

F3 (106) (32)/RUSDIP/PMU/CMS/2007/10680-99**Dated: 5.10.2007****Sub: Design & Construction Management System: Circular -4.****Ref: Guidelines for Waste Water sector for the works to be taken up under RUSDIP.**

Waste Water Sector has so far been a neglected sector and most of the cities being covered with water supply do not have any waste water system or at best some skeleton system in a limited area. The importance of this sector cannot be underestimated keeping in view its impact on general environment and the public health. The sector being in infancy in the state needs to be adopted carefully so as to ensure its success and adoption by the society; and with this view major interventions are proposed in the fifteen towns under RUSDIP. The following guidelines should be considered during taking up projects under this sector:

System Design

1. The works under RUSDIP should be properly dovetailed with the ongoing schemes under UIDSSMT by Government of India / taken up by the concerned line agency. The Detailed Project Report must be prepared as per the Guidelines given in the Manual on Sewerage and Sewage Treatment published by CPHEEO, Ministry of Urban Development.
2. The sanitation plan for the city should take into account the likely changes in the city in next 30 years (i.e. up to design year 2041) and plan for them. The design of the sewers should be for the design year projection requirements and accordingly space planning should be done. However, the units which can be developed in modules (e.g. Sewage Treatment Facility, Waste Water Pumping machinery, on site treatment facilities, etc.) can be designed for appropriate shorter periods.
3. The population projections for the city should be developed adopting all the standard methods, looking into the dynamism and future prospects of the town and keeping in view the projections that may have been developed by the Town Planning Department for the city.
4. The population projections of the city should be further subdivided in projection of population of wards. This will differentiate in the growth according to the present status of the wards e.g. an already crowded ward is likely to not grow or grow slowly, an average developed ward will grow moderately and the wards which are new and sparsely developed so far will grow faster. These projections should be discussed with the local town planning officials, PHED and the city officials. Their opinion in the distribution of population and it's projection should also be considered before finalizing the figures. These figures should then be used for arriving to the distribution zone wise population and water demand projections. No proposals for any individual locality can be considered unless this city exercise is complete and the proposal is in line with the city projection. These projections should be one of the first tasks and should be got approved from the PMC before further designs of distribution networks in the city.
5. Generally 80% of the water supply may be expected to reach the sewers. However, the sewers should be designed for a minimum waste water flow of 100 litres per capita per day. Industries and commercial buildings often use water

other than the municipal supply and may discharge their liquid wastes into the sewers. Estimates of such flows have to be made separately.

6. A proper and updated city plan is an essential pre-requisite for proper planning and design of all utilities and more so for the Sewerage Systems showing the levels prepared through various surveys. This may be supported with proper digital town maps. These maps should be updated with field surveys at the time of preparation of the Sanitation Plans.
7. The physical Infrastructure required to be planned can be broadly classified as:
 - (a) **A sewerage system:** Including network of pipes that collect waste water from domestic, institutional, commercial and industrial premises and the collector and interceptor sewers and possibly pumping stations that convey the waste water to treatment plant.
 - (b) **Treatment plant:** where the quality of the waste water is improved for its safe disposal or reuse. The sludge generated by the waste water treatment process is also normally processed at the plant for safe disposal and reuse.
 - (c) **Effluent disposal facilities:** for conveying the treated liquid effluents to the point at which they are either safely disposed of into the ground or to a body of water – a water course or lake or to a point where they are directly reused in agriculture, fish farming, forestry, industry or planned reuse site.
 - (d) **Sludge disposal:** by means of which liquid, semi-solid or dried sludge are transported to the point where they are either safely disposed to sanitary landfill or recycled, principally for use in agriculture either in crude or in processed form.
8. The proposed systems should satisfy its purpose based upon appropriate technology, will respond to environment and social concerns, will generate a satisfactory rate of return and be both sustainable and affordable.
9. The sewerage system is designed keeping future requirements into consideration (generally 30 years) consisting of one or more outfall sewers, trunk sewers and laterals generally operating by gravity, but with force mains and pumping stations where required. The systems are to be designed on separate system to accept the domestic waste including sullage but excluding any rain water and industrial waste as acceptable. The house collection system should be designed so as to achieve this.
10. The sewers are not designed to convey municipal solid wastes, whether of domestic, commercial or industrial origin. The citizens should be made aware of this and the system should also be designed and operated in a manner to discourage this. The sewer systems are designed to function with minimal maintenance if this is followed.
11. Efforts should be made to design the systems in a manner which leave minimum man holes on the streets which are generally the source of intrusion of external wastes. Spacing of the manholes is depending upon the cleaning capacity of the sewer jetting machine.
12. The proper assessment and conditions of under ground utilities, strata and water are very important for the execution of waste water system. This should be ensured before designing of the system and needs to be properly quantified. Accordingly provisions should be taken in the estimates & BOQ.
13. The system is beneficial when all the premises are connected to the system and there is no waste flowing in the drains. The service lines to connect the house connections to the sewer system should be laid along with the laying of the sewers. The service lines should be laid for all the premises up to the boundary of the premise and plugged so that it can be extended by the premise owner within

