Useful compilations for developing National Guidelines for minimum standards for sanitation during disaster situations

For discussions on 12 August 2008 at NDMA, New Delhi

Steering committee on Sanitation
NDMA, New Delhi

11 August 2008

To: Major General Dr.JK Bansal
NDMA, New Delhi

Dear Sir,

Subject: Process towards arriving at minimum standards for sanitation in disaster situations

Disaster situations pose challenges of basic sanitation, hygiene, health care waste management. These aspects were reviewed by a group of experts invited by National Disaster Management Authority and an attempt has been made in the following pages to compile available information in order to arrive at minimum standards for following areas:

1. **Excreta Disposal** (Pages 49 to 53)
2. **Solid Waste Management** (Pages 1 to 25)
3. **Health Care Waste Management** (Pages 26 to 48)
4. **Promotion of Hygiene (with focus on personal hygiene)** (Pages 54 to 57)
5. **Waste water management** (Pages 58 to 61)

This is compilation of information, mostly derived from WHO, UNICEF, SPHERE Project, Legislations related to Environment protection of Government of India. Focus has been given as suggested by NDMA to activities that need to be taken up during the first 10 days and next 40 days after natural disasters.

This compilation is for review for the meeting on 12 August 2008 by the sub group on basic sanitation. I am attaching herewith efforts from my side on "Solid Waste Management" and "Health care waste management" for your review. Also, I am attaching useful materials on Excreta Disposal, Promotion of Hygiene (with focus on personal hygiene) and waste water management which Col. Dr.Upadhyay, Dr.Rakesh Sharma and Mr.vikranth from SPHERE project might find it useful.

I wish to share with you that another one month will be required to put the document together in appropriate format

Spruthvish

Dr.S.Pruthvish
Convener, sub group on Sanitation in Disaster Situations

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Minimum Standards for Solid Waste Management in situations of Natural Disasters

1. Background, situation analysis :

Matters related to debris and other wastes generated as a consequence of disasters, the interruption of collection services, the overload of final disposal sites, and waste management in shelters and campsites – all are waste peculiar to disaster situations.

Reestablishing solid waste collection services after a natural disaster constitutes a major challenge. This is especially so if we take into account not only the possible consequences of this event, but also the fact that most developing countries particularly in rural and peri-urban areas, lack systems with sufficient coverage.

This draft document prepared by the Steering Committee on Sanitation constituted by NDMA is a compilation of available material .

Addressing a concrete disaster may represent a valuable opportunity to improve the waste management system with regards to the situation prior to the event, both in terms of the service coverage and service equity. We are sure that this guide will contribute to achieving these important goals.

2. Rationale for minimum standards – reference documents reviewed and short summary

Waste is produced by households, shops, markets, businesses, medical centres and distribution points.

Generation rates vary considerably according to seasons, diets (e.g. changes from fresh vegetable to packaged aid goods) and even the day of the week. An average of around 0.5kg/ capita/ day is common in low-income cities.

Waste densities also vary considerably. Densities for low-income cities are usually around 200-400 kg/m3.

Where lots of packaging is used in emergency situations, densities are likely to decrease.

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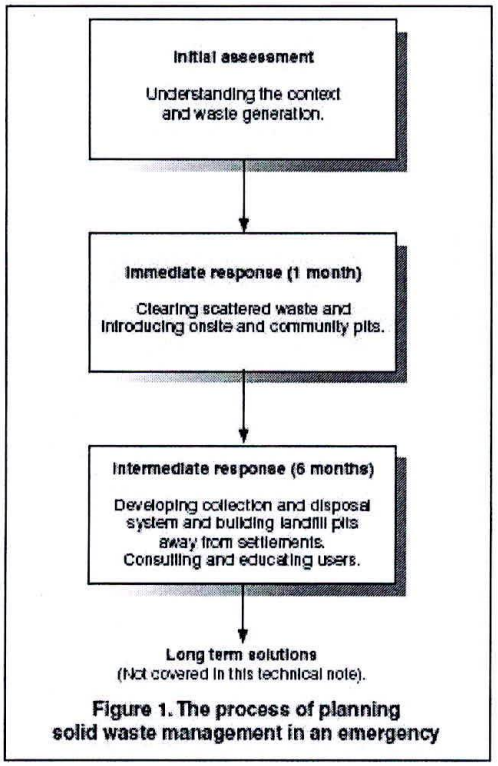

Figure 1. The process of planning solid waste management in an emergency

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3. Initial Assessment Collection of municipal solid waste (waste peculiar to post disaster scenario) Segregation Storage, Transportation, Processing , Disposal - standard operating protocols in low resource settings in post emergency situation

Initial assessment

The first stage in dealing with solid waste is to understand the emergency context and the nature of waste being generated. The following sections outline key questions for consideration.

The context

- What solid waste management systems/ equipment is already in place? How has it been affected? Is it possible to work with and learn from the existing systems?
- How many people are affected? Where are they? What are they doing with waste at present? Are there any pertinent cultural factors?

- What opportunities or restrictions does the environment present? Is it possible to dig pits? Where are surface water sources located? At what level does the water table like? Where is land available?

The waste

- What waste is being generated (e.g. organic, hazardous, dry etc.)?
- Where is waste being generated? How accessible are waste generators?
- How much waste is being generated?

Immediate response

Activities should be prioritised according to present and future health hazards of different waste types and sources. Activities are likely to focus on clearing of existing scattered waste and managing waste from households and markets.

On-site household disposal

Suitable where space is not too limited and where waste has a high organic content (as it will decompose and reduce in volume). Also useful in areas where access is difficult.
Pits should be 1m deep and be frequently covered with ash/soil to prevent access to waste by insects and rats, and to reduce odours.
Note that on-site disposal is labour-intensive and requires advanced household cooperation.

Community pits

Must be located within 100m walking distance of any household (SPHERE Guidelines).
As a rough guide guide, 50 people will fill 1m3 of a pit each month, depending on generation rates and density.

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Intermediate solutions

Community issues

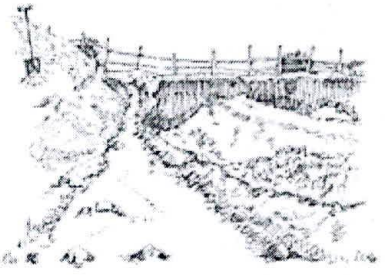
Consultation. It is useful and important to consult potential users of a waste management system before and during design and implementation.
Education. It is important for participating communities to understand how good solid waste management can be achieved and can benefit their health.

Collection and storage

In some situations on-site, community pits may be a suitable medium-term solution, whilst in others it will be necessary to devise ways of removing and disposing of waste. This will usually involve the following:

- storage in the house;
- deposition at intermediate storage point; and
- collection and transport to final disposal.

In the home, plastic bags or a small container with a lid make suitable storage containers.
For intermediate storage points in communal areas bins of maximum 100 litre capacity are required (when full this will weigh around 40kg). Oil drums cut in half can be suitable. Ideally the bin will be arranged so that it can be emptied easily (e.g. hinged so it can tip into a handcart). A 100 litre bin is required for each 50 people or for a few market stalls. Bins require daily emptying, and this is labour-intensive.



Transport

When selecting suitable vehicles, waste generation rates and densities need to be considered along with:

- areas they need to access (e.g. narrow alleys or uneven paths); and
- distance between collection and disposal points.

For example, a wheelbarrow could collect waste from approximately 50 individuals before requiring emptying.

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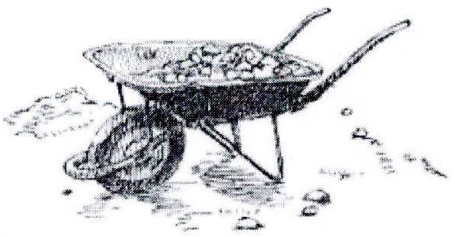
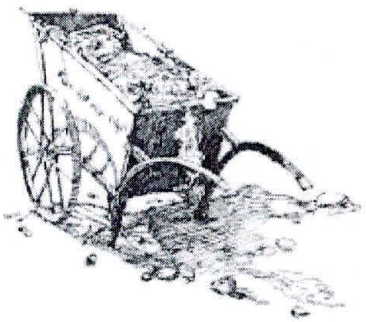
Disposal

As a medium-term solution, larger-scale landfill pits can be constructed. Without leachate (liquid runoff) treatment these are not suitable for long-term use. They should be situated at least1km downwind of settlements, at a location selected in consultation with the population. They should also be situated downhill of water sources and at least 50m from surface water sources. Carefully consider drainage where the pit is on sloping ground and erect fences to keep animals and scavengers out.



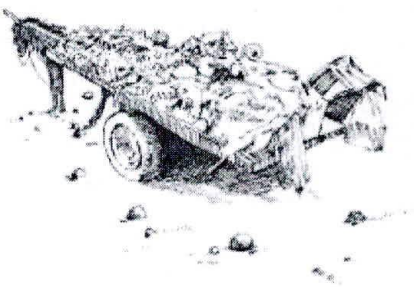


Staff

Approximately 2.5 workers are required for 1000 community members (WHO/ UNEP 1991). Protective clothing and equipment need to be considered (e.g. gloves, boots, visibility jackets).

4. Other important factors

Incineration



Incineration is not usually a favourable option for solid waste management as it requires a large capital input and care for operation and management to ensure nonpolluting bone. Where burning is deemed necessary (e.g. to reduce waste volume), it must be done at least 1km downwind of settlements, and ashes should be covered with soil daily. On-site burning of household waste can be highly-polluting and can be a fire hazard.

Care of equipment

Waste can often be corrosive, so it is important to paint all metal waste management equipment and to wash it frequently. Such activity can significantly increased the life of equipment

Emergency response waste

Packaging of emergency response provisions (e.g. food, water, medicine, shelter) can produce serious waste problems. Consider this in procurement and where possible manage packaging waste at point of distribution to prevent its widespread scattering

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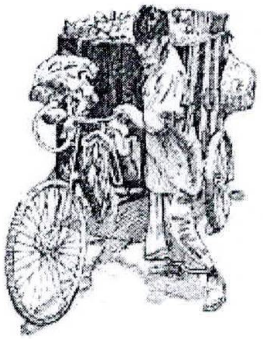
Recycling and composting

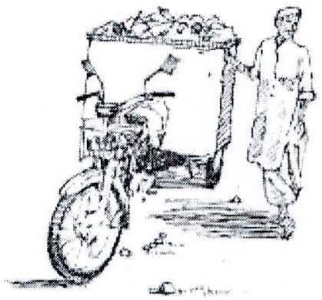
In time it may be possible to work with local recycling industries to encourage entrepreneurs or waste collectors to gather recyclable items. This can provide a source of income as well as reducing the amount of waste requiring disposal. Home composting can also be an effective means by which to reduce the volume of waste requiring collection and disposal.



