



STREET CLEANING HANDBOOK

*Useful elements for consideration in the planning and
management of street cleaning services*



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1 STREET CLEANING, GENERAL CRITERIA FOR THE SETTING UP OF SERVICES

Street cleaning is a fundamental service required in modern urban life: traffic, movement of people, commuting, and widespread commercial activity are some of the factors which contribute to the production of rubbish on the streets. Also natural factors, such as the presence of trees, small green spaces and digging up the ground, contribute to the production of rubbish which needs collecting.

The aim of street sweeping is to keep urban areas clean and in perfect hygienic condition, which contributes to the general decorum of the urban area.

The various activities are carried out by trained personnel, equipped with manual tools and special equipment if the service is mechanised (mechanical street sweepers, street washers). From the technical and organisational point of view, it is necessary to define carefully the areas to be served, the type of service, frequency, number of people to be employed and the equipment to be used.

1.1 Definition of the areas to be served

The definition of the areas to be covered by the street cleaning service is the responsibility of the local authority. The service does not generally cover all the areas included in the local authority's competence, but only the roads, streets and public squares. Private areas and those occupied by commercial activities are not usually included unless specifically paid for.

Cleaning services are only carried out by local authorities outside urban areas if they are their direct responsibility, other roads are usually looked after by the various private companies which have contracts to maintain the roads outside towns. The definition of the surface area to be cleaned, and how often it should be cleaned, naturally has a direct effect on the cost of the service.

In order to assure equal standards of quality throughout the territory, it is necessary to plan the normal cleaning activities by:

- First subdividing the territory into zones, and deciding the relevant responsibilities
- Classifying the streets where the service is needed according to their tendency to get dirty
- Defining the frequency with which they need to be cleaned (or bands of frequency) for each class of street, in order to guarantee a general standard of cleaning everywhere
- Identifying the most efficient and effective methods, based on the kind of territory to be covered

1.2 Definition of the type of service

For those responsible for the planning of the cleaning service, a complex and difficult phase is the *classification of streets*, which is necessary in deciding the relevant minimum frequency which will guarantee an acceptable level of cleaning quality with the technology and resources available.

This choice is essentially based on *street classification*, which requires a widespread survey of all the areas involved. To this end, the following parameters should be identified:

- Level of pedestrian use of the area involved
- Length of road networks and type of road surface material (degree of compactness and permeability of the surface)
- Presence of trees, bushes etc. on roadsides, and characteristics and type of leaves (deciduous, evergreen)
- Degree of commercial activity
- Intensity of traffic
- Frequency of tourists
- Presence of places with high levels of importance and/or traffic (offices, churches, bus terminuses and railway stations, schools, post offices etc.)
- Markets, fairs, public events
- Type of urban environment to be served

In more detail, the *classification of streets* implies also the evaluation of:

- **Type of material used for road surfacing and pavements**

In order to accurately evaluate the best cleaning method among the various methods available, it is necessary to survey the degree of compactness and permeability of the surfaces to be cleaned, as well as the kind of materials used in construction and the joints used. These factors affect the efficiency of the service and the ease with which manual or mechanical equipment can be used. For example, it would not be possible to use mechanical equipment on a rough surface which is disconnected and permeable, so only manual cleaning would be possible. Another factor is the width and type of carriageway, which is important in determining whether large, medium or small street sweepers can be used.

- **Type of waste**

In consideration of the many types of rubbish which accumulate on the streets, a complete classification is almost impossible. In order to choose the best operating service possible, however, a general classification of its origin, based on different cycles of production, is useful.

This will include:

- Waste originating from the street itself (dust, soil, mud etc.), produced by weather conditions and traffic
- Seasonal waste (leaves, twigs and so on) produced by weather conditions or consequent human intervention, which is limited to certain periods of the year
- Recurring waste (general litter – paper and tin cans) mostly originating from lack of respect for the environment by users, in general shop and bar owners etc. who clean their property and dispose of



their rubbish in public areas. This kind of waste usually accumulates at certain times of day and almost always in the same places

- Casual waste (empty cigarette packets, cigarette ends, matches, tickets, receipts, sweet papers, animal waste, oil leaks from vehicles, unwanted leaflets etc.) caused by normal pedestrian traffic and vehicles, and which varies with their frequency.
- Exceptional waste, usually bulky waste which people occasionally throw out on the streets

- **Amount of waste present per surface unit**

This element influences the kind and frequency of the service. Above all, we can say that most rubbish accumulates along the sides of streets, especially in the gutters (except waste on roads and seasonal waste, produced by weather conditions). It is obvious that the more waste accumulates per surface area, the more onerous the collecting and disposal service necessary, and this can be considered to be in proportion to the amount of pedestrian and vehicular traffic present.

- **Conditions affecting the service**

This is the real problem of existing street cleaning services which, because of the amount of traffic and the need for vehicles to park, have to deal with numerous obstacles which cause an increase in the amount of time necessary. In the majority of cases, an optimal service can be rendered by adding one or two manual workers to the mechanical vehicle service in operation. These workers can remove litter from places which are hard to reach with the vehicle, and collect the waste into piles in the places where the vehicle passes.

1.3 Methods

The parameters listed above are useful in estimating the size of the services needed in consideration of:

- Cleaning methods for the services to be provided
- Personnel to be used and number of members in each cleaning team
- Number and type of vehicles necessary to cover the territory to be served
- Organisational structure of the service
- Investment and running costs
 - Considering the complexity and variability of the problem to be solved, the organisational model proposed needs to be **flexible** enough to cope with possible variations in the conditions which were taken into consideration at the planning stage. An example of this is when there is a snowfall, and the personnel responsible for sweeping the streets have to become snow clearers or sand and grit spreaders.
 - Besides this, an economical street cleaning service with a high level of quality can only be obtained by using a organisational scheme which is **integrated** or **mixed**. This involves using a combination of mechanical equipment and manual labour, as can be seen in the Table below. This shows that the majority of companies opt for a mixed method of street sweeping.

Sweeping method used		
Manual	Mechanical	Mixed



Local authorities	7%	50%	43%
Companies	6%	6%	88%
Source: APAT, Technical standards of urban cleansing services 2002			



2 MANUAL SWEEPING

2.1 Description

This involves cleaning and collection services carried out by manual workers in the places where waste is visible. The waste is then taken away on handcarts, three-wheeled vehicles or other small motorised vehicles.

The constant growth in the mechanisation of street sweeping means that manual sweeping has become more and more a specific complementary service aimed at particular areas, for example, the cleaning of covered pedestrian areas, flowerbeds, car parks, and fountains, working alongside sweeping machines, weeding, cleaning gutters and drains, cleaning up animal waste, collecting animal carcasses and used needles etc. This figure is more accurately known as an **environmental worker**, being a qualified and specialised person equipped with different kinds of tools which permit greater efficiency and functionality compared to the traditional **road sweeper**.

2.2 Where to operate

Manual sweeping is generally carried out where viability and economic factors do not allow the use of mechanical equipment. This occurs mainly in town centres, access roads to towns and sometimes on the immediate outskirts of towns. In these places, systematic operations which complement mechanical services are carried out, or specific operations in response to seasonal factors, for example when leaves are falling, can be planned on the outskirts of town as well.

2.3 When to operate

The service should preferably be carried out in the morning, depending on the variable frequency of operations (daily, alternate days, twice weekly etc.), estimated on the basis of the parameters outlined above. Night-time shifts are not generally advised, because they can disturb residents and because of the need to consider workers' safety. In areas where there are a large number of tourists, the presence of people at all hours of the day and night means that a cleaning service has to be provided over a twenty-four hour period.