his premise. In case the premise has not been developed, the line should be plugged and left for future connectivity.

14. It is desirable to start from the down stream end of the out fall and commissioning it. The trunk mains should be taken up after this and commissioned as the work progresses. The laterals that get connected to the commissioned sections of outfall/trunk sewers only should be laid to avoid disruption in the city and immediate benefits of the work done. The full city coverage can be taken up in the phases as per availability of funds under RUSDIP or line agency.
15. It is generally not possible to take up work for the whole city at once and the work may have to be prioritized. A method of prioritizing can be:
 - (a) Areas where lack of a sewer system is creating unsanitary living conditions or unacceptable odor levels, e.g. areas with a high population density and no drainage system or found with low permeability adversely affecting septic tank soak ways.
 - (b) Areas with high groundwater level requiring the use of cess-pools and so where frequent emptying of the tanks is either impractical or extremely costly.
 - (c) Areas where the quality of the ground water is adversely affected by septic tank effluent and the ground water is a source of drinking water or discharges in a polluted state to a water course.
 - (d) City centre, commercial centre and the more densely populated areas of the town.
16. In general pumping stations are to be avoided on the sewerage systems to the extent possible because of the additional costs involved in construction and operation. They have to be installed if the design so requires. Now a properly designed and constructed pumping system can give trouble free service. The pumping stations can be suitably automated for better operation. Due to shortage of electricity, proper size of sump well should be designed considering likely retention period. Suitable provisions should be included for regular power supply to these pumping stations.
17. The most common form of installing sewers is open excavation of trenches or open cut. This method has limitations on account of depth that can be handled, time taken and the disruption of the services of the concerned street for the work period. Usually this method is not feasible beyond 5-6 m depths. Alternative techniques of trench less technologies involving tunneling and micro tunneling are used for laying sewers where open cut is not feasible on any of the above counts. This procedure though prevalent in developed countries, is not common in India, but should be considered as an alternative where the situations warrant. The techniques of thrusting pipes in ground can also be used in specific cases.
18. Industrial Effluents may be avoided to mix with municipal waste water and if an industry is permitted to discharge its effluent/processed effluent into the public sewer, the authority should agree to follow general discharge standards for waste water as mentioned in the Schedule VI of Environment (Protection) third Amendment Rules, 1993.

Design criteria and materials:

19. Manning's coefficient of 0.011 may be adopted for PVC-U, RCC and DI pipes for design.
20. Minimum sewer cover should be 1.2 m to allow for proper depth of service connections to the sewers. This can be reduced only in exceptional cases after justification in line with the levels of outfall or connecting sewer. Moreover it can also be considered with a cover up to 60 cm or suitable cover in the initial

upstream line (starting points), in case it reduces the depth of whole of the system.