Management and implementation

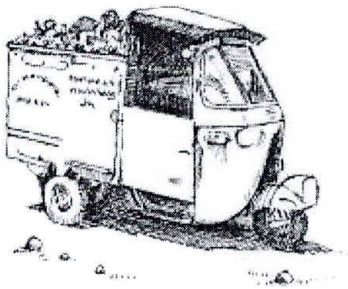
It is important to consider management structures and implementation methods. At times in emergency situations, particularly early on, activities may have to be strongly enforced until more participating systems can be introduced.

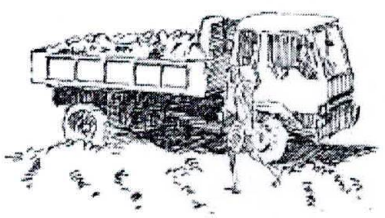
Continuously review, monitor and response to the nature of waste, pervading conditions and levels of community participation.



Long-term waste management

In the long-term, capacity of landfill sites need to be increased, leachate needs to be contained and treated and the overall sustainability of waste management practices must be considered. Long-term solutions are beyond the scope of this technical note.





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1. Harvey, P., Baghri, S and Reed, R. A. (2002) Emergency Sanitation: Assessment and Programme Design. WEDC, Loughborough, UK
2. SPHERE Guidelines, The Sphere Project (2004) Humanitarian Charter and Minimum Standards in Disaster Response, The Sphere Project: Geneva, Switzerland (Distributed worldwide by Oxfam GB), http://www.sphereproject.org/handbook/index.htm
3. Ministry of Environment and Forests, Government of India (EPA)
4. WHO – Disaster Response series – No.7

(Following aspects are being compiled)

6. Learnings from the past

7. How to use these minimum standards

8. Efforts required towards sustainability.

9. Acknowledgements

Annexure 1

Identification of landfill for future use /Improvement of existing landfill

(Schedule III ,[see rules 6(1) and (3), 7(2)])

Specifications for Landfill Sites (Ministry of Health and Environment)

Site Selection

1. In areas falling under the jurisdiction of 'Development Authorities' it shall be the responsibility of such Development Authorities to identify the landfill sites and hand over the sites to the concerned municipal authority for development, operation and maintenance. Elsewhere, this responsibility shall lie with the concerned municipal authority.
2. Selection of landfill sites shall be based on examination of environmental issues. The Department of Urban Development of the State or the Union territory shall co-ordinate with the concerned organisations for obtaining the necessary approvals and clearances.

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3. The landfill site shall be planned and designed with proper documentation of a phased construction plan as well as a closure plan.
4. he landfill sites shall be selected to make use of nearby wastes processing facility. Otherwise, wastes processing facility shall be planned as an integral part of the landfill site.
5. The existing landfill sites which continue to be used for more than five years, shall be improved in accordance of the specifications given in this Schedule.
6. Biomedical wastes shall be disposed off in accordance with the Bio-medical Wastes (Management and Handling) Rules, 1998 and hazardous wastes shall be managed in accordance with the Hazardous Wastes (Management and Handling) Rules, 1989, as amended from time to time.
7. The landfill site shall be large enough to last for 20-25 years.
8. The landfill site shall be away from habitation clusters, forest areas, water bodies monuments, National Parks, Wetlands and places of important cultural, historical or religious interest.
9. A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Department's land-use plans.
10. Landfill site shall be away from airport including airbase. Necessary approval of airport or airbase authorities prior to the setting up of the landfill site shall be obtained in cases where the site is to be located within 20 km of an airport or airbase..

Facilities at the Site

11. Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
12. The landfill site shall be well protected to prevent entry of unauthorised persons and stray animals.
13. Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.
14. The landfill site shall have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.
15. Provisions like weigh bridge to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required shall be provided.
16. Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours shall be provided.
17. Safety provisions including health inspections of workers at landfill site shall be periodically made.

Specifications for land filling

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18. Wastes subjected to land filling shall be compacted in thin layers using landfill compactors to achieve high density of the wastes. In high rainfall areas where heavy compactors cannot be used alternative measures shall be adopted.
19. Wastes shall be covered immediately or at the end of each working day with minimum 10 cm of soil, inert debris or construction material till such time waste processing facilities for composting or recycling or energy recovery are set up as per Schedule I.
20. Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil shall be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper drainage berms shall be constructed to divert run-off away from the active cell of the landfill.
21. After completion of landfill, a final cover shall be designed to minimize infiltration and erosion. The final cover shall meet the following specifications, namely :--

a. The final cover shall have a barrier soil layer comprising of 60 cms of clay or amended soil with permeability coefficient less that 1 x 10^{-7} cm/sec.
b. On top of the barrier soil layer there shall be a drainage layer of 15 cm.
c. On top of the drainage layer there shall be a vegetative layer of 45 cm to support natural plant growth and to minimize erosion.

Pollution prevention

22. In order to prevent pollution problems from landfill operations, the following provisions shall be made, namely :-

a. Diversion of storm water drains to minimize leachate generation and prevent pollution of surface water and also for avoiding flooding and creation of marshy conditions;
b. Construction of a non-permeable lining system at the base and walls of waste disposal area. For landfill receiving residues of waste processing facilities or mixed waste or waste having contamination of hazardous materials (such as aerosols, bleaches, polishes, batteries, waste oils, paint products and pesticides) minimum liner specifications shall be a composite barrier having 1.5 mm high density polyethylene (HDPE) geomembrane, or equivalent, overlying 90 cm of soil (clay or amended soil) having permeability coefficient not greater than 1 x 10^{-7} cm/sec. The highest level of water table shall be at least two meter below the base of clay or amended soil barrier layer;
c. Provisions for management of leachates collection and treatment shall be made. The treated leachates shall meet the standards specified in Schedule- IV;
d. Prevention of run-off from landfill area entering any stream, river, lake or pond.

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Water Quality Monitoring

23. Before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept in record for future reference. The ground water quality within 50 metres of the periphery of landfill site shall be periodically monitored to ensure that the ground water is not contaminated beyond acceptable limit as decided by the Ground Water Board or the State Board or the Committee. Such monitoring shall be carried out to cover different seasons in a year that is, summer, monsoon and post-monsoon period.

24. Usage of groundwater in and around landfill sites for any purpose (including drinking and irrigation) is to be considered after ensuring its quality. The following specifications for drinking water quality shall apply for monitoring purpose, namely :-

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S.No.	Parameters	IS 10500: 1991 Desirable limit (mg/l except for pH)
1.	Arsenic	0.05
2.	Cadmium	0.01
3	Chromium	0.05
4.	Copper	0.05
5.	Cyanide	0.05
6.	Lead	0.05
7.	Mercury	0.001
8.	Nickel	-
9.	Nitrate as NO_3	45.0
10	PH	6.5-8.5
11.	Iron	0.3
12.	Total hardness (as $CaCO_3$)	300.0
13.	Chlorides	250
14.	Dissolved solids	500
15.	Phenolic compounds (as C_6H_5OH)	0.001

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16.	Zinc	5.0
17.	Sulphate (as SO_4)	200

25. **Ambient Air Quality Monitoring**

26. Installation of landfill gas control system including gas collection system shall be made at landfill site to minimize odour generation, prevent off-site migration of gases and to protect vegetation planted on the rehabilitated landfill surface.
27. The concentration of methane gas generated at landfill site shall not exceed 25 per cent of the lower explosive limit (LEL).
28. The landfill gas from the collection facility at a landfill site shall be utilized for either direct thermal applications or power generation, as per viability. Otherwise, landfill gas shall be burnt (flared) and shall not be allowed to directly escape to the atmosphere or for illegal tapping. Passive venting shall be allowed if its utiliztion or flaring is not possible.
29. Ambient air quality at the landfill site and at the vicinity shall be monitored to meet the following specified standards, namely :-

S.No.	Parameters	Acceptable levels
(i)	Sulphur dioxide	120 μ γ/μ^3 (24 ηουρσ)
(ii)	Suspended Particulate Matter	500 μ γ/μ^3 (24 ηουρσ)
(iii)	Methane	Not to exceed 25 per cent of the lower explosive limit (equivalent to 650 mg/m^3)
(iv)	Ammonia daily average	
	(Sample duration 24 hrs)	0.4 mg/m^3 (400 μ γ/μ^3)
(v)	Carbon monoxide	1 hour average : 2 mg/m^3

		8 hour average : 1 mg/m^3

29. The ambient air quality monitoring shall be carried out by the concerned authority as per the following schedule, namely:-

(a) Six times in a year for cities having population of more than fifty lakhs;

(b) Four times in a year for cities having population between ten and fifty lakhs;

(c) Two times in a year for town or cities having population between one and ten lakhs.

Plantation at Landfill Site

30. A vegetative cover shall be provided over the completed site in accordance with the and following specifications, namely :-

(a) Selection of locally adopted non-edible perennial plants that are resistant to drought and extreme temperatures shall be allowed to grow;

(b) The plants grown be such that their roots do not penetrate more than 30 cms. This condition shall apply till the landfill is stabilised;

(c) Selected plants shall have ability to thrive on low-nutrient soil with minimum nutrient addition;

(d) Plantation to be made in sufficient density to minimize soil erosion.

Closure of Landfill Site and Post-care

31. The post-closure care of landfill site shall be conducted for at least fifteen years and long term monitoring or care plan shall consist of the following, namely :-

(a) Maintaining the integrity and effectiveness of final cover, making repairs and preventing run-on and run-off from eroding or otherwise damaging the final cover;

(b) Monitoring leachate collection system in accordance with the requirement;

(c) Monitoring of ground water in accordance with requirements and maintaining ground water quality;

(d) Maintaining and operating the landfill gas collection system to meet the standards.

32. Use of closed landfill sites after fifteen years of post-closure monitoring can be considered for human settlement or otherwise only after ensuring that gaseous and leachate analysis comply with the specified standards.