The operations of the environmental worker should also be seen as a way to maintain the level of cleaning in areas already covered by mechanical cleaning. There could therefore be a zone where manual sweeping (for example, in the afternoon), is carried out to go over particular areas which have already been cleaned mechanically in the morning.

The following Table shows the frequency of manual sweeping usually adopted, and the respective minimum and maximum standard values.

Frequency of manual sweeping (days/week)			
	Average	Minimum	Maximum
Companies	3.95	0.50	7.00
Local authorities	5.00	1.00	7.00
Source: APAT, Technical standards of urban cleansing services 2002			

2.4 Choosing frequency

Methods and frequency depend on the type of urban settlement and the population density of the area, road traffic and if tourists are present.

In *town centres*, ordinary general cleaning is usually carried out by a morning shift every day except Sunday, with one afternoon shift (in the central areas) for “spot” cleaning and bin emptying. In some cases specific sweeping shifts are needed in the morning on Sundays and bank holidays.

In *other areas*, twice-weekly cleaning is generally necessary, even if some “critical spots” need operating flexibility (for example, at bus stops, streets in front of schools, offices, sports grounds etc.).

Manual cleaning also has to be specially organised at times when particular events take place, for example fairs, concerts, sporting and other events, etc. In these circumstances the environmental worker can move more easily than a machine among the public to empty bins, clean the streets etc.

Frequency of non-mechanised sweeping				
Description	Optimum Standard	Minimum Standard	Situation observed (company)	Situation observed (local authority)
Area with large presence of tourists and/or commercial activities	At least twice a day every day including weekends/bank holidays	Once a day including weekends/ bank holidays	4 to 12 times a month	1 to 12 times a month
High density residential areas, commercial activities	At least once a day including weekends/bank holidays	Alternate days, excluding weekends/bank holidays		
Medium density residential areas	At least twice a week	Once a week		
Areas where periodical or occasional events take place (markets, various events)	With the same frequency as the event	With the same frequency as the event		

Source: APAT, Technical Standards for urban cleansing services 2002

2.5 Personnel necessary

The choice of the number of people to employ in manual cleaning depends on local factors, and is influenced by the quantity of waste, which in turn influences the methods used for its collection.

Each worker is usually assigned an area of approximately 10-15,000 square metres, depending on the different characteristics of the area and the amount of waste to be collected. The effective capacity for cleaning can be estimated at 2,500-3,000 linear metres of streets in town centres, and 6,000-7,000 linear metres on the outskirts.

The number of workers in relation to the number of inhabitants served is shown in the following Table:

Number of personnel employed in street sweeping per 10,000 inhabitants (manual cleaning)			
	Minimum	Maximum	Average
Local authorities	0.9	11.1	4.2
Companies	1.3	5.6	2.9
Source: APAT, Technical Standards for urban cleansing services 2002			

2.6 Type of equipment

The worker employed in manual cleaning uses different kinds of equipment, and in some cases where efficiency and flexibility can be improved, light vehicles.

- Light vehicles to take away the waste collected (for example, small Piaggio Ape flat back or tip-up trucks, three-wheeled vehicles etc.)
- Long-handled plastic or bamboo brushes or brooms in natural fibre, hand brushes for sweeping rubbish onto dustpans, bins
- Blowers
- Shovel, rake, fan
- Weeding tools
- Iron implement for cleaning drains etc
- Trolley for carrying bin and tools
- Plastic bags/sacks for rubbish
- Keys for opening bins/containers
- Long-handled pincers and air-tight bins for collecting used needles
- Replacement plastic bags/sacks for waste paper bins

Number of tools used in cleaning services per 10,000 inhabitants served, (manual cleaning)			
	Minimum	Maximum	Average
Local authorities	0.4	2.1	1.6
Companies	1.6	5.9	3.5
Source: APAT, Technical Standards for urban cleansing services 2002			

2.7 Operating phases

The job of street sweepers can be divided into the following working phases:

- At the beginning of their shift, they go to their department to collect their service order
- They put on a suitable uniform provided by the company to protect them from adverse weather conditions (rain, snow, ice etc.). Highly visible garments should be provided for personnel working on the streets. Hygiene, safekeeping and cleaning of garments should be emphasised



- Workers then carry out the tasks assigned to them for cleaning streets, squares, pavements, and public spaces in general, including drains and gutters
- When using vehicles, workers should respect the highway code. They should also compile their work reports for the planned maintenance of tools and equipment
- Workers should respect their working hours, carefully carry out their tasks according to when they are programmed, and respect the orders given to them by their supervisor
- Workers should keep their tools and equipment in perfect order
- Workers should behave in a suitable manner when dealing with their colleagues and the public

The organisation of the work rota or particular orders issued by the company can, of course, cause variations in the activities of the environmental worker as outlined in this grid.

2.8 The role of the street sweeper in care of the territory

The street sweeper who is responsible for a certain part of the territory should be able to understand its needs: in this sense the worker does not carry out the tasks assigned to him /her by the zone manager in a passive way, but reacts and adapts his work according to the specific requirements of the area.

The street sweeper represents the image of the company or the local authority in the territory while carrying out his or her job, and the public can ask him/her for information about particular services available or timetables, or can give suggestions for improving the existing services.

From this point of view, it should be kept in mind that the street sweeper deserves adequate training on environmental subjects, such as laws relating to waste, separate collection, work safety as well as some aspects of psychology and communication techniques.

The worker who knows the territory well can also be useful for the company or the local authority in carrying out controls of the complete service offered (for example, rubbish not put in bins, broken equipment), to give a quicker response for solving potential problems.

Total number of street sweepers				
	North	Centre	South	Total
Inhabitants/worker	2,147	2,784	2,257	2,515
Total productivity of street sweepers				
	North	Centre	South	Total
(m2 cleaned/worker/year)	41,305	3,579	24,418	32,588
Source: FEDERAMBIENTE, Survey of urban cleansing services 2002				

3 MECHANICAL SWEEPING

3.1 Description

Mechanical sweeping allows, especially when vacuum type equipment is used, the carrying out of an action which removes dust at the same time as removing rubbish. This is not possible with only manual sweeping.

The technical restrictions connected to the production of equipment and the obstacles which can be found on the streets (for example, parked cars), mean that cleaning with mechanical equipment is only completely efficient if carried out together with manual cleaning.

Technological progress has allowed the production of more and more efficient sweeping machines which are less noisy, more economical and conform to the most recent European norms regarding emissions. The widespread use of this type of equipment means that the number of general personnel employed can be reduced, and more specialised personnel can be employed as drivers and street sweepers.

3.2 Where to operate

In general, the service is carried out in town centres and on streets on the outskirts of urban centres, as well as on main roads – all the places where traffic permits the use of mechanised equipment.

The organisation of the mechanical sweeping service, like that for manual sweeping, should be done by dividing the area to be served into different sections or zones to be served by each street sweeper. The itinerary should be mapped out on a street plan and/or listed according to street names together with their respective frequency of service. This information should be provided for the drivers who operate in the various zones.

3.3 When to operate

The mechanical sweeping service is a support for and an integration of manual sweeping and should be carried out daily in the same areas where manual sweeping takes place, using standard and compact street sweepers.

3.4 Choice of frequency

The service should be carried out according to previously established programmes in which different times are laid out (weekly, twice-weekly, or three times a week, depending on the area). The frequency of the service is decided by taking into consideration the amount of traffic on the streets, the users (habitations and commercial activities), presence of trees/hedges, traffic flow and the presence of tourists.