21. Infiltration flows should be considered in areas where the water table is high. Ground water infiltration should be considered as 5000 liter per hectare per day minimum to 50000 liter per hectare per day.
22. Proposed peaking factors as per the Manual are acceptable and same are given below;

Contributory Population	Peak Factor
up to 20000	3.00
20000 to 50000	2.50
50000 to 750000	2.25
Above 750000	2.00

23. The minimum gradient may be adopted as per the Manual. However where feasible steeper gradients may be used in initial reaches without increasing the depths of subsequent system. Recommended slopes for attaining minimum velocity of 0.60 meter per second are given below;

Present Peak Flow (cum per second)	Recommended slope 1 in
0.002	165
0.003	250
0.005	320
0.010	500
0.015	770
0.020	835
0.030	1000

24. Minimum pipe diameter for upper reaches may be kept as 200 mm as per the prevailing practice, provided that adequate slopes are available. In cases where flows are expected to be very low and self-cleansing velocities cannot be made available, proper provision for procurement of sewer jetting machines should be taken for the town.
25. Pipe Materials: Selection of material for sewer pipe depends upon flow characteristics, availability in the sizes and ease of handling and installation, water tightness, physical strength, resistance to acids & alkalis, resistance to scour, durability and cost. Out following available pipe material for sewer selection can be made on the basis of Economy and Strength point of view of combined bedding (bedding factor) and pipe (Three Edge Bearing Strength).
26. PVC-U pipes are resistant to corrosion, light weight, economical in laying, jointing and maintenance and have length of 6m. The consideration should be given to using PVC-U sewer pipe conforming to IS 15328 : 2003 with elasto-meric sealing rings for smaller diameters. PVC-U pipes are available in the range of 110 mm to 630 mm nominal outside diameter and should be considered with techno-economic viability. The house connection should be done through PVC-U pipe of 110 mm nominal outside diameter.
27. R.C.C. pipes with appropriate bedding and protective coatings inside on the basis of structural analysis and economy can be used for all larger diameters. The recommendation to use only NP3 or NP4 RCC pipes needs to be analyzed and justified considering proper bedding after comparing the overall cost.
28. We may use sulfate resistant cement in the RCC pipes, in case availability is ensured in the market.
29. DI pipes of K-7 can be used for nallah crossing and for pumping main.

30. **Manholes** - The use of pre-fabricated RCC manholes with cast iron rings and ferroconcrete manhole covers is to be encouraged for their ease of installation and better quality control. It should be encouraged to increase the spacing up to 60 to 70 meters from prevailing practice of 30 meters (thus significantly reducing costs) and provide proper sewer cleaning equipment to facilitate maintenance. This should be supported with the use of 'Y' and 'T' consumer connections (Property connections) up to the property line at right angles to the sewer.
31. **Ventilating Shaft** - Ventilation shafts are only required in areas where sewage has been in the system long enough for decomposition to begin. Therefore, these are not normally required in the upper reaches of the system and should only be considered for the lower reaches following a case-by-case assessment.

Waste Water Treatment:

32. The sewerage system collects the waste water and transports it to the site for waste water treatment. There are several Process Options available for Waste Water Treatment. The choice of the Treatment Process depends upon:
- Degree of treatment proposed to be achieved depending upon the end use of the effluent and sludge.
 - Land area available
 - Total sewage to be treated and its quality
 - Proximity to the population
 - Sophistication of back up services for O&M of the plant
33. The degree of treatment to be given to the Waste Water is dependent upon the quality of effluent to be achieved. This may be considered in accordance to the Prevention of Pollution Act. In the Schedule VI of Environment (protection) third Amendment Rules, 1993, all the standard of the effluent for discharging into inland surface water, irrigation and marine coastal areas mentioned and treatment of waste water is dependent on these standards **or** the type of beneficial re-use and the quality restrictions that this imposes. Some important discharge standards of effluent are given below;

Parameter	Discharge in Inland Surface Water	Discharge on Land for Irrigation
Suspended Solids in mg/l, max	100	200
pH	5.5-9.0	5.5-9.0
BOD in mg/l	30	100
COD in mg/l	250	-

34. Environmental Impact Assessment for the waste treatment plant is to be carried out.
35. There are a number of process with several variants developed which either combine the above process and some with different process. The treatment process may be classified in following categories:
- Aerobic Suspended Growth Systems:** These are of two types one which employs recirculation of sludge viz. conventional activated sludge process and its variation which do not re-circulate the sludge viz. aerated lagoons. There are several variants in the process available. These process are capable of achieving 20:30 (20 ppm BOD : 30 ppm Suspended Solids) standards of treatment. They require less amount of land (activated sludge process require about 0.1 to 0.3 sqm per person depending upon size of the plant with 0.1 sqm per person on population > 25,000) and high

consumer of power and require fair amount of sophistication for satisfactory O&M.