Special provisions for hilly areas

33. Cities and towns located on hills shall have location-specific methods evolved for final disposal of solid wastes by the municipal authority with the approval of the concerned State Board or the Committee. The municipal authority shall set up processing facilities for utilization of biodegradable organic wastes. The inert and non-biodegradable waste shall be used for building roads or filling-up of appropriate areas on hills. Because of constraints in finding adequate land in hilly areas, wastes not suitable for road-laying or filling up shall be disposed of in specially designed landfills.

Annexure II

Schedule IV

[see rules 6(1) and (3), 7(2)]

Standards for Composting, Treated Leachates and Incineration

1. The waste processing or disposal facilities shall include composting, incineration, pelletisation, energy recovery or any other facility based on state-of-the-art technology duly approved by the Central Pollution Control Board
2. In case of engagement of private agency by the municipal authority, a specific agreement between the municipal authority and the private agency shall be made particularly, for supply of solid waste and other relevant terms and conditions.
3. In order to prevent pollution problems from compost plant and other processing facilities, the following shall be complied with, namely :-

i. The incoming wastes at site shall be maintained prior to further processing. To the extent possible, the waste storage area should be covered. If, such storage is done in an open area, it shall be provided with impermeable base with facility for collection of leachate and surface water run-off into lined drains leading to a leachate treatment and disposal facility;

ii. Necessary precautions shall be taken to minimise nuisance of odour, flies, rodents, bird menace and fire hazard;

iii. In case of breakdown or maintenance of plant, waste intake shall be stopped and arrangements be worked out for diversion of wastes to the landfill site;

iv. Pre-process and post-process rejects shall be removed from the processing facility on regular basis and shall not be allowed to pile at the site. Recyclables shall be routed through appropriate vendors. The non-recyclables shall be sent for well designed landfill site(s).

v. In case of compost plant, the windrow area shall be provided with impermeable base. Such a base shall be made of concrete or compacted clay, 50 cm thick, having permeability coefficient less than 10^{-7} cm/sec. The base shall be provided with 1 to 2 per cent slope and circled by lined drains for collection of leachate or surface run-off;

vi. Ambient air quality monitoring shall be regularly carried out particularly for checking odour nuisance at down-wind direction on the boundary of processing plant.

- In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:-

Parameters	Concentration not to exceed * (mg/kg dry basis , except pH value and C/N ratio)
Arsenic	10.00
Cadmium	5.00
Chromium	50.00
Copper	300.00

Lead	100.00
Mercury	0.15
Nickel	50.00
Zinc	1000.00
C/N ratio	20-40
PH	5.5-8.5

* Compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops.

4. The disposal of treated leachates shall follow the following standards, namely:-

S.No	Parameter	Standards (Mode of Disposal)		
		Inland surface water	Public sewers	Land disposal
1.	Suspended solids, mg/l, max	100	600	200
2.	Dissolved solids (inorganic) mg/l, max.	2100	2100	2100
3	PH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
4	Ammonical nitrogen (as N),	50	50	-

	mg/l, max.			
5	Total Kjeldahl nitrogen (as N), mg/l, max.	100	-	-
6	Biochemical oxygen demand (3 days at 27^0 C) max.(mg/l)	30	350	100
7	Chemical oxygen demand, mg/l, max.	250	-	-
8	Arsenic (as As), mg/l, max	0.2	0.2	0.2
9	Mercury (as Hg), mg/l, max	0.01	0.01	-
10	Lead (as Pb), mg/l, max	0.1	1.0	-
11	Cadmium (as Cd), mg/l, max	2.0	1.0	-
12	Total Chromium (as Cr), mg/l, max.	2.0	2.0	-
13	Copper (as Cu), mg/l, max.	3.0	3.0	-
14	Zinc (as Zn), mg/l, max.	5.0	15	-
15	Nickel (as Ni), mg/l, max	3.0	3.0	-
16	Cyanide (as CN), mg/l, max.	0.2	2.0	0.2
17	Chloride (as Cl), mg/l, max.	1000	1000	600
18	Fluoride (as F), mg/l, max	2.0	1.5	-

19	Phenolic compounds (as C_6H_5OH) mg/l, max.	1.0	5.0	-

Note : While discharging treated leachates into inland surface waters, quantity of leachates being discharged and the quantity of dilution water available in the receiving water body shall be given due consideration.

The incinerators shall meet the following operating and emission standards, namely:-

A. Operating Standards

(1) The combustion efficiency (CE) shall be at least 99.00%.

(2) The combustion efficiency is computed as follows :

$$C.E. = \frac{\%CO_2}{\%CO_2 + \%CO} \times 100$$

1. Emission Standards

Parameters	Concentration mg/Nm^3 at (12% CO_2 correction)
(1) Particulate matter	1
(2) Nitrogen Oxides	4
(3) HCl	5

(4) Minimum stack height shall be 30 metres above ground.

(5) Volatile organic compounds in ash shall not be more than 0.01%.

Note :

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1. Suitably designed pollution control devices shall be installed or retrofitted with the incinerator to achieve the above emission limits, if necessary.
2. astes to be incinerated shall not be chemically treated with any chlorinated disinfectants
3. Chlorinated plastics shall not be incinerated.
4. Toxic metals in incineration ash shall be limited within the regulatory quantities as specified in the Hazardous Wastes (Management and Handling) Rules, 1989 as amended from time to time.

Only low sulphur fuel like l.d.o., l.s.h.s or Diesel shall be used as fuel in the incinerator.

Annexure III

Management of Municipal Solid Wastes (Normal situation)

S.no	Parameters	Compliance criteria
1.	Collection of municipal solid wastes	1. Littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the State Governments. To prohibit littering and facilitate compliance, the following steps shall be taken by the municipal authority, namely :- i. Organising house-to-house collection of municipal solid wastes through any of the methods, like community bin collection (central bin), house-to-house collection, collection on regular pre-informed timings and scheduling by using bell ringing of musical vehicle (without exceeding permissible noise levels); ii. Devising collection of waste from slums and squatter areas or localities including hotels, restaurants, office complexes and commercial areas; iii. Wastes from slaughter houses, meat and fish markets, fruits and vegetable markets, which are biodegradable in nature, shall be managed to make use of such wastes; iv. Bio-medical wastes and industrial wastes shall not be

		mixed with municipal solid wastes and such wastes shall follow the rules separately specified for the purpose; v. Collected waste from residential and other areas shall be transferred to community bin by hand-driven containerised carts or other small vehicles; vi. Horticlutural and construction or demolition wastes or debris shall be separately collected and disposed off following proper norms. Similarly, wastes generated at dairies shall be regulated in accordance with the State laws; vii. Waste (garbage, dry leaves) shall not be burnt; viii. Stray animals shall not be allowed to move around waste storage facilities or at any other place in the city or town and shall be managed in accordance with the State laws. 2. The municipal authority shall notify waste collection schedule and the likely method to be adopted for public benefit in a city or town. 3. It shall be the responsibility of generator of wastes to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system to be notified by the municipal authority as per para 1(2) of this Schedule.
2.	Segregation of municipal solid wastes	In order to encourage the citizens, municipal authority shall organise awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials. The municipal authority shall undertake phased programme to ensure community participation in waste segregation. For this purpose, regular meetings at quarterly intervals shall be arranged by the municipal authorities with representatives of local resident welfare associations and non-governmental organizations.
3.	Storage of	Municipal authorities shall establish and maintain storage

	municipal solid wastes	facilities in such a manner as they do not create unhygienic and insanitary conditions around it. Following criteria shall be taken into account while establishing and maintaining storage facilities, namely :- i. Storage facilities shall be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility shall be so placed that it is accessible to users; ii. Storage facilities to be set up by municipal authorities or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly; iii. Storage facilities or 'bins' shall have 'easy to operate' design for handling, transfer and transportation of waste. Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black; iv. Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for safety of workers.
4.	Transportation of municipal solid wastes	Vehicles used for transportation of wastes shall be covered. Waste should not be visible to public, nor exposed to open environment preventing their scattering. The following criteria shall be met, namely:- i. The storage facilities set up by municipal authorities shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing;

		ii. Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided.
5.	Processing of municipal solid wastes	Municipal authorities shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimize burden on landfill. Following criteria shall be adopted, namely:- (i) The biodegradable wastes shall be processed by composting, vermicomposting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. It shall be ensured that compost or any other end product shall comply with standards as specified in Schedule-IV; ii. Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes in specific cases. Municipal authority or the operator of a facility wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down before applying for grant of authorisation.
6.	Disposal of municipal solid wastes	Land filling shall be restricted to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Land filling of mixed waste shall be avoided unless

		the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation of alternate facilities, land-filling shall be done following proper norms. Landfill sites shall meet the specifications as given in Schedule –III.

Annexure IV

Solid Waste Management

If organic solid waste is not disposed of, major risks are incurred of fly and rat breeding (see Vector Control section) and surface water pollution. Uncollected and accumulating solid waste and the debris left after a natural disaster or conflict may also create a depressing and ugly environment, discouraging efforts to improve other aspects of environmental health. Solid waste often blocks drainage channels and leads to environmental health problems associated with stagnant and polluted surface water.

Solid waste management standard 1: collection and disposal

People have an environment that is acceptably uncontaminated by solid waste, including medical waste, and have the means to dispose of their domestic waste conveniently and effectively.

Key indicators (to be read in conjunction with the guidance notes)

- People from the affected population are involved in the design and implementation of the solid waste programme.
- Household waste is put in containers daily for regular collection, burnt or buried in a specified refuse pit.
- All households have access to a refuse container and/or are no more than 100 metres from a communal refuse pit.
- At least one 100-litre refuse container is available per 10 families, where domestic refuse is not buried on-site.

Compilations from sources of WHO, GOI – Ministry of Environment, SPHERE Project Draft dated 11 August 2008 Steering Committee on Sanitation : Dr.S.Pruthvish, MSRMC, Bangalore

- Refuse is removed from the settlement before it becomes a nuisance or a health risk (see guidance notes 1, 2 and 6).
- Medical wastes are separated and disposed of separately and there is a correctly designed, constructed and operated pit, or incinerator with a deep ash pit, within the boundaries of each health facility (see guidance notes 3 and 6).
- There are no contaminated or dangerous medical wastes (needles, glass, dressings, drugs, etc.) at any time in living areas or public spaces (see guidance note 3).
- There are clearly marked and appropriately fenced refuse pits, bins or specified areas at public places, such as markets and slaughtering areas, with a regular collection system in place (see guidance note 4).
- Final disposal of solid waste is carried out in such a place and in such a way as to avoid creating health and environmental problems for the local and affected populations (see guidance notes 5-6)

Guidance notes

1. Burial of waste: if waste is to be buried on-site in either household or communal pits, it should be covered at least weekly with a thin layer of soil to prevent it attracting vectors such as flies and rodents and becoming their breeding ground. If children's faeces/nappies are being disposed of they should be covered with earth directly afterwards. Disposal sites should be fenced off to prevent accidents and access by children and animals; care should be taken to prevent any leachate contaminating the ground water.