Frequency of mechanical sweeping service (days/week)			
	Average	Minimum	Maximum
Companies	3.95	0.50	7.00
Local authorities	4.12	1.00	7.00

3.5 Personnel necessary

A street sweeping machine in excellent condition can theoretically cover an operating area of approximately 100,000 square metres per day, but its potential is usually greatly reduced by the need to work together with manual sweepers, which dramatically reduces the speed at which the sweeping team can work. The effective daily operating capacity of a mechanised sweeping team can therefore be realistically estimated at approximately 15-20,000 sq. metres in central areas, and 20-25,000 sq. metres on the outskirts of towns. There is also the need to periodically empty the hopper and fill up with water during the shift, which also means stopping at intervals.

The number of personnel employed in mechanised sweeping in relation to the number of inhabitants served is shown in the Table below:

Number of people employed in mechanised sweeping per 10,000 inhabitants served			
	Minimum	Maximum	Average
Local authorities	0.6	6.8	2.4
Companies	0.3	2	0.9
Source: APAT, Technical Standards of urban cleansing services 2002			

3.6 Types of equipment

The machines used for mechanised street sweeping can be roughly divided into three categories:

- a) Mechanical
- b) Vacuuming
- c) Mechanical/Vacuuming
 - a) The *purely mechanical street sweepers* are designed for the collection of large quantities or bulky rubbish (with respect to dirt or leaves on the streets), and are especially suitable for cleaning markets (crates and trays, fruit and vegetable waste etc.).

Rubbish is collected by this kind of machine using a system of shovels mounted on a conveyer belt which automatically picks up rubbish from the ground and delivers it into a container/hopper. The conveyor belt is usually worked by a chain or belt system connected by pulleys or directly to the gears of the machine, or by a supplementary hydraulic motor.
 - b) *Vacuum-type street sweepers* use a rubbish collection system based on the vacuuming up of litter from the ground. Inside the container/hopper there is a turbine engine which can be chosen according to the required type (size, number of revs etc.). When in operation it creates a vacuum in order to suck up rubbish from the road and deliver it via a loading head and tube to a container/hopper. A filter stops the litter in the hopper obstructing the turbine engine and emitting dust. The turbine engine is supported by two or three rotating brushes positioned on the ground, which sweep the litter towards the loading head. Compared to the mechanical type street sweepers, this

type of machine is more suitable for use on streets and roads as it is more accurate and can collect small pieces of litter and dust.

c) So-called *mechanical/vacuuming sweepers* are quite rare. They provide a mixed system which is essentially based on a mechanical conveyor belt (possibility of transporting bulky rubbish), assisted by a turbine engine situated inside the container/hopper which in some cases can work as a dust vacuumer, thus keeping down the amount of dust created when the litter is loaded. This gives a more complete operation but of course the more complex technology can mean that its use and maintenance are also more difficult.

- All machines must have a system for keeping down dust and a suitable noise reduction system to keep the decibel level below legal requirements.

Number of machines used in street cleaning per 10,000 inhabitants served.					
	Minimum		Maximum		Average
Local authorities	0.4		6.8		1.6
Companies	0.3		1.3		0.8
Source: APAT, Technical Standards of urban cleansing services 2002					
Types of machines					
	Sweepers	Compact sweepers	Light vehicles	Street washers	Other
Local authorities	92.86%	28.57%	57.14%	21.43%	21.43%
Companies	96.00%	60.00%	76.00%	68.00%	32.00%
Source: APAT, Technical Standards of urban cleansing services 2002					

3.7 Operating phases

The job of the driver of the street sweeper is to carry out the following operating phases:

- Report to headquarters at the beginning of the shift to pick up the work schedule
- Responsibility for the upkeep and care of the vehicle, including cleaning and small maintenance jobs
- Check liquid levels and functioning of lights, indicators, rotating lights, emergency equipment, and brushes
- Check the working of the hydraulic and dust reduction systems
- Responsibility for discipline and the general carrying out of the service
- Carrying out cleaning operations according to the work schedule; workers operating in the area should prepare the ground before the sweeping machine arrives by collecting rubbish in piles in the gutters, or in the centre of the road when cars are parked along the street
- Respect the number of hours assigned for the shift and also the operating itinerary laid down in the service order
- If necessary, filling up the machine with water from roadside hydrants
- Compile the daily work report
- Report any breakdowns, damage or defects of the machine on return to headquarters



- Carry out the orders of the supervisor, to whom should be given the maximum collaboration
- Take only equipment and tools assigned to him/her, and look after them with care
- Do not allow unauthorised people outside the service to board the vehicle
- Return to base and unload rubbish into a skip/clean the vehicle
- Substitute brushes where necessary.

The organisation of the work or particular arrangements organised by the company can of course cause variations in the activities of the driver of the street cleaning vehicle, as can be seen the in the following grid:

Street sweepers in use				
	North	Centre	South	Total
Inhabitants/street sweepers	12,173	13,520	22,050	13,210
Use of street sweepers				
	North	Centre	South	Total
(kms swept/sweeper/year)	8,641	7,083	5,223	7,957
Source: FEDERAMBIENTE, Survey of urban cleansing services 2002				

Restrictions on the movement of operating vehicles is the real problem which concerns present day cleaning services, because of the increasingly chaotic situation on the roads and the presence of parked vehicles. This means that the driver is faced with numerous obstacles which increase the time needed to carry out the job.

In such a situation mechanised street cleaning is rendered impossible in many places where the quantity of rubbish is greatest, and where the use of mechanised cleaning would be most efficacious and profitable. It is necessary, therefore, to make provisions to keep vehicles from blocking streets by using restrictive measures, for example, *protected lanes* where it is forbidden to park at certain times.

3.8 Street cleaning equipment

There is a wide choice of equipment for street cleaning. Many companies providing equipment operate in the Italian market, offering a wide range of sweeping machines (mechanical, vacuuming, mixed) of various dimensions (mini/compact, medium sized street sweepers and large vehicles). It has been found by surveying the main operators in the sector that the Italian market for machinery of this type is quite small, which has led to the development of small-scale companies. However, the technology necessary suffers from the relatively low volume of production which does not allow important investment in research and development, except for the bigger producers sharing the largest sector of the market.

The choice of equipment has a particular importance in the planning of road cleaning services and should be considered carefully, taking into account features of the product such as reliability, efficiency, ergonomics as well as external factors like the presence of authorised garages for maintenance of the vehicle, availability of spare parts, and the possibility of a road test before buying the vehicle.

The Table below compares the main technical specifications for street sweepers, divided into the following categories:



- a) Compact street sweepers, with a capacity of less than 2 m³, which can be driven by holders of category B driving licences. These are classified as “operating machines”.
- b) Medium sized street sweepers, with hopper capacity of more than 2 m³, which can be driven by holders of category B driving licences. These are classified as “operating machines”, and vehicles classified as “light vehicles” .
- c) Large chassis-based vehicles which can be driven by holders of category C driving licences. This are classified as “trucks”.

The data and information shown in the Table have been taken from brochures and trade price lists freely obtainable from suppliers. For small scale equipment such as brushes, blowers etc. it was not considered necessary to include detailed information in this summary, and it can easily be found in specific publications and catalogues.