(b) **Aerobic Attached Growth Systems:** These systems have the biological growth attached to a media and the sewage is allowed to flow through them with natural air circulation. They can be low rate, High rate and super rate roughening filters. Trickling filters are the examples of these filters. They use either rock and gravel media or also use plastic media. A recent development is of the Rotating Biological Filters wherein the media is moved in the stream of waste water. These processes require 2-6 times the land but use much less power. They also have the nuisance of odor, flies and choking associated with them.

(c) **Stabilization Ponds:** The stabilization ponds are classified as Aerobic, Anaerobic and Facultative depending upon the depth of the pond and the process that is encouraged because of its simplicity. **In general the Stabilization Ponds are a good option where land can be made available.**

- ✓ The aerobic tanks are shallow (< 0.5 m) create intense algal growths.
- ✓ The Anaerobic tanks are 2.5 - 5.0 m depth and used for high BOD loads. They have odor problems.
- ✓ The Facultative ponds have aerobic action at top layers and anaerobic at lower layers. It prevents odor problem by the existence of the aerobic layer. It is the most commonly used pond system. The average depth is 1.0-1.5 m with a permissible BOD loading governed by the latitude of the area and the minimum temperatures. The general detention period being in the order of 4-6 days. The BOD removal of 80-90% can be achieved. The pathogen removal efficiency is also very high and the effluent is safe for use in irrigation for crops not eaten raw. The operating process is simple and requires some specialist attention in handling only occasionally. The power requirement is minimal (only for pumping). The requirement of land is high approximately 2-4 sqm/person (may be preferred to 20 hectare per one lakh person). This is the best suited process for Rajasthan conditions. It can be developed in modules. Lands if acquired close can be considered as an asset for increased value when town reaches closer and can be shifted further if necessary.

36. **Anaerobic Treatment:** The anaerobic digestion of the primary and secondary sludge has been practiced for a long time and is an established procedure. However a number of high rate systems have been developed for anaerobic reactors for treating high BOD industrial wastes and are also used for municipal waste treatment. The various kind of process are Anaerobic Contact Process, Anaerobic Filters, Anaerobic Fixed Film Filters, Fluidized and Expanded Bed Reactors and Up flow Anaerobic Sludge Blanket Reactor (UASB). The most common type used in Municipal wastes is UASB with mixed reports.

37. There are possibilities for combining the treatment of waste water from more than one municipalities at one place and also of splitting the treatment facilities in more than one places for the same city. The choice is primarily governed by the topography. There are advantages and disadvantages associated with both the options. There is very strong economy of sizes in case of highly mechanized plants and there is a case for merging more than one Municipality when they are adopted. However stabilization ponds can be split without much loss on the cost.

38. The land area for treatment plants is a major input and the municipal governments should identify and earmark the same as early as possible even if they plan to

construct at a later date. The appropriateness of the site can be evaluated after detailed analysis, but generally the direction of slope and surface flow should point towards the direction where the land should be reserved.

39. The Waste Water Treatment Plants are not considered good neighbors and therefore to mitigate the nuisance of odor or noise, it is desirable to provide for an exclusion zone of 100 - 200m width around the plant and should be heavily planted with trees. This area maybe reduced if some specific measures are being taken in the plant to reduce the nuisance levels.
40. Proper Operation and Maintenance of the Waste Water Treatment Plants is a major issue of the existing plants. It is desirable to in build an O&M contract with the construction agency when constructing a new plant for suitable periods (5-7 years). This will give a proper start to the system and gradually expertise can be built up locally to take over the O&M.