2. Refuse type and quantity: refuse in settlements varies widely in composition and quantity, according to the amount and type of economic activity, the staple foods consumed and local practices of recycling and/or waste disposal. The extent to which solid waste has an impact on people's health should be assessed and appropriate action taken if necessary. Recycling of solid waste within the community should be encouraged, provided it presents no significant health risk. Distribution of commodities that produce a large amount of solid waste from packaging or processing on-site should be avoided.

3. Medical waste: poor management of health-care waste exposes the community, health-care workers and waste handlers to infections, toxic effects and injuries. In a disaster situation the most hazardous types of waste are likely to be infectious sharps and non-sharps (wound dressings, blood-stained cloth and organic matter such as placentas, etc.). The different types of waste should be separated at source. Non-infectious waste (paper, plastic wrappings, food waste, etc.) can be disposed of as solid waste. Contaminated sharps, especially used needles and syringes, should be placed in a safety box directly after use. Safety boxes and other infectious waste can be disposed of on-site by burial, incineration or other safe methods.

4. Market waste: most market waste can be treated in the same way as domestic refuse. Slaughterhouse waste may need special treatment and special facilities to deal with the liquid wastes produced, and to ensure that slaughtering is carried out in hygienic conditions and in compliance with local laws. Slaughter waste can often be disposed of in a large pit with a hole cover next to the abattoir. Blood, etc. can be run from the abattoir into the pit through a slab-covered channel (reducing fly access

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to the pit). Water should be made available for cleaning purposes.

5. Controlled tipping/sanitary landfill: large-scale disposal of waste should be carried out off-site through either controlled tipping or sanitary landfill. This method is dependent upon sufficient space and access to mechanical equipment. Ideally waste that is tipped should be covered with soil at the end of each day to prevent scavenging and vector breeding.

6. Staff welfare: all solid waste management staff who collect, transport or dispose of waste should be provided with protective clothing, at minimum gloves and ideally overalls, boots and protective masks. Water and soap should be available for hand and face washing. Staff who come into contact with medical waste should be informed of the correct methods of storage, transport and disposal and the risks associated with improper management of the waste.

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Minimum Standards for Health Care Waste Management in Disaster Situations

Key parameters to assess before selecting options

A number of local conditions should be assessed before choosing options for the treatment and disposal of health-care wastes including:

1. The quantities of waste produced daily at the PHC level
2. Availability of appropriate sites for waste treatment and disposal (e.g. space on PHC premises and distance to nearest residential areas).
3. Possibility of treatment in central facility or hospital with waste treatment facility within reasonable distance
4. Rainfall and level of groundwater (to take precautions against flooding of burial pits, or provide shelter for incinerators or other facilities)
5. Availability of reliable transportation
6. An overview of options used in the country (see if there is an existing mapping)
7. The availability of a national legislation
8. The availability of a national HCWM plan and policy for health care waste management
9. The availability of environmental regulations including those derived from the ratification of global legally binding Conventions.
10. The availability of equipment and manufacturers in the country or region
11. Social acceptance of treatment and disposal methods and sites
12. Availability of resources (human, financial, material)

The availability of resources requires additional attention.

- Availability of trained personnel, or possibility of training, for the more sophisticated treatment options.
- If incineration is considered, the availability of refractory bricks and concrete, sufficient paper/cardboard or wood/fuel should be considered, in particular for the more sophisticated models requiring pre-heating.
- Disinfection of syringes before transportation may require bleach (e.g., sodium hypochlorite solution) or other disinfectants.

The continuous availability of the required resources is a prerequisite for a waste treatment system to be sustainable and remain operational.

Scenarios considered

Six decision trees cover the seven scenarios considered in this guide. They are intended to assist in the selection of HCW treatment and disposal options:

- Urban area with access to a legally approved modern waste treatment facility or located within reasonable distance to a larger health-care facility with treatment facility
- Urban area without access to legally approved modern waste treatment facility
- Peri-urban area

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- Rural area with access to a legally approved waste treatment facility or located within reasonable distance to a larger health-care facility with treatment facility
- Rural area without access to a legally approved modern waste treatment or disposal facility
- Mass immunization activities at PHC
- Outreach immunization activities

Definitions

An **urban area** is a densely populated geographical area with a substantial infrastructure of public services, having generally little space on/or around the premises.

A **peri-urban area** typically is a community composed of a large percentage of informal housing, which has been established on the periphery of an urban area.

A **rural area** is a small community or geographical area, having a population generally of less than 5,000, a low population density, and located in the countryside. The decision-trees include the following basic elements of solid waste management as they apply to the management of waste generated at PHCs. These elements cover the "waste stream" from its generation to its final disposal.

1. □ waste minimization
2. □ segregation
3. □ codification
4. □ handling
5. □ Transportation
6. □ treatment
7. □ disposal

Waste minimization

Waste minimization is defined as the prevention of waste production and/or its reduction. It involves specific strategies, changes in management and behavioural change. Methods of waste reduction include modification of purchasing procedures, control of inventory, and production of less toxic materials when discarded as wastes. No actions should however be taken that would impact on the quality and limit the access to health care.

Segregation

Segregation is in some ways a minimization of wastes. In fact, it reduces the quantity of wastes which are hazardous and therefore require special attention and treatment. Segregation is the separation of wastes into the following categories: sharps, infectious non-sharps and non-hazardous waste (similar to household waste). Segregation of PHC waste occurs on site at the time the waste is generated, for example, when an injection is given and the needle and syringe are placed in a waste container, or when packaging is removed from supplies and equipment.

Non-hazardous waste (e.g., paper) can be recycled. Non-infectious biodegradable organic wastes (e.g., food waste) can be composted and then used on-site or by the

community. For additional information related to waste, reduction and storage see Annex B.

Infectious waste must never be mixed with non-infectious waste to keep the volume of infectious waste as low as possible.

Codification

Codification is a colour-coded system which define the containers in which waste must be stored once segregated – for example: yellow or red for infectious waste and black for non-infectious waste.

Handling

Handling concerns the collection, weighing and storing conditions. In general, the maximum time of storing should not exceed 24 hours.

Treatment

Treatment modifies the characteristics of the waste. Treatment of wastes mainly aims at reducing direct exposure less dangerous to humans, at recovering recyclable materials, and at protecting the environment. For wastes from PHC, the main aim is to disinfect infectious waste, to destroy disposable medical devices, in particular used syringe needles, which should not be reused, or at least to render them inaccessible or sterile prior to plastic reprocessing. For additional information related to treatment see Annex C.

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Disposal

Disposal refers to the final placement of treated waste, using a sanitary landfill or any other environmentally acceptable method of final storage appropriate to the local conditions. For additional information related to land disposal see Annex E.

The practices of managing wastes from PHC centres described in this guide are mainly based on the following two criteria:

1. the minimisation of the occupational and public health risks associated with the management of PHC waste, and
2. the minimisation of volume and mass of infectious sharps and non-sharps.

The decision-trees describe the flow of PHC solid waste from the point of generation until final disposal of the waste. Decision points are represented in the diagrams by hexagons, and actions or operations (e.g. segregation, transportation) are represented by boxes. The flow of waste from one operation or decision point to the next is represented by arrows.

General Decision-Making Process

The steps below when should be followed when using the decision-trees:

1. Determine the scenario which best reflects the situation of the PHC centre you want to analyse.
2. Commence the decision process at the top of the decision-tree diagram. Follow the initial flow arrow shown in diagram. When branching of the flow occurs, select the appropriate route based on the conditions that apply.
3. If needed, refer to the more detailed information in the Annexes concerning the specific types of waste management alternatives, or to one of the other sources mentioned in the list of references (Annex A).

Urban area with access to legally approved modern waste treatment facility

Scenario 1 describes the waste management decision-tree for a PHC centre in an urban area that has access to a legally approved modern waste treatment facility. Having access means that this treatment facility lays within reasonable distance from the PHC centre, and that it accepts treating its waste. The treatment facility may require the PHC facility to pay for the treatment of the waste, and that the packaging of the waste complies with certain conditions, generally aimed at protecting worker's safety and preventing waste spillage. Waste management service providers are generally accredited by a national regulatory body to ensure compliance with national standards. In growing urban areas the trend is to set up a central treatment plants that collect, segregate and process waste including medical waste. High capacity incinerators with pollution control device and/or more environmentally friendly alternative methods such as steam treatment and shredding are available in certain places. Other opportunities, such as incineration in kilns used for industrial purposes may also be explored. Finally, Scenario 1 should also be used when there is an opportunity to treat the waste in a nearby hospital which has a waste treatment facility.

Urban area without access to legally approved modern waste treatment facility

Scenario 2 describes the waste management decision tree for a PHC centre in an urban environment that does not have access to a modern treatment facility. This may well be the most difficult situation for a PHC centre wishing to safely dispose of its

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waste. Most of the possible options are not entirely satisfactory in terms of safety and better solutions need to be worked out. Although one PHC centre alone has relatively limited possibilities to address HCW management issues outside their premises, action can be taken at central level to improve their situation.

Peri-urban area

Scenario 3 shows the decision tree for a PHC centre in a peri-urban area. In such an environment, the PHC centre may or may not have the opportunities of both urban and rural areas.

PHCs in rural area

PHCs located in rural area often receive substantive quantities of sharp waste from out-reach activities and health posts. These wastes may be carried in safety boxes (complete needle syringe) or contained in a sharp container (needle and the hub) when mutilated at the source. In that case the potentially infected plastic syringes can be carried in a bag but need further treatment before disposal.

Safety boxes can be transported to a defined and legally approved modern facility for treatment. Needles and safety containers can be disposed in a safe sharp pit. A study conducted in Eritrea - Eritrea needle removal devices pilot trials, the Ministry of Health of Eritrea (MOH) and the World Health Organization Africa Regional Office (WHO AFRO), September 2003, shows that a pit of one cubic meter can contain approximately 1 million needles. Plastic syringes can be disinfected in contact with a 0.5% hypochlorite solution, boiled or autoclaved if available and then shredded prior to recycling or land disposal.