Model	RCM RONDA	BUCHER CitySpider	ECOLOGICA	KARCHER ICC 2 D	SCHMIDT Tremo 501	HAKO Citymaster	SICAS SA2.2	RAVO-MATHIEU Azura	DULEVO 200 quattro
Type	vacuum	vacuum	vacuum	vacuum	vacuum	vacuum	vacuum	vacuum	Meccanical/vac.
Performance									
Max cleaning capacity (m ² /hr)	13000	-	-	37600	-	-	-	-	-
Max cleaning width (mm)	1750	950-1700	-	2350	2400	1300-2500	2000-2700	1230-2600	1300-2600
Drive									
Engine	Kubota	Kubota	VM D703 LTE	-	VW AFD	-	VM 494HT2 or Kubota	64B/3	VM 01 A/15
Fuel	diesel	diesel	diesel	petrol	diesel	diesel	diesel	diesel	diesel
HP (kW)	19.5	18.6	-	36.8	58	-	53 – 68.5	59	46
Speed (km/hr)	-	-	0-40	0-40	0-40	0-50	0-40	-	0-38
Operating speed (km/hr)	-	0 - 16	-	0 - 16	0-12	-	0 - 12	-	-
Capacity									
Hopper capacity (m ³)	0.31	0.85	1	1.5	1.5	1.715	1.75	2	2.5
Water tank capacity (lt)	75	170	250	300	-	380+150	320+150	450	-
Dimensions and weight									
Length X Width X Height (mm)	2619x1300x2030	2790x950x1890	-	4150x1130x1900	5100x1300x2220	4400x1275x1700	3800x1750x2250	3780x1230x2000	-
Weight (kg)	1030	1250	260	1820	2200	2500	3100	2800	3750
Max carrying weight (kg)	-	550	-	-	2700	1500	1300	1700	-
Dust supression system									
	Filter	Water	Water	Filter	-	Water	Water	Water	Filter

Comparison of Technical Specifications for Street Sweepers – Compact (up to 2m³ capacity)



Comparison of Technical Specifications for Street Sweepers- Medium dimensions (2-4m³ capacity)

Model	SICAS 4000	SICAS Millennium	SCHMIDT SK 4000	BUCHER CityCat 5000	DULEVO 5000 Veloce	RAVO 5200
Type	mechanical	vacuum	vacuum	vacuum	Mechanical/vac.	vacuum
Performance						
Max cleaning capacity (m ² /hr)	63000					
Cleaning width (mm)	3150	2200-3000		2200	1300-3500	2100
Drive						
Engine	Iveco 8040/45	Deutz			Iveco aifo	Iveco 8065
Fuel	diesel	diesel		diesel	diesel	diesel
HP (kW)	100	118	79	137	154	77
Max speed (km/hr)	0-40	0-40	0-80	0-40	0-70	0-65
Working speed (km/hr)	0-20	0-12		0-15		
Capacity						
Hopper capacity (m ³)	3.2	3.5	4	4	5	3.3-3.5
Water tank capacity (lt)	1400	700		70	500	600
Dimensions/weight						
Length x Width x Height (mm)	5950x2360x2600	4582x1840x2580	5700x1900	4500x2500x1800	6000x2300x3050	4378-2100-2480
Weight (kg)	7500	5600		5200		5350-5800
Max carrying weight (kg)	3600	5300		5300	4160	5400-5550
Dust Supression system						
	water	water	water	water	water	water

Comparison of Technical Specifications for Street Cleaners - Large dimensions

Model	SCHMIDT SK 5000-6000	FARID FJ 600	BUCHER Cityfant 60	RAVO 6006
Type	vacuum	vacuum	vacuum	vacuum
Performance				
Max cleaning capacity (m ² /h)				
Cleaning width (mm)		2300	2100	2500
Drive				
Vehicle type	Iveco 135.14/145.17	Iveco 150		
Auxiliary engine		Perkins 1004.4		Perkins
Fuel		diesel	diesel	diesel
HP (kW)		86	136	81
Speed (km/hr)			0-85	
Working speed (km/hr)			0-18	
Capacity				
Hopper capacity (m ³)	5.6 – 7.4	6	6	6
Water tank capacity (lt)	1450-1800	1250	2000	1250
Dimensions/weight				
Length x Width x Height (mm)		5845x2550x3100	6035x2550x3200	6690xh2800
Weight (kg)		15000	15000	
Max carrying weight (kg)		5250	6000	
Dust supression system				
	water	water	water	water

4 MIXED SWEEPING

This form of cleaning can be carried out in all areas of the town, from the centre to the outskirts. It involves an integration of mechanical and manual sweeping. Manual cleaners collect rubbish from pavements, flower beds, traffic islands, around bin stands, litter accumulated around drain covers, and all other areas where the mechanical cleaner cannot reach, and sweep it onto the road. The cleaning vehicle then collects the rubbish and cleans nearby streets where there are no impediments such as pavements, flower beds etc., and they can operate with good results.

5 SEASONAL ACTIVITIES, COLLECTION OF LEAVES

For this type of service, working methods can differ greatly, depending on operating conditions:

- The leaf vacuuming machine can work alone in gardens, parks, squares etc. where there is freedom of movement and a relatively large quantity of leaves. On tree-lined roads it works with the assistance of cleaning teams which move the leaves with the help of blowers, brushes, rakes or other equipment, to where the machine will pass. Leaves can also be collected using jets of water.
- Street sweepers can only work on asphalted surfaces, and can work without the help of auxiliary personnel in these areas only if there are no cars parked on the roadside or in parking areas where the dead leaves collect. Otherwise the leaves have to be collected as in the previous case.
- Temporary no parking signs and traffic cones can be placed along the streets to be cleaned to stop cars parking there and allow efficient cleaning to take place. In areas where there is heavy traffic, this can be done at weekends or on bank holidays to avoid inconvenience and ensure safer operating conditions.
- Both street cleaners and leaf vacuumers usually unload leaves in piles to be collected by trucks with large containers and cranes with grab claws or compactor trucks.
- In areas where it is not possible to use leaf vacuuming equipment and/or street sweepers, or where the quantity of leaves does not justify their use, manual sweepers only are used. In this case the leaves are generally loaded onto three-wheeled vehicles or small flat-back trucks which unload in the same places as leaf vacuumers and street sweepers.

If traffic conditions do not permit vehicles to park for the necessary period of time, or prevent the accumulation of piles of leaves, manual cleaners can put the collected leaves into sacks, which can later be loaded onto trucks.

6 DISPOSAL OF WASTE FROM STREET CLEANING

Comma c, Article 7 of Law 22/97 (Commonly known as the “Ronchi” decree) specifically classifies the rubbish originating from street cleaning as urban waste.

The same concept is repeated in Article 21 comma 2 which states: *“For the purposes of collection, transport and storage, all refuse originating from street sweeping, of whatever nature or origin, in other words, all that which is found lying on the streets and public areas, or on the streets and private areas which are however subject to public use, or coastal and lakeside roads and on river banks, is to be considered urban waste”*.

Waste originating from street sweeping is codified CER 20 03 03, which is different from that of waste from Urban Solid Waste collection (CER 20 03 01).

Waste from street sweeping is characterised by the presence of polluting elements on the streets, such as lead, chromium etc. For this reason it should not be disposed of in waste treatment and composting plants as it can pollute the compost produced.

The treatment plant should therefore have a specific area in which to unload street sweeping machines.

The final destination of waste collected from street sweeping is therefore that of disposal without any specific further treatment.

Waste from street sweeping must be weighed separately from the rest of the waste collected. Some regional norms in Italy (for example, in Lombardy, Umbria, etc.) specify that the quantity of waste originating from street sweeping must be deducted from the total production of waste for the calculation of the percentage of waste collected separately for recycling.

On the basis of figures supplied by various companies who run the service in Italy, it is estimated that the quantity of waste from street sweeping is approximately 10% of the total waste produced, or about three million tonnes per year.

7 GEOGRAPHICAL INFORMATION SYSTEMS (GIS) FOR THE MANAGEMENT OF STREET CLEANING SERVICES

The Geographical Information Systems for the management of Street Cleaning Services are a useful operating instrument for management, both as support for other instruments used in decision-making, and as knowledge systems which are indispensable for operations of control management.