Effluent disposal and beneficial reuse :

41. The effluent is a precious resource and should be looked at with care for its beneficial reuse. The choice between disposal in streams/rivers/water bodies or reuse should be ascertained after considering various options for reuse (agriculture and forestry, landscaping, fish - farming, industry, aquifer re - charge and domestic) on the basis of sound economic analysis of benefit and costs.
42. Effluent disposal: The option for effluent disposal in Rajasthan is river, other natural and man made watercourses and lakes. Before determining an appropriate effluent quality standard for effluents discharged to river and watercourses, it is first necessary to determine the following:
 - (a) The natural ecology of the watercourses - to ensure that this is protected and unharmed by the discharge of effluent;
 - (b) The minimum flows normally experienced in a year - in order to determine the minimum dilution likely to be available to the effluent;
 - (c) The legitimate local uses of a river or watercourse, as these require different water qualities, in order of the progressively higher water quality required for the purpose, these uses include Fish cultivation & Water supply etc.
43. The steps that can be taken for arriving at the best out of the effluent disposal and re-use options can be as follows:
 - (a) Step 1:
 - ✓ List the options of disposal and reuse
 - ✓ There should be a disposal option as even where reuse options are available, they may not be a long term or they may not use the full quantity of the effluent particularly where the use is seasonal.
 - ✓ In reuse option, it will be rarely economical to transport it to long distances and re-use should be looked for in near vicinity as far as possible.
 - ✓ Recycling in domestic environment should be considered only in extreme scarcity situations and that too with the caution of a dual pipe network duly colored differently.
 - (b) Step 2:
 - ✓ In order to determine the least cost option, carry out an economic analysis of the remaining options. An "whole life" analysis should be made. The risk attached to adopting any of the reuse options should be assessed - e.g. degree of

dependence that may be placed on industry accepting effluent in the medium and long term.

- (c) Step 3:
 - ✓ Where re-use option is least cost only with the values of the more esoteric elements of an evaluation – such as environmental benefits, the comparison without such values may also be seen and a more educated decision may be made.
- (d) Step 4:
 - ✓ Reuse options may now be ranked and decision may be taken whether to adopt re-use or not and if yes which.

Sludge Disposal and Beneficial Re-use :

44. All Waste Water Treatment Plants generate sludge as a by-product. The quantity of sludge varies from process to process but may be broadly assessed as 1-1.5% of the original volume of waste water / may be about 1.2 to 2.0 liters of sludge/person/day. This would be about 2 times the solid waste generated in a city by weight.
45. The untreated sludge is not preferred to be disposed in the environment, as it will cause Offensive odors, Risk of accumulation of toxic gases (e.g. hydrogen sulphide) and inflammable gases (e.g. methane), Risk of health to workers and consumers of agricultural products that come in contact with it, Accumulation of toxic materials in the disposal area and the grease and oil in untreated sludge clogs the soil effecting crop growing capacity of soil. Proper treatment and disposal should be incorporated in the designs and estimates.
46. The stabilization process using the anaerobic digestion process have the added advantage of generating methane rich gas which can be used for heating the process or for providing part of the power requirement for the plant or for use in nearby residential colonies or industry.
47. Thus the most common form of sludge treatment prior to sanitary landfill or use on agriculture land will consist of:
- (a) Initial thickening of the sludge primary and secondary using either stirred gravity thickener or mechanical centrifuges;
 - (b) Stabilization using the anaerobic digestion process with methane rich gas produced to be used for heating or power generation;
 - (c) Dewatering the sludge to cake consistency by using belt presses or by using drying beds
 - (d) Transporting for agricultural use or to sanitary land fill.
48. The steps that can be taken to arrive at the most appropriate sludge disposal option –re-use option can be following:
- (a) Determine the annual and total sludge volumes expected to be generated on given moisture contents.
 - (b) Identify the options for disposal of sludge and beneficial re-use.
 - (c) Undertake the study to evaluate the environmental risks and benefits and the economic costs of the disposal options and beneficial re-use options.
 - (d) Compare the alternatives and considering the following:
 - ✓ Capital and operating costs of each option
 - ✓ An assessment of the economic costs – the benefits and dis-benefits of each option including the environment.
 - (e) Choose the most practical, reliable and cost effective option or combination of options.

Inspection and Testing :

49. Categories of inspection and test for various materials/equipments have to be clearly identified and mentioned in the bid document (technical specifications). Inspection category must be classified as follow;

Category A: The Drawing has to be approved by the Engineer before manufacturing and Testing. The material has to be inspected by the Engineer or by an Inspecting agency approved by the Engineer at the manufacturer's premise before packing and dispatching.