Rural area with access to legally approved modern waste treatment within reasonable distance

This scenario is similar to the decision tree 1 or 3 and is for a rural PHC centre that is located within reasonable transportation distance to a district hospital that operates a legally approved modern waste treatment facility. Such scenarios are likely to be rare.

However, the judgement "within reasonable distance" also depends on the arrangements in place that could be explored for transporting the waste. For example, if supplies such as immunization goods are transported to the PHC centre from a district hospital, it could also be envisaged to transport the waste back to that district hospital for treatment. Often, countries do have legislation concerning transportation of HCW, this need to be considered. Note that the use the same vehicle to transport supplies and waste should only happen after any risk for cross contamination is completely discarded.

Remote area without access to legally approved modern waste treatment or disposal facility

Scenario 4 illustrates the decision tree for a rural PHC centre that does not have access to legally approved modern waste treatment and disposal facilities. Consequently, the PHC centre must operate its own waste treatment system using multiple technical options for sharps, infectious and non-infectious wastes. Information on options applicable to rural PHC centres is included in Annexes C and E.

Immunization activities at PHC centre

Scenario 5 is the decision tree for a PHC involved in immunization activities.

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Supplies can be safely collected on site and treated on site if the facility exists or transported to an existing or organised central facility for treatment.

Outreach immunization activities

Scenario 6 is the decision tree for outreach immunization activities. The waste produced should be collected in safety containers then brought back to a centralized facility for treatment.

2. Provisions of BMW Rules 1998 under EPA :

Category No. I	**Human Anatomical Waste** (human tissues, organs, body parts)	incinera
Category No. 2	**Animal Waste** (animal tissues, organs, body parts carcasses, bleeding parts, fluid, incineration@/deep burial* blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge from hospitals, animal houses)	
Category No 3	**Microbiology & Biotechnology Waste** (wastes from laboratory cultures, stocks or specimens of micro- organisms live or attenuated vaccines, human and animal cell waving/incineration@ culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)	local au
Category No 4	**Waste sharps** (needles, syringes, scalpels, blades, glass, etc. that may cause disinfection (chemical treat- puncture and cuts. This includes both used and unused sharps)	ment@(
Category No 5	**Discarded Medicines and Cytotoxic drugs** (wastes comprising of outdated, contaminated and discarded inc ineratio n@/destruct ion and medicines)	
Category No 6	**Solid Waste**	

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	(Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, beddings, other material contaminated with blood)	incineration@ autoclav
Category No. 7	**Solid Waste** (wastes generated from disposable items other than the waste such as tubings, catheters, intravenous sets etc).	shaprs disinfection by chemical treatment@@ autoclaving/
Category No. 8	**Liquid Waste** (waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities)	disinfec treatme
Category No. 9	**Incineration Ash** (ash from incineration of any bio-medical waste)	disposal in municipal landfill
Category No. 10	**Chemical Waste** (chemicals used in production of biologicals, chemicals used in disinfection, as insecticides, etc.)	chemic dischar

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@@ Chemicals treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.
Multilation/shredding must be such so as to prevent unauthorised reuse.
@ There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.

- Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.

Annexure I

SCHEDULE II

(see Rule 6)

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COLOUR CODING AND TYPE OF CONTAINER FOR DISPOSAL OF BIO-MEDICAL WASTES

Colour Conding	**Type of Container** -I Waste Category	**Treatment options as per Schedule I**
Yellow	Plastic bag Cat. 1, Cat. 2, and Cat. 3, Cat. 6.	Incineration/deep burial
Red	Disinfected container/plastic bag Cat. 3, Cat. 6, Cat.7.	Autoclaving/Microwaving/ Chemical Treatment
Blue/White translucent	Plastic bag/puncture proof Cat. 4, Cat. 7. Container	Autoclaving/Microwaving/ Chemical Treatment and destruction/shredding
Black	Plastic bag Cat. 5 and Cat. 9 and Cat. 10. (solid)	Disposal in secured landfill

Notes:

1. Colour coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule I.
2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
3. Categories 8 and 10 (liquid) do not require containers/bags.
4. Category 3 if disinfected locally need not be put in containers/bags.

Annexure II

SCHEDULE III

(see Rule 6)

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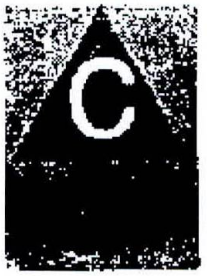
LABEL FOR BIO-MEDICAL WASTE CONTAINERS/BAGS

BIOHAZARD SYMBOL

CYTOTOXIC HAZARD SYMBOL





BIOHAZARD

CYTOTOXIC

HANDLE WITH CARE

Note : Lable shall be non-washable and prominently visible.

Annexure III

SCHEDULE IV

(see Rule 6)

LABEL FOR TRANSPORT OF BIO-MEDICAL WASTE CONTAINERS/BAGS

Day ..... Month .....
Year .....
Date of generation .....

Waste category No .....
Waste class
Waste description

Sender's Name & Address
Address
Phone No .....
Telex No ....
Fax No .....
Contact Person .....
In case of emergency please contact
Name & Address :

Phone No.

Receiver's Name &

Phone No .....
Telex No .....
Fax No .....
Contact Person .....

Note :
Label shall be non-washable and prominently visible.

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Annexure IV

SCHEDULE V

(see Rule 5 and Schedule 1)

STANDARDS FOR TREATMENT AND DISPOSAL OF BIO-MEDICAL WASTES

STANDARDS FOR INCINERATORS:

All incinerators shall meet the following operating and emission standards

A. Operating Standards

1. Combustion efficiency (CE) shall be at least 99.00%.
2. The Combustion efficiency is computed as follows:

$$C.E. = \frac{\%CO_2}{\%CO_2 + \%\ CO} \times 100$$

3. The temperature of the primary chamber shall be 800 ± 50 deg. C°.
4. The secondary chamber gas residence time shall be at least I (one) second at 1050 ± 50 C°, with minimum 3% Oxygen in the stack gas.

B. Emission Standards

Parameters	Concentration mg/Nm^3 at (12% CO_2 correction)
(1) Particulate matter	150
(2) Nitrogen Oxides	450
(3) HCI	50

(4) Minimum stack height shall be 30 metres above ground

(5) Volatile organic compounds in ash shall not be more than 0.01%

Note :

- Suitably designed pollution control devices should be installed/retrofitted with the incinerator to achieve the above emission limits, if necessary.
- Wastes to be incinerated shall not be chemically treated with any chlorinated disinfectants.
- Chlorinated plastics shall not be incinerated.
- Toxic metals in incineration ash shall be limited within the regulatory quantities as defined under the Hazardous Waste (Management and Handling Rules,) 1989.
- Only low sulphur fuel like L.D.0dLS.H.S.1Diesel shall be used as fuel in the incinerator.

STANDARDS FOR WASTE AUTOCLAVING:

The autoclave should be dedicated for the purposes of disinfecting and treating bio-medical waste,

(I) When operating a gravity flow autoclave, medical waste shall be subjected to :

(i) a temperature of not less than 121 C' and pressure of 15 pounds per square inch (psi) for an autoclave residence time of not less than 60 minutes; or

(ii) a temperature of not less than 135 C° and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes; or

(iii) a temperature of not less than 149 C° and a pressure of 52 psi for an autoclave residence time of not less than 30 minutes.

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(II) When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following:

(i) a temperature of not less than 121 C° and pressure of 15 psi per an autoclave residence time of not less than 45 minutes; or

(ii) a temperature of not less than 135 C° and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes;

(III) Medical waste shall not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reasons, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved.

(IV) **Recording of operational parameters**

Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.

(V) **Validation test**

Spore testing :

The autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be Bacillus stearothermophilus spores using vials or spore Strips; with at least $1X10^4$ spores per millilitre. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, regardless of temperature and pressure, a temperature less than 121 C° or a pressure less than 15 psi.

(VI) Routine Test

A chemical indicator strip/tape the changes colour when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may be necessary to use more than one strip over the waste package at different location to ensure that the inner content of the package has been adequately autoclaved

STANDARDS FOR LIQUID WASTE:

The effluent generated from the hospital should conform to the following limits

PARAMETERS	**PERMISSIBLE LIMITS**
PH	63-9.0
Susponded solids	100 mg/l
Oil and grease	10 mg/l
BOD	30 mg/l
COD	250 mg/l
Bio-assay test	90% survival of fish after 96 hours in 100% effluent.

these limits are applicable to those, hospitals which are either connected with sewers without terminal sewage treatment plant or not connected to public sewers. For discharge into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 shall be applicable.

STANDARDS OF MICROWAVING

(37)

1 Microwave treatment shall not be used for cytotoxic, hazardous or radioactive wastes, contaminated animal car casses, body parts and large metal items.

2. The microwave system shall comply with the efficacy test/routine tests and a performance guarantee may be provided by the supplier before operation of the limit.

3. The microwave should completely and consistently kill the bacteria and other pathogenic organisms that is ensured by approved biological indicator at the maximum design capacity of each microwave unit. Biological indicators for microwave shall be Bacillus Subtilis spores using vials or spore strips with at least 1 x 101 spores per milliliter.

STANDARDS FOR DEEP BURIAL

1. A pit or trench should he dug about 2 meters deep. It should be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.

2. It must be ensured that animals do not have any access to burial sites. Covers of galvanised iron/wire meshes may be used.

3. On each occasion, when wastes are added to the pit, a layer of 10 em of soil shall be added to cover the wastes.

4. Burial must be performed under close and dedicated supervision.

5. The deep burial site should be relatively impermeable and no shallow well should be close to the site.

6. The pits should be distant from habitation, and sited so as to ensure that no contamination occurs of any surface water or ground water. The area should not be prone to flooding or erosion.

