for a period of one year from date of installation against faulty workmanship and materials used. Hydraulic cylinders and power packs are covered for six months as per our suppliers' warranty.

AFTER SALES SERVICE
In support to our proven products, we at Ratcliff have in place a network of highly trained service men located in all major centers providing a full technical back-up service on a 24 hour basis, 365 days a year.
These service men are capable of undertaking any work necessary to ensure total
Reliability of all Ratcliff products on an ongoing basis including regular servicing and annual examinations as determined by law.
This service is provided by way of fully equipped service vans covering the entire Republic.

YOURS SINCERELY

NIGEL BOWER
083 652 3696

Appendix 12: Example of an order placed for liners

	NAME	ORG.	FAX	EMAIL
To:	Mr L Casieri	Plastica Film Extrusions	(012) 804-7268	
CC:	John Clements		011 447-7964	

From: Torben Kristiansen, CTA "Sustainable Health Care Waste Management in Gauteng"

Date: 2002-11-22 **Pages:** 3

Re: Pilot Project for Health Care Waste – Order of Equipment

Dear Mr L Casieri
In accordance with:

- Our faxed RFQ dated 12th November 2002
- Your faxed quotations dated 15th and 19th November 2002

Kindly supply the following virgin polyethylene bags/liners with waterproof heat-sealed seams:

Delivery No:	**1**	**2**	**3**		
Item Number w (cm) x l (cm) x t (micron)	**10th January 2003***	**7th March 2003#**	**2nd May 2003#**	**Total Quantity**	**Quoted price per 1,000**
1 46 x 54 x 50 red	12,000	7,000 +/- 50%	7,000 +/- 50%	26,000 +/- 27 %	R 312-50
2 56 x 66 x 60 red	14,000	8,000 +/- 50%	8,000 +/- 50%	30,000 +/- 27 %	R 558-00
3 75 x 95 x 50 red	3,000	3,000 +/- 50%	-	6,000 +/- 25 %	R 896-50
4 75 x 95 x 80 red	4,000	3,000 +/- 50%	2,000 +/- 50%	9,000 +/- 28 %	R1 434-40
5 100 x 95 x 50 red	2,000	2,000 +/- 50%	-	4,000 +/- 25 %	R 1 326-25
6 46 x 56 x 30 black	50,000	35,000 +/- 50%	35,000 +/- 50%	120,000 +/- 29 %	R 177-70
7 56 x 66 x 30 black	80,000	40,000 +/- 50%	40,000 +/- 50%	160,000 +/- 25 %	R 264.40
8 75 x 95 x 60 black	6,000	4,000 +/- 50%	4,000 +/- 50%	14,000 +/- 29 %	R 1 019-60

Notes:

1. Delivery Instructions: The items are to be delivered to Leratong Hospital (Krugersdorp) and Itireleng Clinic (Dobsonville) in split-numbers to be specified before supply cf. 3) below and before first supply
2. Terms: Electronic transfer into your account upon confirmation of delivery. (Kindly supply bank details.)
3. Exact quantities for delivery number 2 and delivery number 3 will be advised on or before 21st February and 11th April, respectively.
4. All bags/liners are to de delivered packed flat within suitable outer bags. Items 4 and 5 to be packed in 50's, and all other items in 100's.

Samples:

5. In accordance with paragraph 3 of the RFQ, you are required to provide samples/test results, as set out below, for evaluation by Rambøll as soon as possible after placement of a formal order by Rambøll:

   5.1. RED BAGS/LINERS:

   5.1.1. five samples of each of the three bag/liner thicknesses specified above, viz. 50, 60 and 80 micron. The samples should show the proposed red pigmentation, but may be of any size within the range 46 x 54 cm to 100 x 95 cm.

   5.1.2. one tensile strength test result, together with puncture-resistance test results for the 50 and 80 micron sheet.

   5.2. BLACK BAGS/LINERS:

   5.2.3. five samples of each of the two bag/liner thicknesses specified above, viz. 30 and 60 micron. The samples should show the proposed black pigmentation, but may be of any size within the range 46 x 54 cm to 75 x 95 cm.

   5.2.4. one tensile strength test result.

   Samples should be delivered to Mr T Kristiansen, c/o DACEL, 15th Floor Glencairn Building, 73 Market St. (between Joubert & Eloff), Johannesburg.

   Two working days should be allowed for such evaluation. Should Rambøll take in excess of two days for the evaluation, the due date for delivery number 1 (see above) will be adjusted accordingly.

6. Your attention is specifically drawn to the terms of paragraph 7 of the RFQ.

   Kindly confirm receipt of this order by return of fax and advise the date for samples and tests to be submitted.

For your information only: As this project is part of a Danish-South African development project. Please note that the project is being implemented by the Gauteng Department of Environment Conservation and Land Affairs, but all contracting and procurement is carried out by RAMBØLL Consulting Engineers (represented i SA by me) and all agreements and payments will be with RAMBØLL.