In particular, such instruments provide information for different people:

- People working in technical offices for dynamic management of the various components of the service, to localise quickly the itineraries, means in use etc. and update technical data in real time in this context
- For operating personnel, to provide a valuable data bank to optimise and organise operations in the territory
- For management, to carry out analyses and obtain reports on the state of the service integrated with information deriving from the management sector

7.1 General features of a GIS

The geographical information system (GIS) is a software programme which allows the positioning and analysis of objects and events which exist and occur on the ground. GIS technology integrates standard operations carried out using the most common databases, such as research and statistical analysis, the functionality of actual GIS systems such as memorisation and storage of data, treatment and analysis of data, the creation of representations and copies of output (maps and tables), with the specific advantages of the visualisation and geographical analysis provided by maps. These capabilities distinguish GIS systems from other information systems, and represent a very valuable instrument for a wide range of users who need to visualise and analyse information, explain events, forecast outcomes and results, and plan strategies using data banks in direct or indirect relation to a particular territory.

7.2 Management of street cleaning services

Such applications allow the management of areas or street itineraries where street sweeping and cleaning services with mechanical or manual means are carried out.

The areas to be covered, the perimeter or the length of each individual zone are calculated and provided, which allows for the development of necessary analyses for the calculation of costs and charges and the organisation of the service, as well as providing support with objective factors for the drawing up of service regulations/service contracts. Overlapping due to the management of the service and the frequency of cleaning for the various streets are also easily checked, and the information can also be supplied to residents (service charts).

These systems can be easily integrated into vehicle localisation systems with GPS equipment. That is, it is possible to pinpoint the position of vehicles by signals from the most common telecontrol systems based on GPS technology. The publication of all the graphic and numerical contents of the data bank is also possible with these systems. These publications can be integrated into any server company's services or put on the company's website, and can be consulted using any WEB browser. This means that



information can also be accessed by domestic users.

9. CLEANING OF STREETS, SQUARES AND PEDESTRIAN SUBWAYS

The cleaning of streets, squares, pedestrian subways and steps is carried out in the following ways:

- Mechanised system (pressurised cold/hot water)

Generally, work has to be carried out where access to non potable water is not available. For this reason vehicles/machines have to be used which have water tanks for washing purposes (sometimes integrated with detergents which should be free of polluting additives and are compatible with drainage systems for rainwater/detergents).

Tank capacity varies from 1,000 to 7-8,000 litres. If pressure washing from the vehicle only and without the support of workers on the ground who can manoeuvre manual washing jets is used, then it is necessary to refill the tank several times during the shift. If manual washing jets are used, the speed will be reduced but a more complete result will be obtained. As well as the suppression of dust and hydraulic transport of small pieces of litter (sometimes they are used to precede street sweeping machines), a more thorough cleaning of the surface with the use high pressure jets (also with the help of hot water/steam) will be achieved. The latter system is important for disinfecting particular places (fish markets, where pigeon droppings and human excrement accumulate etc.).

- Manual system

In this case water sources are used to which are attached reels fitted with a nozzle or jet which can be directed by the worker. They can be used to wash the nearby areas (steps and other uneven surfaces). The desired effect is to suppress dust and wash away small items of litter and residues, as long as they can be washed into drainage system without counter-indications (for example, the Paris network).

10 OTHER SERVICES

Services complementary to street cleaning are usually carried out, which contribute to the decorum and hygiene of the urban area. These services are often carried out directly by personnel employed in street cleaning. A panoramic view of these additional services is set out below. It does not purport to be an exhaustive list of the services which a company can offer to local authorities/clients. Another important factor should be taken into consideration - that the integration of sweeping services with other services also leads to economies of scale with the consequent reduction in overall costs.

10.1 Cleaning of markets

The cleaning of markets takes place at the end of the market day as soon as the market area is free of obstacles. Special cleaning teams equipped with suitable equipment collect market refuse left on the ground and clean the whole area occupied by the market. Local authority regulations can oblige stall holders to reduce the amount of refuse they leave behind to be cleaned up.

10.2 Cleaning and maintenance of historical and ornamental public fountains

The cleaning and disinfecting service for ornamental and historical fountains, as well as public drinking fountains and urinals, is included in the zones served by mechanical and manual cleaning and is carried out by the following methods:

Washing and cleaning the object and surrounding floor, as well as disinfecting to guarantee hygiene.

Fountains are periodically cleaned and washed with suitable equipment which will not damage delicate parts (marble, bas-reliefs etc.), and their basins are emptied and refilled with clean water.

10.3 Cleaning of drains and manholes

A special team equipped with canal-jet type expurgating equipment cleans roadside drains and manholes and removes material lying there, except for those constructed of stone or concrete.

The areas covered are those where normal manual/mechanical cleaning takes place.

On average, each drain/manhole is cleaned twice a year. In some places, when necessary, they are cleaned more often, to stop them being blocked by debris, leaves etc., and allow the normal drainage of rainwater.

Sometimes it is necessary to unblock and check the working order of roadside drains. When this service is being carried out, the presence of any problems or broken parts should be communicated to the local authority so that they can arrange for repairs to be made.

The service is carried out on normal working days, and integrated into the shift system for other services.

10.4 Snow-clearing service

In the case of snowfalls, when cleaning personnel cannot carry out normal household waste collection and other services, all available personnel is employed in clearing snow from pavements and other pedestrian areas, streets, roads and squares near to schools, hospitals, clinics, public offices and churches, in order to leave these areas free for pedestrian traffic as soon as possible. The local authority should have a plan of action which indicates the streets and roads to be covered by this service.

As regards the circulation of traffic, small snowploughs with salt and grit spreaders are used on roads and streets, smaller vehicles with tanks of salt solution are used in town centres and on narrow streets, and large snowploughs equipped with salt and grit spreaders are used on wider roads. All available personnel and equipment are organised by the relevant office of the local authority according to plans laid out for the various zones of the territory. Snow clearing teams, equipped with the necessary tools and equipment and co-ordinated by supervisors, are responsible for shovelling away the snow. Where necessary, three shifts a day can be organised.

10.5 Collection of used needles

The collection of used needles requires particular attention because of the risks and danger they pose, especially in areas where children walk or play.

The service is usually organised in the following way:

- Workers employed in manual sweeping are responsible for collecting used needles and checking the areas most at risk in their own work zones.
- In some places considered to be high risk areas, a specially trained employee carries out this service. All workers are equipped with special protective clothing and equipment, such as thick gloves, heavy-soled shoes, long-handled pincers specially made for picking up needles, polyethylene containers with lids etc.

The used needles which are collected are taken to authorised plants for the disposal of clinical waste.

10.6 Collection of animal carcasses

This is a special service for removing animal carcasses found in public areas, or those notified by the local authority, and disposing of them in line with the relevant health regulations. Particular equipment, materials and health precautions are employed to avoid risks to workers and the public. This kind of service has to be authorised by the relevant health authority, which issues the necessary certification and authorisation required by law.

11 SOME EXAMPLES OF CLEANING SERVICES

11.1 The Association of Local Authorities of the Lake Trasimeno area (Perugia)

The area under consideration, mainly consisting of rural areas, has approximately 65,000 permanent residents. The area also has many cultural and other tourists who come on rural holidays in spring, summer and autumn. The nine local authorities which make up the Association are characterised by small historic town centres which have been restored and preserved by residents. The many villages in the area are small (1,000-2,000 inhabitants) with isolated houses built mostly near the main arterial roads.