Category B: The drawings of the Equipment have to be submitted and to be approved by the Engineer prior to manufacture. The material has to be tested by the manufacturer and the manufacturer's test certificates are to be submitted and approved by the Engineer before dispatching of the Equipment.

Category C: The material may be manufactured as per standard and delivered to the site.

General :

50. The surface drains should not be connected to the sewer systems as they also carry rain water, solid wastes and silt which tend to choke the sewers.
51. During construction full care needs to be taken for diverting traffic and for fencing and safety of the excavation sites. The excavated materials may have to be transported to other suitable sites (to maintain flow of traffic) and transported back for refilling of trenches. The provisions for properly supporting the trenches should be taken.
52. The issues related to safety, excavation in different strata, underground water conditions, shifting of under ground utilities, on site testing, backfilling of trenches, road restoration should be properly attended in the technical specifications, estimates and BOQ.
53. In case of road restoration, provision for restoration of complete road width should be preferred and incorporated in the estimates and BOQ.
54. All necessary tests should be listed and carried out with due diligence, and detailed in the technical specifications of the bid document. Particular attention should be given to the following field tests:
- ✓ Hydrostatic Test: Entire section of the sewer shall be proved by water tight by filling in pipes with water to the level of 1.50 m. above the top of the highest pipe in the stretch and heading the water up for the period of one hour. The loss of water over a period of 30 minutes should be measured by adding water from a measuring vessel at regular 10 minutes intervals and noting the quantity required to maintain the original water level. For water tightness, the average quantity added should not exceed 1 litre / hour / 100 linear metres / 10 mm nominal internal diameter. Any leakage including excessive sweating which causes a drop in the test water level will be visible and the defective part of the work should be removed and made good. The pipes shall be broken to check the reinforcement as per IS 458 for every 500 m length of pipes.
 - ✓ Water Tightness test for Manhole: The entire height of the manhole shall be tested for water tightness as per CPHEEO Manual, by closing both the incoming and outgoing ends of the sewer and filling the manhole with water and the drop in water level not more than 50 mm per 24 hours shall be permitted.
 - ✓ Flow Test: After completion of entire network of the sewer line, flow test to be carried out.

55. Inventory by the line agency are to be transferred on digital base maps of the town with GIS layers.
56. The standard bidding documents should be understood very clearly and ensure required details (i.e. special conditions of the Contract, Technical specifications, drawings and BOQ items including preamble to BOQ etc.) in the bid document for the particular sub-project, harmony in the documents by the DSC/IPIU /IPMC/ in-charge packages in PMU.
57. The estimates should be reflective of the present market prices and should be based on the current SOR to be issued by RUSDIP and the market prices for items not included there.
58. Safety aspects needs to be attended in the design of the system and included in BOQ properly – Excavation in deep trenches, barricading, crossing with water supply lines, execution in narrow streets.

Design Report Format:

59. The report should consist two parts:

- (a) **City status report**
- (b) **Sub-project specific report**

60. The **city status report** should contain at least the following chapters:

- (a) Index
- (b) Salient Features of the town – Topography, Hydrology, Geology, Water Supply Status and Ground Strata with respect to the designed depths etc.
- (c) Introduction – History of water supply and sewerage schemes with up to date details, ongoing & future plans and their status; re-organization & augmentation of water supply schemes sufficient for sewerage system.
- (d) Back ground consisting of **present status** but not limited to in terms of:
 - i Water supply – existing supply and augmentation proposals for feasibility of sewerage system.
 - ii Sewerage Scheme- Sanitation system and its coverage matrix, existing sewerage network, Treatment facility and untreated sewage flow and its characteristics.
 - iii Sewerage Pumping Machinery – Existing number of pumping stations, locations, capacity, power consumption etc.
 - iv Number of Property Connection – Number of household connected and can be connected.
 - v Financial status - Billing (amount), revenue realization, expenditure on O&M (with bifurcation of sub-head expenditures).
 - vi Coverage - Area, households, population, length of sewer lines with their sizes and material.
 - vii Organization status - Manpower details and capacity to handle O&M.
 - viii Other salient features of present sewerage system covering inter departmental issues.
- (e) Analysis of parameters detailed at s. no. 60 (d) of present status of sewerage system - Existing requirements, future requirement with horizon of Year 2021, 2031 and 2041.
- (f) Analysis of deficiency in the town with present requirements and future requirements of Year 2021, 2031 and 2041, measures to mitigate the deficiencies with improvement in the existing system and augmentation of the existing system.
- (g) Analysis of waste water characteristics
- (h) Executive summary for suggestive measures to mitigate deficiencies / long term solutions and list of proposed works in totality.