Yours truly,

Torben Kristiansen
Chief Technical Advisor, Sustainable Health Care Waste Management in Gauteng

T: 011 3351664
F: 011 3551663
E: torbenk@gpg.gov.za
C: 082 3323720
W: www.ramboll.com

APPENDIX 13: List of equipment and consumables to be delivered

HEALTH CARE WASTE MANAGEMENT PILOT PROJECT: LERATONG HOSPITAL

LIST OF EQUIPMENT & CONSUMABLES TO BE DELIVERED BY SUPPLIERS

	Quantities					Unit Cost (excl. VAT)	Expected delivery date(s)	Supplier Details				Comments
	Liner System	Box System	HCGW	Total Number				Company Name	Contact Number	Fax Number	Contact Person	
EQUIPMENT												
770 L wheelie bin (red)	20			**20**		R 1,696.00	week 13-17 Jan '03	Plastic Omnium	012-250-9100	012-250-2909	Jeanette Bokaba	
100 L roto-moulded box + lid		140		**140**		R 275.00	week 13-17 Jan '03	Pioneer Plastics	012-541-6000	012-541-1738	Jurgen Hartel	
100 L roto-moulded box lid only		14		**14**		R 55.00	week 13-17 Jan '03	Pioneer Plastics				
50 L roto-moulded box + lid		133		**133**		R 190.00	week 13-17 Jan '03	Pioneer Plastics				
50 L roto-moulded box lid only		13		**13**		R 35.00	week 13-17 Jan '03	Pioneer Plastics				
30 L Addis bin		45		**45**		R 22.90	**week 17-20 Dec '02**	USABCO	011-221-5700	011-221-5717	Tracy Greeff	
Galv. Stand for 110 L liner	40		28	**68**		R 325.00	week 13-17 Jan '03	Namron Enterprises	012-546-0229	012-546-0231	Robby Mills	
Galv. nursing trolley basket for 30 L liner	19			**19**		R 78.50	week 13-17 Jan '03	Namron Enterprises				
Galv. wall basket for 30 L liner	15		339	**354**		R 78.50	**week 17-20 Dec '02**	Namron Enterprises				
Galv. nursing trolley bracket for 30 L bin		20		**20**		R 67.50	week 13-17 Jan '03	Namron Enterprises				
Galv. wall bracket for 30 L bin		25		**25**		R 65.35	week 13-17 Jan '03	Namron Enterprises				
Wall bracket for 8 L sharps box	34	47		**81**		R 11.20	week 13-17 Jan '03	Namron Enterprises				
Nursing Trolley bracket for 8 L sharps box	19	20		**39**		Not yet ordered						
Nesting wire cage trolley for box system		14		**14**		R 3,280.00	**week 17-20 Dec '02**	Ladder & Trolley Mart	011-834-2371	011-838-6233	Bob Nesbitt	
Scale	1			**1**		R 11,500.00	week 13-17 Jan '03	Trek Scale	011-626-3490	011-626-2029	Jason Wallace	To be installed by supplier
CONSUMABLES												
8 L sharps containers incl. Lids	350	250		600		R 9.44	week 13-17 Jan '03	Namron Enterprises	012-546-0229	012-546-0231	Robby Mills	
Tall sharps	5	29		34		R 40.00	week 13-17 Jan '03	ClinX Waste	011-902-1101	011-902-5253	Kevin Bowman	
Polyethylene Bags/Liners **(prices quoted are per 1,000)**												
46 x 54 red 50 mic. (kickabout trolley)	6,000	6,000		12,000	*	R 312.50	week 13-17 Jan '03	Plastica Film Extrusions	012-804-9081	012-804-7268	Mr Casieri	
56 x 66 red 60 mic. (30 boxes & baskets)	6,000	5,000		11,000	*	R 558.00	week 13-17 Jan '03	Plastica Film Extrusions				
75 x 95 red 50 mic. (50 L box)		1,500		1,500	*	R 896.50	week 13-17 Jan '03	Plastica Film Extrusions				
100 x 95 red 50 mic. (100 L box)		1,600		1,600	*	R 1,326.25	week 13-17 Jan '03	Plastica Film Extrusions				
75 x 95 red 80 mic. (stands)	4,000			4,000	*	R 1,434.40	week 13-17 Jan '03	Plastica Film Extrusions				
46 x 54 black 30 mic. (12 L Pedal or other)			50,000	50,000	*	R 177.70	week 13-17 Jan '03	Plastica Film Extrusions				
75 x 95 black 60 mic. (Hanging Bag)			6,000	6,000	*	R 1,019.60	week 13-17 Jan '03	Plastica Film Extrusions				
56 x 66 black 30 mic. (Small Hanging Bag)			70,000	70,000	*	R 264.40	week 13-17 Jan '03	Plastica Film Extrusions				

* These are **part-deliveries**; additional items will be delivered in March and April 2003

APPENDIX 14: Storage Requirements for Equipment

PILOT TESTS AT LERATONG HOSPITAL

SPACE REQUIRED FOR STORAGE OF EQUIPMENT

ITEM	No.	Area/unit	Total Area	
Wheelie bins	25	0.98	24.5	
Re-usable boxes 100 L	168	0.025	4.2	nest 10 high
Re-usable boxes 50 L	196	0.012	2.4	nest 10 high
Racks for 110 L bags	42	0.105	4.5	2 high
Racks for 30 L bags	25		1.0	
Racks for nursing Trolleys	20		1.0	
Sharps Brackets	90		2.0	
32 L Addis bins	45	0.005	0.3	nest 20 high
Wall racks for 32 L bins	25		1.0	
N/T racks for 32 L bins	20		1.0	
8 L sharps	2,400	0.002	4.8	nest 20 high
5 L tall sharps	48		0.5	
10 L speci-can	1,320	0.003	4.0	nest 20 high
46 x 54 liner	28,000		1.0	
56 x 65 liner	23,000		1.0	
75 x 95 liner	24,000		2.0	
100 x 95 liner	4,000		0.4	
Kickabout trolleys	41		2.0	
12 L pedal bins	27		1.0	
Nesting trolleys for plastic boxes	10	0.5	5.0	
Total:			**63.6 m2**	

Note: Liners and other small items could be stored inside wheelie-bins
This would save approx. 14 m2