These local authorities have always paid great attention to urban cleansing services, especially street sweeping, which accounts for more than 30% of the total costs of urban cleansing services.

Until several years ago, street sweeping was mainly manual. Only in the main towns was mechanical sweeping carried out. In the light of changes which have taken place in the urban characteristics of the territory, road surfacing and the increase in traffic along the roads which make up the territory, which has led to an increase in the amount of waste produced, it has been necessary to modify the service and extend it to new areas, and introduce mixed street sweeping, especially in the villages and on the outskirts.

These changes were put into operation three years ago, and now cover almost all the territory of the local authorities in question. The service has also been rationalised, thanks to the employment of the new technology which has become available. The total costs of the service have not increased by any significant amount.

The quality of the service has increased greatly, especially on the outskirts and in the villages, thanks to mechanical sweeping which is done weekly (on average) on the main roads and streets and squares which have the heaviest traffic. The degree of satisfaction of residents and tourists can be considered very high. In a recent Databank "Customer Satisfaction Audit", 80% of those interviewed said they were satisfied with the cleaning of streets and pavements.

The present service, which covers the nine main towns and 30 villages, is carried out as follows:

- Daily sweeping of town centres (manual/mechanical on alternate days)
- Villages and the outskirts are classified according to type of sweeping service: manual or mixed, and frequency (daily, three times a week, weekly). Where mixed sweeping is carried out, mechanical sweeping is not usually done more than once a week.
- The workers employed in manual sweeping are usually also employed in other services, which take up an average of 20-30% of their time (emptying bins, separate waste collection etc.)

Approximately 28 workers are employed in street sweeping.

The equipment used daily is as follows:

- 5-6 vacuum type street sweepers of medium size (4m³)



- 21 light vehicles with flat-back or tip-up

This service is also carried out on Sundays in the areas bordering Lake Trasimeno during the summer holiday period, in order to cope with the extra presence of tourists..

11.2 Milan

The methods used for street sweeping in Milan were changed in March 1999 and have since been under continual revision in order to ensure a more efficient service to residents and “city users”.

The planning and implementation of the new street sweeping service, arising from the need for greater flexibility and improvement in the existing service, was based on two main actions:

1) a complete revision of the classification of Milan’s streets according to four main factors: *the amount of traffic on the streets* (subdivided into high, medium and low) with the different amounts of waste produced; the *characteristic features of the streets* (viability, different kinds of pavement, presence of paving stones etc.); the *visibility* (if the area is of architectural, cultural commercial or tourist value) and *the impact of the activity of the AMSA company’s cleaning service on residents* (for example, night-time cleaning in the centre, daytime cleaning on the outskirts etc.).

This type of classification has meant that the daily itineraries of street cleaning teams could be studied and classified by homogeneous frequency. The resources of Amsa, the company which runs the city’s urban cleansing services, have been re-distributed, with some changes in zones, in order to provide a more precise and efficient service.

2) the number of sensitive areas has been increased; the four zones where Amsa operates have been divided into 22 areas, covering over 450,000 square metres. These are determined according to their particular characteristics which range from extremely high frequency of traffic, to cultural, architectural, commercial or touristic importance, and where Amsa can operate 24 hours a day, 7 days a week.

Another important innovation concerns the operation of “labelling” carried out in the city. Nearly all the streets of Milan have been supplied with approximately 25,000 personalised labels, attached to roadside waste and litter bins, which state the times and days for each street when street sweeping teams will be in action.

As regards the cleaning of pavements and gutters, the service takes place in two different shifts: in the centre between 23.30 and 04.30; outside the centre between 14.30 and 19.30.

Large-scale cleaning which includes washing of streets and roads (the day this takes place is called *Milano Pulito*: “Clean Milan”) when a ban on parking in the streets affected is necessary, is carried out on different days from the above, to allow residents to park their cars on the pavements on these days.

Since 23 April 2001, when Amsa stipulated a contract with the local authority of Milan, the company has been responsible for integrating a further 1,450,000 square metres into its cleaning service, divided as follows:

- 770,000 sq. m. relating to traffic islands and verges/embankments on tree-lined roads, and flowerbeds
- 680,000 sq. m. relating to small parks and public gardens, and bus/tram depots



The service is carried out as follows:

1. Thorough cleaning of the areas most in need every month. The service is carried out at night, between midnight and 06.00 in the morning, and traffic cones are put in place 48 hours before cleaning to prevent cars parking in the area.
2. Maintenance activities in the same areas are carried out once a week between 06.00 and 12.00 by Amsa employees using small trucks.
3. Cleaning of small green areas and bus depots is carried out at least once a week, in the morning, depending on the characteristics of the area.

The new project includes:

- a) an extension, after about one year of experimentation, of daytime street cleaning with a parking ban, to some residential areas where most cars are normally parked at night rather than in the daytime.
- b) street sweeping and washing in the main outdoor market areas (77 out of 97), at the same time as rubbish collection of market waste is carried out, with the consequent elimination of the need for night-time no parking signs for street cleaning (in operation since 14 July 2003).
- c) mechanised sweeping of pavements using small vacuum sweepers specially acquired for this purpose.
- d) a new mechanical sweeping method for kerbs, using a new kind of patented equipment which can also reach under parked cars and other places, which was impossible using traditional methods (for example in parking bays or where cars park facing the pavement, thus covering the gutters).

With these innovations Amsa has increased the number of kilometres swept and washed mechanically every week by 20%, and a further increase of approximately 8% in the total area covered by manual sweeping and multifunctional machines.

Approximately 150 teams are employed every day in general street sweeping, and 19 teams are employed in daily large-scale cleaning, using 339 machines/vehicles. About 180 teams are employed a day in bin-emptying.

11.3 Padua

In the city of Padua the street sweeping service is organised as follows:

1. Manual sweeping.
2. Mechanised sweeping in residential areas.
3. Night-time large-scale mechanised sweeping of main roads.

Manual sweeping

The service is carried out by employees equipped with manual equipment (brushes, shovels, pincers and containers for collecting used needles, plastic bags and bins for collecting the rubbish which is swept up). A typical team is made up of one employee with an "Ape-car", a small three-wheeled flat back vehicle for collecting rubbish. 51 teams are employed on a daily basis.



Employees carry out the following operations:

- Pavement sweeping
- Sweeping of kerbs and gutters
- Cleaning of grates covering drains for rain water
- Collection of used needles
- Cleaning under and around waste bins and containers (wet collection)
- Cleaning around bottle and paper banks, and other containers for separate collection
- Collection of litter lying around paper banks and other containers, and putting it into the appropriate containers to reduce the volume of paper collected by the street sweeping service
- Emptying of litter bins and replacement of plastic bags
- Removing litter dumped in public gardens and flower beds
- Removing litter dumped in ornamental fountains and drinking fountains

Zones and timetables for the service

Manual sweeping is carried out in all areas of the city at different times and with different frequencies. The historic centre bounded by the old city walls (Orange zone) is cleaned daily in two daytime shifts: 05.00-11.00 and 13.00-19.00. Manual sweeping outside the city walls (Green zone) is carried out three times a week, between 05.00 and 11.00. On the outskirts of the city, the service is carried out twice-monthly. Six technical co-ordinators control the operation of the service.

Exceptional cleaning services

The company responsible for cleaning services plans exceptional cleaning services together with the local authority. If necessary this can also be carried out at night, so as not to interfere with the circulation of traffic. In this case, the service is carried out with the co-operation of traffic wardens/traffic police for the placing of traffic cones/warning signs, and the closure of roads where there is heavy traffic.