7. The location of the deep burial site will be authorised by the prescribed authority.

8. The institution shall maintain a record of all pits for deep burial.

Safe Management of Health Care Waste
The checklist for Health Care Settings and Systems in defined geographic area

Guidelines for filling up the checklist:

1. **It is desirable that the person spends three hours within each of the Health Care Setting. Then, record the activities according to the proforma.**
2. **Open mind, Frankness and informal atmosphere need to be set in before the Endeavour is undertaken**
3. **It is mandatory to provide a feed back to the institution regarding their Health Care Waste Management practices.**
4. **Use separate sheet of paper for comments by the investigator**

Name of the Health Care Setting:
Address:

Telephone / Fax/ Email:
Name of the respondent with designation:

Services provided (encircle): Only OPD / OPD + IP / Others (specify)
Facility (encircle on or many): General / Speciality / Super-speciality

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Staff Position (number):

Duty Doctors	**Consultants Doctors**	Nursing Staff	Ward Boys / Ayahs
X Ray technicians	Lab Technicians	Others	Others
Total Number of Staff			

Number of Beds: _____ Average Bed Occupancy:_____
Average in Patient admission/ Day: _____ Average out Patients /Day_____
Average Deliveries/ Month:_____ Average Surgeries/ Month _____
Number of Dental Chairs:
Outpatient strength in Last One year:
Inpatient Strength in the Last One year:

Tick if the following is present:

- O Infection Control Committee
- O Disinfection Policy
- O Waste Management Policy
- O Waste Sharps Management Policy
- O Waste Management Committee
- O HIV Infection Control Policy
- O Occupational Safety Policy

Encircle the Facilities available for Waste Management:

Segregation & Containment	Deep Burial	Incineration	Microwaving	Autoclave	Others (specify)	Others (specify)

REMARKS

1. Authorisation / Renewal obtained: Yes / No
2. System of recording illness / injuries / accidents: Yes / No
3. System of recording and reporting illness / injuries / accidents: Yes / No
4. Periodic monitoring of the waste management facility undertaken: Yes / No
5. Training provided to the staff: Yes / No; Retraining provided to the staff: Yes / No

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Record if the following is happening regarding handling of Health Care Waste.

Waste Materials	***Segregation***	***Disinfection***	***Disfigurement***	***Containment***	***Transportation***	***Colour coding***	***Final Disposal***
Surgery remains							
Waste sharps							
Incinerable Waste							
Placenta							
Plastics							
Paper							
Food Waste							
Laboratory Waste							
Others (specify)							
Others (specify)							

NOTE: NA = Not Applicable; C = Complete; IC = Incomplete; S = Satisfactory; NS = Not Satisfactory; A = Appropriate; IA = Inappropriate

OCCUPATIONAL SAFETY OF THE HEALTH CARE PERSONNEL:
Indicate Yes if being provided ***and used****,* NO if otherwise

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	Uniform	*Apron*	*Boots*	*Mask*	*Goggles*	*Gloves*	*Vaccination given*
Duty Doctors							
Nurses							
Technicians							
Laboratory							
Radiology							
Others							
Waste Handlers							
Ward boy							
Ayah							
Helper							
Others							

WASTE CONTAINERS (sample in a representative fashion)

	1	2	3	4	5
Location of Container					
Waste contained					
Size (in Lts)					
Shape					
Lid Present	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Material of the container					
Collection Frequency/ day					

Please indicate the quantum of the following types waste being generated (*per patient per bed or total for the whole hospital*):

a) Infectious waste

b) Plastics waste

c) Waste sharps

d) General waste

e) Other types of hazardous waste

Please comment in brief regarding the systems of waste management in your city / district or a defined geographic area. The following headings are indicative only:

a) Policy for waste management

b) Common (commercial or cooperative) treatment facility / facilities

c) Transportation of waste outside the health care institutions

d) Recycling sector (comment on both the formal and informal systems, both itinerant buyers and rag-pickers)

e) Experience with use of Non burn technologies especially systems for composting (either aerobic or anaerobic) of waste

f) Costs for management of waste (both in house and for common facilities)

g) Training and such capacity building efforts that have already been undertaken

h) Community participation and NGO involvement in issues related to waste management

i) Occupational health and safety systems

j) Evaluation and monitoring systems for waste management

Please share the difficulties faced when you have been attempting for better waste management systems

What would you consider as the Strengths and Opportunities available for instituting waste management systems

List the currently implementable legislations

Any other issues you would like to share

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Strengths Noticed

Weaknesses Noticed

Opportunities foreseen

Threats Anticipated

Facilitators Discuss the Strengths, Weaknesses, Opportunities and Threats identified by the members in the group are put together and discussed.

HEALTH CARE WASTE MANAGEMENT CELL
DEPARTMENT OF COMMUNITY MEDICINE

MS RAMAIAH MEDICAL COLLEGE

Options for Safe Management of Specific Health Care Waste

for a small health care setting (rural)

Sl.No.	*Items*	*Point of Generation*	*Final disposal*

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1.	***Contaminated plastic waste*** • Plastic syringes • IV tube • Urosac bag • Vacutainers • Blood bag • Endotracheal tube • Ryle's tube	• Segregation, • Decontaminate with hypochlorite soln., (For blood bag, inject hypo chlorite inside) • Disfigure.	Secured landfill, if available OR Shredding and recycling
2.	Culture plate from microbiology lab	Autoclave, wash, reuse/ Disposable culture plates- Autoclave and treat it as plastic waste	-
3.	Plastic carry bag	Treat it as general waste	Secured landfill, if available OR Shredding and recycling
4.	***Waste Sharps*** • Hypodermic needles • Scalpel blade • Metal tops of vials • Broken ampoules • Vials • Glass syringe - broken	• Segregation • Decontamination/ Disinfection • Collection in puncture proof containers	Encapsulation/ Secured landfill/ concrete pit collection
5.	Slide after smear is examined	Disinfect, wash & Reuse	-
6.	Glass syringe - intact	Autoclave, reuse	-
7.	Intact glass bottles	Autoclave, reuse	-
8.	***Pharmaceutical wastes*** • Unused vials • Unused ampoules • Unused tablets • Unused Syrup	Segregation	Drugs to be incinerated/ Secured landfill; and the container treated as intact glassware or if broken as waste sharps
9.	**Unused pressurized containers**	Release the pressure & Mechanical compression	

10.	***Anatomical waste*** • Placenta • Amputated limb • Excised organs	Segregation, Collection and stored in corrosion proof washable containers	Deep burial/ transport to CTF if available/ Incineration
11.	***Cytotoxic waste*** • Methotrexate tablets • Drugs used for treatment of leukaemia	Segregation	Incineration
12.	***Radiological waste*** • Radioactive iodine • Itrium 90 • Dosimeter	-	Contained and stored its half-life is completed.
13.	***Liquid waste*** • Remains of urine specimen • Blood/ csf/ pleural fluid/ ascitic fluid in the lab • Remains of stool specimen in the lab	Disinfect with equal amount of hypo chlorite solution, contact period of 2 hours	Treated as any other liquid waste. (OUR PROTOCOLS CAN BE SHARED)
14.	**Rubber Catheter**	Autoclave & reuse	Deep burial

HEALTH CARE WASTE MANAGEMENT CELL
DEPARTMENT OF COMMUNITY MEDICINE

MS RAMAIAH MEDICAL COLLEGE

Options for Safe Management of Specific Health Care Waste for a big hospital

Sl.No.	*Items*	*Point of Generation*	*Final disposal*
1.	***Contaminated plastic waste*** • Plastic syringes • IV tube • Urosac bag • Vacutainers • Blood bag • Endotracheal tube • Ryle's tube	• Segregation, • Decontaminate with hypochlorite soln., (For blood bag, inject hypo chlorite inside) • Disfigure • Shredders	Secured landfill, Non chlorinated plastics can be incinerated
2.	Culture plate from microbiology lab	Autoclave, wash, reuse	If broken, treat as sharp
3.	Plastic carry bag	Treat it as general waste	Recycle
4.	***Sharp wastes*** • Hypodermic needles • Scalpel blade • Metal tops of vials • Broken ampoules • Vials • Glass syringe - broken	• Segregation • Decontamination/ Disinfection • Collection in puncture proof containers	Encapsulation/ Secured landfill/ concrete pit collection
5.	Slide after smear is examined	Disinfect, wash &	If broken, treat

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		Reuse	as sharp
6.	Glass syringe - intact	Autoclave, reuse	-
7.	Intact glass bottles	Autoclave, reuse	-
8.	***Pharmaceutical wastes*** • Unused vials • Unused ampoules • Unused tablets • Unused Syrup	Drugs to be incinerated/ Secured landfill; and the container treated as intact glassware or if broken as waste sharps	To draft a policy for the supplier to take back the waste and treat appropriately
9.	Unused pressurised containers	Release the pressure	Depressurizing by mechanized compressor in a closed and contained room.
10.	***Anatomical waste*** • Placenta • Amputated limb • Excised organs	Segregation, Collection and stored in corrosion proof washable containers	Deep burial/ Incineration/ CTF
11.	***Cytotoxic waste*** • Methotrexate tablets • Drugs used for treatment of leukaemia	Segregation	Incineration/ To draft a policy for the supplier to take back the waste and treat appropriately
12.	***Radiological waste*** • Radioactive iodine • Itrium 90 • Dosimeter	-	Contained and stored its half-life is completed.
13.	***Liquid waste*** • Remains of urine specimen • Blood/ CSF/ Pleural fluid/ Ascitic fluid in the lab • Remains of stool specimen in the lab	Disinfect with equal amount of hypo chlorite solution, contact period of 2 hours (OUR PROTOCOLS CAN BE SHARED)	Final disposal into the general sewage carriage system
14.	Rubber Catheter	Autoclave & reuse	Deep burial

Compilations on minimum standards for health care waste management in disaster situations NDMA Steering committee , draft dated 3 June 2008 Dr.S.Pruthvish

The final disposal options to be taken into consideration and based on this, to evolve the systems at the point of generation

Useful material on Excreta Disposal in disaster situations dated 11 August 2008

Sanitation : Context : Human excreta Disposal

Introduction :

Where normal sanitation structures have been damaged or destroyed it is essential to provide toilet facilities immediately. Emergency facilities are usually provisional and need to be progressively improved or replaced as the situation develops.

Designated defecation fields or areas can be used where enough space is available. These work best in hot, dry climates and should be clearly marked, fenced (if possible), and protected against flooding. They should be located downwind and away from living areas, avoid water courses, and at a reasonable distance (minimum 50m) from water points. Shovels should be provided to families so that they can dig small holes to defecate into and cover their faeces with dirt. Collective trench latrines may also be an option. In longer term situations or after the initial emergency period has subsided, it may be more practical to build simple pit latrines, VIP latrines, or poor-flush latrines. In situations where the soil is rocky or the ground water is very close to the surface elevated platforms may be constructed.