Mechanical sweeping of city areas

All areas of the city are divided as follows:

- a) Areas outside the city walls: 3 zones, each with 6 itineraries
- b) Areas inside the city walls, excluding historical centre: 2 zones, each with one itinerary
- c) Area of the historical city centre: 4 zones, each with 1 itinerary
- d) Area city squares: 1 zone with one itinerary

Description of the service



The cleaning of secondary streets and roads with low to average traffic, of cycling routes and pedestrian areas is carried out by teams equipped with small sweepers and light vehicles equipped for emptying the sweepers and doing any manual cleaning necessary.

Frequency of the service

A cleaning team operates in every zone every day except Sundays, with a total of 10 teams. The itineraries are divided up as follows:

- a) Areas outside the city walls: once a week
- b) Area inside the city walls, excluding historical centre: twice a week
- c) Historical city centre: once a day
- d) Squares: once a day

Shifts

- Mornings 05.00 - 11.00
- Afternoons 13 -19, 14-19, 15-21 on Saturdays

Night-time mechanical cleaning of main roads

All the main roads in the local authority area are divided into eight itineraries, each of which can be cleaned in one shift.

Description of the service

- Cleaning and washing of main roads with heavy traffic (washing service not on days with presence of rain or ice) with mechanised equipment
- Typical cleaning team: driver with sweeper, driver with street washer
- Operations with street sweepers: 4 (52 weeks of the year)
- Operations with street washers: 4 (35 weeks of the year)

Frequency of the service

The service is provided from Monday to Thursday, in order to avoid night-time traffic from Friday evening to Sunday evening. Two street sweeping vehicles are used (also two street washing vehicles, weather permitting). Given that the total number of itineraries is 8, there are 4 operating nights a week and 2 teams, the frequency of operations for each itinerary is once a week (each itinerary has characteristics and dimensions which mean that cleaning takes up one full shift).

Timetable

From 00:00 to 06:00; night-time service with parking forbidden on set days. The company which manages the service is responsible for placing no parking signs indicating the day of the week and the times when parking is forbidden.

Type of equipment



High-powered mechanical-vacuuming street sweepers mounted on trucks. High-pressure street washing equipment (50 bar) mounted on trucks.

11.4 Perugia

The local authority of Perugia covers an area of 449.92 sq. kms, with a daily average presence of 200,000 people. The city is situated at a maximum of 493 metres above sea level and dominates the Tiber Valley over a rugged hilly area. The type of land, mainly low hills, has led to the development of a large variety of urban settlements, giving the city a unique aspect with a rich artistic and cultural patrimony of medieval origin.

The area covered by the local authority is divided into three zones:

- a) Zone A – Historical centre: characterised by a particular kind of viability (narrow streets and alleyways, steps, steep streets etc.), which does not allow the use of medium or large scale equipment and vehicles.
- b) Zone B – City centre adjacent to the historical centre, characterised in the main by streets where the use of medium and large vehicles is possible.
- c) Zone C – Outskirts, suburbs and rural areas: the rest of the area covered by the local authority which is characterised by industrial areas, suburbs and rural areas.

On the basis of these parameters, the urban and non-urban areas where it is possible to use mechanical equipment, and those where only manual cleaning is possible, were determined. The service is carried out with different frequencies, varying from one or two daily shifts (historical centre) to once a month in some areas outside the city. There are two shifts a day from Monday to Saturday, and on Sundays and bank holidays morning and afternoon cleaning of the historical centre is guaranteed during the summer months. The first shift is from 05.00 to 12.30 and the second shift from 12.30 to 20.00.

Statistics relating to the service

The Table below gives figures for the areas to be cleaned with the relative frequency of the service:

FREQUENCY	STREETS m2	SQUARES m2
Daily	279,054	63,302
Three times a week	619,026	28,299
Twice a week	246,615	1,260
Once a week	972,697	109,990
Every two weeks	378,740	-----
Monthly	116,696	-----
Daily (afternoons)	18,354	14,546
Sundays/holidays	26,880	20,239
TOTAL	2,658,062	237,636

Additional services

The company which manages the street cleaning service in Perugia is also responsible for a number of additional services which are indispensable for the decorum of the city.

- Cleaning of markets



- Collection of animal carcasses
- Used needle collection
- Washing service for streets, squares and pedestrian subways
- Cleaning and maintenance of historical and ornamental fountains
- Cleaning of drains and gutters
- Cleaning and disinfecting urinals and drinking fountains
- Snow service
- Litter bin emptying and cleaning
- Periodic cleaning of roadside areas where household waste bins are placed

Among the additional services provided, one of the most important is:

Services to be carried out for special and periodic events

Cleaning of crossroads outside urban areas

The main access roads to the city of Perugia are the exits from the E-45 dual carriageway from Orte to Cesena. The uncivil behaviour of people who leave all kinds of litter at traffic lights and crossroads, the presence of immigrants who wash car windscreens and sell various articles in these places, means that rubbish of all kinds accumulates in flower beds, on traffic islands and grass verges. Cigarette packets, bottles and paper tissues are thrown away, which disfigure these main entry roads and ruin the image of the city of Perugia. The street sweeping service provides periodic cleaning of these areas using street sweepers and rakes and brushes for manual cleaning by employees.

Street cleaning after grass cutting

The practice of leaving litter along roadsides and in gutters is a growing phenomenon, due to the lack of civic pride among people. This phenomenon is more evident when grass cutting and park maintenance is carried out, and litter becomes more visible. Co-ordinated activities with the local authorities provide for an immediate cleaning of escarpments and verges and other green spaces immediately after the grass has been cut. It is easier to do these activities together because of the presence of employees who can direct the traffic and place warning signs while cleaning takes place.

Cleaning and furniture removal from flats on request of the local authority

Personnel employed in street cleaning can also clean, disinfect and empty flats and other buildings on specific request of the local authority.

Special cleaning of monuments and places in the local authority of Perugia

Gesenu, the company which manages cleansing services for the local authority, also carries out special cleaning services for monuments, squares, tunnels, and pedestrian subways using specific equipment and products such as pressurised washing equipment, special detergents etc.

Personnel employed



The personnel employed in mechanical and manual sweeping and other services have employment contracts agreed with the specific Trades Unions involved in the sector, and work one or two shifts.

PERSONNEL EMPLOYED	NO.
Manager: external services	1
Manager: mechanical cleaning	1
Manager: manual cleaning	1
Team leader	2
Driver of street sweeper	17
Worker with light vehicle	27
Street sweeper	27
Other services	8
TOTAL	84

Vehicles – equipment used

TYPE OF VEHICLE – EQUIPMENT	NO. IN SERVICE
Ravo 5002 Vacuum sweeper	14
Farid vacuum sweeper mounted on 120 EK 18 type vehicle	3
Ape-car: light flat-backed vehicle ATM2T	21
Ape-car: light vehicle with tip-up ATM3T	10
150 EK 18 type truck for transport of sweeper - truck	1
Kramer Tremo disinfecting vehicle	2
Tank truck for street washing	1
Espurgo JUROP vehicle for drain cleaning	1
Cars for controlling operations	4
TOTAL	57

11.5 Rimini

General characteristics of the territory

Rimini has a population of about 130,000 inhabitants, with a total area of approximately 134 square kms, and around 550 kms of roads. Tourism is concentrated only in part of the territory.

The total area of the local authority of Rimini is divided into homogenous zones depending on the specific characteristics of the territory, as follows:

- Tourist zone (yellow area)
- Town centre (orange area)
- Residential zone (violet area)
- Industrial areas/workshops (blue area)
- Non-urban zone (non-coloured area)

Organisation of the resort zone



The demarcation line which divides the resort zone from the other zones is easily recognisable as the railway line which goes from Ancona to Rimini and from Rimini to Ravenna. This line has affected the urban and economic development of the town since it was built.

All tourist accommodation and services can be found in this zone, for example there are approximately 1,250 hotels, and the seasonal presence of tourists is felt exclusively in this area. For example, in the high season in summer the population increases from the normal 25,000 residents to about 400,000 people, which brings with it all the associated problems.

Some of the problems which affect the organisation of the service

It is necessary to go into detail regarding some of the specific problems which affect the normal running of the services:

- The times when the services are used by tourists is one of the aspects which most affects the organisation of the work, in particular the problem of finding the best time to carry out cleaning operations. The typical day of tourists depends on the type of client.
- Young people usually begin their day in the afternoon, and carry on until the early hours of the morning. Families start at about 8 in the morning and finish their day any time up to midnight.
 - Because of the way the tourist zone has developed over the years, there is a great problem connected to the lack of car parks, and so it is natural for streets to be full of parked cars.
 - The concentration of such a large number of people and commercial activities in a very small area means that an insufficient number of litter bins can be provided
 - The type and quantity of rubbish to be collected is very different depending on the type of user. In particular, areas used mostly by families are usually much cleaner than those where young people gather.
 - The problem of the collection of leaves, though it is an important aspect of the service, is not taken into consideration here as it does not greatly affect the organisation of the service in summer.

Organisation of the service

The aim of good organisation is, of course, to guarantee a good level of cleaning quality all over the territory. To this end, the territory was subdivided according to:

- How often cleaning is needed
- Organisational constraints

The first factor is therefore the division of the territory into zones, taking into consideration these criteria. In order to guarantee a uniformly high level in all the territory, the organisation of cleaning services is divided as follows:

- Planned cleaning activities, respecting contractual obligations
- Special services throughout the day in specific places where a large amount of litter accumulates, called HOT SPOTS
- Emptying waste paper bins



PLANNED CLEANING ACTIVITIES

Planned cleaning activities are carried out according at different times of day and with different frequencies depending on how heavy the traffic of people/vehicles is in the area. The territory is subdivided according to considerations set out previously, and distinguishes between:

- Primary Traffic Tourist Zone (Main roads, sea-front and coast road)

In these areas, traffic is lightest (except during the peak season in the first two weeks of August), between 03.00 and 07.00, when it starts to increase again. The fact that the roads are very wide and road surface noise is low means that even relatively noisy vehicles like street sweepers can be used without causing particular disturbance to hotel guests. The cleaning shift therefore begins at 02.30 and finishes at 08.00, which allows a good quality service to be provided.

- Secondary Traffic Tourist Zone

In these areas, traffic generally stops before that in the main areas, but the roads are not wide enough to use noisy equipment like street sweepers because the amplification of noise would cause people to protest. Conditions are acceptable only when the town comes to life in the morning, so the work is only carried out between 06.00 and 12.00.

The organisation of cleaning teams for planned activities is divided as follows:

- Vacuum sweepers of 4m³ or 2m³, depending on road dimensions and type of trees or plants present
- Vehicles with water sprinklers to damp down dust
- A sufficient number of manual personnel to prepare for the passage of vehicles and clean areas inaccessible to street sweepers

The identification of HOT SPOTS was necessary to maintain the quality of the service in places where commercial activities are concentrated and a large number of tourists congregate, creating a greater accumulation of rubbish.

Generally these places are cleaned several times a day, depending on the area. An environmental worker with manual sweeping equipment and three-wheeled tip-up truck is guaranteed.

Waste paper bins from 30 to 120 litre capacity are well-distributed throughout the territory, but they are not sufficient to cope with the amount of litter thrown away, even if they are emptied once a day. For this reason they are sometimes emptied up to three times a day, with emphasis on early morning and early evening, so as to leave the majority of waste bins empty before the evening promenade. Also in this case, the worker is equipped with the relevant manual cleaning equipment and small tip-up truck.

PERSONNEL EMPLOYED

For the running of the cleaning service, the company uses its own personnel, as well as people from outside companies. In particular, the tendency is to use internal personnel for the management and planning of cleaning services. As a consequence, the activities which tend to be contracted out are those which use less sophisticated equipment and personnel with average to low specialisation. The services which are usually contracted out to other companies are therefore the cleaning of areas where most rubbish accumulates and the emptying of waste bins.



At all events, the increase in the work load during the summer period is covered by the employment of temporary workers, for a maximum of 51 workers (internal and external) for the local authority of Rimini only. This increase also means the use of extra equipment compared to the winter period, and an extra sweeper with a capacity of 4 m³, as well as 5 sweepers with a capacity of 2 m³, are employed.

Final considerations

In a situation where there is a large presence of tourists, like that of Rimini, it is not possible to apply systems which allow the codification of the various problems which arise, therefore it is necessary to have a sufficiently flexible kind of organisation to cope with variations in the amount of rubbish produced at different times and in different places.

11.6 Rome

The local authority of Rome covers approximately 1,280 sq. kms, is divided into 19 administrative districts and has a population of about 2,700,000 inhabitants. The city is characterised by a city centre with at its heart a historical centre which is among the largest in the world.

The historical centre is almost entirely surrounded by a city “belt” which was built between the end of the nineteenth century and the first decades of the twentieth century, the growth of which was due to the transfer of the functions of the capital of Italy to Rome.

The urban cleansing services for all the local authority area covered by Rome City Council are carried out by the AMA SpA company. In particular, sweeping and associated services are run by AMA SpA through its AMACity Division, which has a particularly decentralised structure. At the moment, the AMACity Division is divided into 50 decentralised operating centres. Approximately 4,200 personnel are employed (including middle-management and technical employees), of whom a significant number are part-time workers.

The service is carried out according to a three-year “Service Contract” agreed between the local authority and the company, which is revised annually.

A summary of the problems relating to the planning and management of sweeping services and those relating to new complementary services are outlined below.

Planning of the sweeping service

The aim is to ensure a homogeneous standard of quality over the whole territory, with particular attention to the historical centre. This can be obtained through:

- Deciding the boundaries of the territory and identifying the various tasks
- Determining the categories of streets for which the service is required, based on their tendency to “get dirty”.
- Deciding the frequency of the service for each category which will guarantee an optimal standard of cleaning for the resources available
- Determining the most efficient and effective cleaning methods to be used for the type of territory

Additional services and high flexibility



In order to deal with changing requests for the service, additional services have been organised in Rome, in addition to the usual complementary services. These are as follows:

- Replacement of timetables at bus stops
- Repairing and looking after fixtures and fittings: street lights, benches, flower baskets, fountains etc.
- Weeding and pruning of grass verges and traffic islands
- Removing illegally dumped rubbish
- Disinfecting and pest control
- Removing graffiti from various surfaces (plaster, marble, metal) and taking down non-authorised posters
- Internal/external cleaning of drains and grates
- Cleaning road surfaces with hot water pressure hoses (also used to clean litter bins and waste containers which are favourite places for sticking posters and bills)
- Removal of abandoned vehicles/motorcycles (with the assistance of the police)
- Removal of old road signs
- Some road repairs (asphalt, paving stones, kerbstones)
- Installation of wooden fences and enclosures, with or without wire fencing

In addition, special emphasis is placed on:

- 1) Itineraries for protected sweeping (parking bans in the city allow periodic in-depth cleaning)
- 2) Entrusting parts of the territory to teams of workers (who are given the responsibility for and task of carrying out all the activities which are necessary in a particular area, for example, sweeping, cleaning the insides of rubbish containers, emptying litter bins, weeding, cleaning drains etc.)