As a general rule, individual family latrines are preferred, are more socially acceptable and can be maintained by the family. If necessary, centralized toilet facilities can be built at the edge of a living quarter or camp section where each family has access to their own latrine. The area allowed for latrines should be big enough to dig new pits when the first ones are full. Latrines of all types need to be properly cleaned and maintained. Responsibilities for cleaning and maintaining latrines should be clearly spelled out. For collective latrines it may be necessary to hire someone to take care of them.

In all cases, good hygiene practices are very important for preventing disease transmission. Clean water should be provided in sufficient quantities to enable proper hygiene. Hands should be washed immediately after defecation, after handling babies' faeces, before preparing food and before eating

Excreta Disposal

Safe disposal of human excreta creates the first barrier to excreta-related disease, helping to reduce transmission through direct and indirect routes. Safe excreta disposal is therefore a major priority, and in most disaster situations should be addressed with as much speed and effort as the provision of safe water supply. The provision of appropriate facilities for defecation is one of a number of emergency responses essential for people's dignity, safety, health and well-being.

Excreta disposal standard 1: access to, and numbers of, toilets

People have adequate numbers of toilets, sufficiently close to their dwellings, to allow them rapid, safe and acceptable access at all times of the day and night.

Key indicators (to be read in conjunction with the guidance notes)

- A maximum of 20 people use each toilet (see guidance notes 1-4).
- Use of toilets is arranged by household(s) and/or segregated by sex (see guidance notes 3-5).
- Separate toilets for women and men are available in public places (markets, distribution centres, health centres, etc.) (see guidance note 3).
- Shared or public toilets are cleaned and maintained in such a way that they are used by all intended users (see guidance notes 3-5).
- Toilets are no more than 50 metres from dwellings (see guidance note 5).
- Toilets are used in the most hygienic way and children's faeces are disposed of immediately and hygienically (see guidance note 6).

1. Safe excreta disposal: the aim of a safe excreta disposal programme is to ensure that the environment is free from contamination by human faeces. The more all groups from the disaster-affected population are involved, the more likely the programme is to succeed. In situations where the population has not traditionally used toilets, it may be necessary to conduct a concerted education/promotion campaign to encourage their use and to create a demand for more toilets to be constructed. Disasters in urban areas where the sewerage system is damaged may require solutions such as isolating parts of the system that still work (and re-routing pipes), installing portable toilets and using septic tanks and containment tanks that can be regularly desludged.

2. Defecation areas: in the initial phase of a disaster, before any toilets can be constructed, it may be necessary to mark off an area to be used as a defecation field or for trench latrines. This will only work if the site is correctly managed and maintained.

3. Public toilets: in some initial disaster situations and in public places where it is necessary to construct toilets for general use, it is very important to establish systems for the proper regular cleaning and maintenance of these facilities. Disaggregated population data should be used to plan the ratio of women's cubicles to men's (of approximately 3:1). Where possible, urinals should be provided for men.

4. Communal toilets: for a displaced population where there are no existing toilets, it is not always possible to provide one toilet per 20 people immediately. In such cases, a figure of 50 people per toilet can be used, decreasing to 20 as soon as possible, and changing the sharing arrangements accordingly. Any communal toilet must have a system in place, developed with the community, to ensure that it is maintained and kept clean. In some circumstances, space limitations make it impossible to meet this figure. In this case, while advocating strongly for extra space to be made available, it should be remembered that the primary aim is to provide and maintain an environment free from human faeces.

5. Shared facilities: where one toilet is shared by four or five families it is generally better kept, cleaner and therefore regularly used when the families have been consulted about its siting and design and have the responsibility and the means to clean and maintain it. It is important to organise access to shared facilities by

working with the intended users to decide who will have access to the toilet and how it will be cleaned and maintained. Efforts should be made to provide people living with HIV/AIDS with easy access to a toilet as they frequently suffer from chronic diarrhoea and reduced mobility.

6. Children's faeces: particular attention should be given to the disposal of children's faeces, which are commonly more dangerous than those of adults, as the level of excreta-related infection among children is frequently higher and children lack antibodies. Parents or care givers need to be involved, and facilities should be designed with children in mind. It may be necessary to provide parents or care givers with information about safe disposal of infant faeces and nappy (diaper) laundering practices.

Excreta disposal standard 2: design, construction and use of toilets

Toilets are sited, designed, constructed and maintained in such a way as to be comfortable, hygienic and safe to use.

Key indicators (to be read in conjunction with the guidance notes)

- Users (especially women) have been consulted and approve of the siting and design of the toilet (see guidance notes 1-3).
- Toilets are designed, built and located to have the following features:

  - they are designed in such a way that they can be used by all sections of the population, including children, older people, pregnant women and physically and mentally disabled people (see guidance note 1);

  - they are sited in such a way as to minimise threats to users, especially women and girls, throughout the day and night (see guidance note 2);

  - they are sufficiently easy to keep clean to invite use and do not present a health hazard;

  - they provide a degree of privacy in line with the norms of the users;

  - they allow for the disposal of women's sanitary protection, or provide women with the necessary privacy for washing and drying sanitary protection cloths (see guidance note 4);

  - they minimise fly and mosquito breeding (see guidance note 7).

- All toilets constructed that use water for flushing and/or a hygienic seal have an adequate and regular supply of water (see guidance notes 1 and 3).
- Pit latrines and soakaways (for most soils) are at least 30 metres from any groundwater source and the bottom of any latrine is at least 1.5 metres above the water table. Drainage or spillage from defecation systems must not run towards any surface water source or shallow groundwater source (see guidance note 5).
- People wash their hands after defecation and before eating and food preparation (see guidance note 6).
- People are provided with tools and materials for constructing, maintaining and cleaning their own toilets if appropriate (see guidance note 7).

Guidance notes

1. Acceptable facilities: successful excreta disposal programmes are based on an understanding of people's varied needs as well as on the participation of the users. It may not be possible to make all toilets acceptable to all groups and special toilets may need to be constructed for children, older people and disabled people e.g. potties, or toilets with lower seats or hand rails. The type of toilet constructed should depend on the preferences and cultural habits of the intended users, the existing infrastructure, the ready availability of water (for flushing and water seals), ground conditions and the availability of construction materials.

2. Safe facilities: inappropriate siting of toilets may make women and girls more vulnerable to attack, especially during the night, and ways must be found to ensure that women feel, and are, safe using the toilets provided. Where possible, communal toilets should be provided with lighting or families provided with torches. The input of the community should be sought with regard to ways of enhancing the safety of users.

3. Anal cleansing: water should be provided for people who use it. For other people it may be necessary to provide toilet paper or other material for anal cleansing. Users should be consulted on the most culturally appropriate cleansing materials and on their safe disposal.

4. Menstruation: women and girls who menstruate should have access to suitable materials for the absorption and disposal of menstrual blood. Women should be consulted on what is culturally appropriate (see Non-food items standard 2).

5. Distance of defecation systems from water sources: the distances given above may be increased for fissured rocks and limestone, or decreased for fine soils. In disasters, groundwater pollution may not be an immediate concern if the groundwater is not consumed. In flooded or high water table environments, it may be necessary to build elevated toilets or septic tanks to contain excreta and prevent it contaminating the environment.

6. Hand washing: the importance of hand washing after defecation and before eating and preparing food, to prevent the spread of disease, cannot be over-estimated. Users should have the means to wash their hands after defecation with soap or an alternative (such as ash), and should be encouraged to do so. There should be a constant source of water near the toilet for this purpose.

7. Hygienic toilets: if toilets are not kept clean they may become a focus for disease transmission and people will prefer not to use them. They are more likely to be kept clean if users have a sense of ownership. This is encouraged by promotional activities, having toilets close to where people sleep and involving users in decisions about their design and construction, rules on proper operation, maintenance, monitoring and use. Flies and mosquitoes are discouraged by keeping the toilet clean, having a water seal, Ventilated Improved Pit (VIP) latrine design or simply by the correct use of a lid on a squat hole.

Planning Guidelines for Minimum Numbers of Toilets at Public Places and Institutions in Disaster Situations

Institution	Short term	Long term
Market areas	1 toilet to 50 stalls	1 toilet to 20 stalls
Hospitals/medical centres	1 toilet to 20 beds or 50 out-patients	1 toilet to 10 beds or 20 out-patients
Feeding centres	1 toilet to 50 adults 1 toilet to 20 children	1 toilet to 20 adults 1 toilet to 10 children
Reception/transit centres	1 toilet per 50 people 3:1 female to male	
Schools	1 toilet to 30 girls 1 toilet to 60 boys	1 toilet to 30 girls 1 toilet to 60 boys
Offices		1 toilet to 20 staff

Source: *adapted from Harvey, Baghri and Reed (2002)*

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Compilations on personal hygiene for arriving at minimum standards in disaster situations dated 11 August 2008

Hygiene

How can personal hygiene be maintained in difficult circumstances?

Despite water shortage and restricted sanitation facilities in emergency situations, it's critical to ensure that some of the available water supply is used for personal hygiene to minimize health risks. Messages about the importance of handwashing with soap at critical times-i.e. after defecation, after handling babies faeces, and before preparing food-are particularly important. As soap may be in short supply during emergencies, the use of ash, sand, or other culturally acceptable substitutes should be promoted.

Rapid assessment of situation at provincial, district , block and PHC level
Sleeping area, cooking area, dining area, storage area , toilets
Appointing a team of food handlers
Assessment of personal hygiene
Educate them on food and water
Provide them facilities required for food safety (cooking utensils, food covers)
Ensuring adequate supply of water for drinking, washing
Ensure proper storage of cooked food

Ensure adequacy of toilets:
Trench latrines away from cooking area
Potty for small children

Ensure proper disposal of stools :
Infants : clean with tissues
Babies : empty the potty to the latrine pit
Adults : follow the instructions given for trench latrines

Ensure cleanliness of toilets:
Prepare cleaning solution (TCL and soap) to clean toilets
Arrange for continuous supply of water and soap for washing
Distribute slippers to children
Keep a separate pairs of slippers to adults near the toilet
Train one group leader to ensure clenliness of toilets (Preparation of cleaning solution, availability/supply of soap and water, health education, supervision)

Sanitation, nutrition, personal hygiene, life skills

Use a public address system to educate :

An idea about organization structure of the camp
Personal Hygiene (hand washing, bathing, brushing teeth, washing clothes, combing hair, clipping nails, wearing footwear)
Environmental sanitation : Not to spit everywhere, proper use of latrines, about the use of different water sources, proper disposal of garbage, wet mop floors and surfaces with cleaning solution, sweeping sleeping areas

Compilations on personal hygiene for arriving at minimum standards in disaster situations dated 11 August 2008

Prevention and early detection of diarrhoeas, ARI, eye infection, skin infection, treatment of diarrhea, head lice infestation (permethrine, phenothrine or lysine)
Nutrition : (Continuation of breast feeding, infant feeding low cost nutritious food for children)

Building up coping strategies, life skills,
Keep occupied : recreation activities, play groups, school
Encourage resettlement, income generation activities

Train tem leaders about special groups (Infant care, care of pregnant mothers, follow-up patients
Promote breast feeding and use of cup and spoon wherever possible (extra milk for breast feeding mothers)
Carryout group discussion, individual conversations to improve positive thinking
Distribute educational leaflets

Hygiene Promotion

The aim of any water and sanitation programme is to promote good personal and environmental hygiene in order to protect health. Hygiene promotion is defined here as the mix between the population's knowledge, practice and resources and agency knowledge and resources, which together enable risky hygiene behaviours to be avoided. The three key factors are 1) a mutual sharing of information and knowledge, 2) the mobilisation of communities and 3) the provision of essential materials and facilities. Effective hygiene promotion relies on an exchange of information between the agency and the affected community in order to identify key hygiene problems and to design, implement and monitor a programme to promote hygiene practices that will ensure the optimal use of facilities and the greatest impact on public health. Community mobilisation is especially pertinent during disasters as the emphasis must be on encouraging people to take action to protect their health and make good use of facilities and services provided, rather than on the dissemination of messages. It must be stressed that hygiene promotion should never be a substitute for good sanitation and water supplies, which are fundamental to good hygiene.

Hygiene promotion is integral to all the standards within this chapter. It is presented here as one overarching standard with related indicators. Further specific indicators are given within each standard for water supply, excreta disposal, vector control, solid waste management and drainage.

Hygiene promotion standard 1: programme design and implementation

All facilities and resources provided reflect the vulnerabilities, needs and preferences of the affected population. Users are involved in the management and maintenance of hygiene facilities where appropriate.

Key indicators (to be read in conjunction with the guidance notes)

- Key hygiene risks of public health importance are identified (see guidance note 1).
- Programmes include an effective mechanism for representative and participatory input from all users, including in the initial design of facilities (see guidance notes 2, 3 and 5).
- All groups within the population have equitable access to the resources or facilities needed to continue or achieve the hygiene practices that are promoted (see guidance note 3).
- Hygiene promotion messages and activities address key behaviours and misconceptions and are targeted for all user groups. Representatives from these groups participate in planning, training, implementation, monitoring and evaluation (see guidance notes 1, 3 and 4 and Participation standard).
- Users take responsibility for the management and maintenance of facilities as appropriate, and different groups contribute equitably (see guidance notes 5-6).

Guidance notes

1. Assessing needs: an assessment is needed to identify the key hygiene behaviours to be addressed and the likely success of promotional activity. The key risks are likely to centre on excreta disposal, the use and maintenance of toilets, the lack of hand washing with soap or an alternative, the unhygienic collection and storage of water, and unhygienic food storage and preparation. The assessment should look at resources available to the population as well as local behaviours, knowledge and practices so that messages are relevant and practical. It should pay special attention to the needs of vulnerable groups. If consultation with any group is not possible, this should be clearly stated in the assessment report and addressed as quickly as possible (see Participation standard, and the assessment checklist in Appendix 1).

2. Sharing responsibility: the ultimate responsibility for hygiene practice lies with all members of the affected population. All actors responding to the disaster should work to enable hygienic practice by ensuring that both knowledge and facilities are accessible, and should be able to demonstrate that this has been achieved. As a part of this process, vulnerable groups from the affected population should participate in

identifying risky practices and conditions and take responsibility to measurably reduce these risks. This can be achieved through promotional activities, training and facilitation of behavioural change, based on activities that are culturally acceptable and do not overburden the beneficiaries.

3. Reaching all sections of the population: hygiene promotion programmes need to be carried out with all groups of the population by facilitators who can access, and have the skills to work with, different groups (for example, in some cultures it is not acceptable for women to speak to unknown men). Materials should be designed so that messages reach members of the population who are illiterate. Participatory materials and methods that are culturally appropriate offer useful opportunities for groups to plan and monitor their own hygiene improvements. As a rough guide, in a camp scenario there should be two hygiene promoters/community mobilisers per 1,000 members of the target population. For information on hygiene items, see Non-food items standard 2.

4. Targeting priority hygiene risks and behaviours: the objectives of hygiene promotion and communication strategies should be clearly defined and prioritised. The understanding gained through assessing hygiene risks, tasks and responsibilities of different groups should be used to plan and prioritise assistance, so that misconceptions (for example, how HIV/AIDS is transmitted) are addressed and information flow between humanitarian actors and the affected population is appropriate and targeted.

5. Managing facilities: where possible, it is good practice to form water and/or sanitation committees, made up of representatives from the various user groups and half of whose members are women. The functions of these committees are to manage the communal facilities such as water points, public toilets and washing areas, be involved in hygiene promotion activities and also act as a mechanism for ensuring representation and promoting sustainability.

6. Overburdening: it is important to ensure that no one group is overburdened with the responsibility for hygiene promotional activities or management of facilities and that each group has equitable influence and benefits (such as training). Not all groups, women or men have the same needs and interests and it should be recognised that the participation of women should not lead to men, or other groups within the population, not taking responsibility.

Drainage standard 1: drainage works

People have an environment in which the health and other risks posed by water erosion and standing water, including stormwater, floodwater, domestic wastewater and wastewater from medical facilities, are minimised.

Key indicators (to be read in conjunction with the guidance notes)

- Areas around dwellings and water points are kept free of standing wastewater, and stormwater drains are kept clear (see guidance notes 1, 2, 4 and 5).
- Shelters, paths and water and sanitation facilities are not flooded or eroded by water (see guidance notes 2-4).
- Water point drainage is well planned, built and maintained. This includes drainage from washing and bathing areas as well as water collection points (see guidance notes 2 and 4).
- Drainage waters do not pollute existing surface or groundwater sources or cause erosion (see guidance note 5).
- Sufficient numbers of appropriate tools are provided for small drainage works and maintenance where necessary (see guidance note 4).

Guidance notes

1. Site selection and planning: the most effective way to control drainage problems is in the choice of site and the layout of the settlement (see Shelter and settlement standards 1-4).

2. Wastewater: sullage or domestic wastewater is classified as sewage when mixed with human excreta. Unless the settlement is sited where there is an existing sewerage system, domestic wastewater should not be allowed to mix with human waste. Sewage is difficult and more expensive to treat than domestic wastewater. At water points and washing and bathing areas, the creation of small gardens to utilise wastewater should be encouraged. Special attention needs to be paid to prevent wastewater from washing and bathing areas contaminating water sources.

3. Drainage and excreta disposal: special care is needed to protect toilets and sewers from flooding in order to avoid structural damage and leakage.

4. Promotion: it is essential to involve the affected population in providing small-scale drainage works as they often have good knowledge of the natural flow of drainage water and of where channels should be. Also, if they understand the health and physical risks involved and have assisted in the construction of the drainage system, they are more likely to maintain it (see Vector Control section). Technical support and tools may then be needed.

5. On-site disposal: where possible, and if favourable soil conditions exist, drainage from water points and washing areas should be on-site rather than via open channels, which are difficult to maintain and often clog. Simple and cheap techniques such as soak pits can be used for on-site disposal of wastewater. Where off-site disposal is the only possibility, channels are preferable to pipes. Channels should be designed both to provide flow velocity for dry-weather sullage and to carry stormwater. Where the slope is more than 5%, engineering techniques must be applied to prevent excessive erosion. Drainage of residuals from any water treatment processes should be carefully controlled so that people cannot use such water and it does not contaminate surface or groundwater sources.

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Water and Sanitation Initial Needs Assessment Checklist

This list of questions is primarily for use to assess needs, identify indigenous resources and describe local conditions. It does not include questions to determine external resources needed in addition to those immediately and locally available.

1 General

- How many people are affected and where are they? Disaggregate the data as far as possible by sex, age, disability etc.
- What are people's likely movements? What are the security factors for the people affected and for potential relief responses?
- What are the current or threatened water- and sanitation-related diseases? What are the extent and expected evolution of problems?
- Who are the key people to consult or contact?
- Who are the vulnerable people in the population and why?
- Is there equal access for all to existing facilities?
- What special security risks exist for women and girls?
- What water and sanitation practices were the population accustomed to before the emergency?

2 Excreta disposal

- What is the current defecation practice? If it is open defecation, is there a designated area? Is the area secure?
- What are current beliefs and practices, including gender-specific practices, concerning excreta disposal?
- Are there any existing facilities? If so, are they used, are they sufficient and are they operating successfully? Can they be extended or adapted?
- Is the current defecation practice a threat to water supplies (surface or ground water) or living areas?
- Do people wash their hands after defecation and before food preparation and eating? Are soap or other cleansing materials available?
- Are people familiar with the construction and use of toilets?
- What local materials are available for constructing toilets?
- Are people prepared to use pit latrines, defecation fields, trenches, etc.?
- Is there sufficient space for defecation fields, pit latrines, toilets, etc.?
- What is the slope of the terrain?
- What is the level of the groundwater table?
- Are soil conditions suitable for on-site excreta disposal?
- Do current excreta disposal arrangements encourage vectors?
- Are there materials or water available for anal cleansing? How do people normally dispose of these materials?

- How do women manage issues related to menstruation? Are there appropriate materials or facilities available for this?

3. Solid waste disposal

- Is solid waste a problem?
- How do people dispose of their waste? What type and quantity of solid waste is produced?
- Can solid waste be disposed of on-site, or does it need to be collected and disposed of off-site?
- What is the normal practice of solid waste disposal for the affected population? (compost/refuse pits? collection system? bins?)
- Are there medical facilities and activities producing waste? How is this being disposed of? Who is responsible?

4. Health care waste management : Please refer to section on health care waste management .

5. (Drainage) Waste water management

- Is there a drainage problem (e.g. flooding of dwellings or toilets, vector breeding sites, polluted water contaminating living areas or water supplies)?
- Is the soil prone to waterlogging?
- Do people have the means to protect their dwellings and toilets from local flooding?