- (i) Phasing of the proposed works in line with allocations under RUSDIP for fulfilling its goal matrix and indicators. Identification of works to be taken up by the concerned line agency. Define role of RUSDIP/ PHED/ULB/ others to meet out the deficiencies.

61. The **sub-project specific report** should contain at least the following chapters:

- (a) Index
- (b) Introduction - Analysis of Priority for RUSDIP
- (c) Detail analysis of the sub-project specific requirement and justification.
- (d) Sub-project specific present level of indicators and indicators after execution of the project covering:

General:

- ✓ Increase in coverage of sewerage system and treatment capacity
- ✓ Number of property connections
- ✓ Reduction in power costs
- ✓ Reduction in pollution and use of effluent
- ✓ Improvement in sanitation facility
- ✓ Corresponding health benefits

Sewer Line Network:

- ✓ Map of the proposed and existing system showing type of sewer, diameter, location, manhole, ventilation shafts, Ground Level and Invert Level. Map should show enough levels and land marks to enable easy orientation in field.
- ✓ Statement of length of sewer lines in various type and diameters.
- ✓ Statement of length of sewer lines depth wise
- ✓ Statement of manholes with its type, depth and drop arrangements if any
- ✓ Description of different sewer zones

Pumping Stations:

- ✓ Number and Location of Pumping Stations in the System
- ✓ Stipulated Duty of Pumping Sets (Q & H) for each type of pump

Sewage Treatment Plants:

- ✓ Capacity / Type & Process of Plant
- ✓ Characteristics of influent and Effluent
- ✓ Estimated requirements of chemicals and power consumption
- ✓ Quantity of effluent, sludge and gas generation every year
- ✓ Disposal and Beneficial Reuse of effluent, sludge and gas

Operation Maintenance Contract:

- ✓ The details of the O & M Contract if it is a part of the contract should be given along with the conditions
- ✓ List the training program to be undertaken to the line agency staff.
- ✓ Guarantees of the equipment if any

- (e) **Technical Report containing** - Narrative of the various design aspect, parameters, alternatives and conclusions – highlighting special features;

- Work Program; Operation and Maintenance; Benefits expected from the investment.
- (f) **Bidding document** - Incorporation of Scope of work, special conditions of contract, Technical specifications, Tender & Detailed Construction Drawings, Estimate & Bill of quantities and preamble to BOQ etc. in Standard Bidding document.
 - (g) **Operation and maintenance** - Expectations from the line agency (personal requirement / cost requirement), Expectations from the contracting firm.
 - (h) **Execution Methodology** - Sequence of execution, Tentative work plan, interface with other works, Quality Assurance and Quality Control, Safety aspect during execution.
 - (i) **Time line for completion of sub-project.**
 - (j) **Likely Impact after the completion of sub-project under RUSDIP** - Improvement in sanitation facility, reduction in pollution, beneficial use of by products such effluent, manure and gas, No. of beneficiaries/ colonies covered/ houses & %of total city area, revenue with respect to O&M expenditure.
 - (k) Linkage of existing and proposed work on base maps prepared by RUSDIP (Availability of plans/ details of existing system)
 - (l) **Sub - project Issues**
 - i **Status of land** availability / Land acquisition for structures (pumping Stations and Sewage Treatment Plant) to be constructed,
 - ii **Interdepartmental issues** with Forest, Railways for crossings of Railway lines and works through railway land, National Highways for road cutting / crossings and Bridges, Power availability from VVNL, BSNL, Pollution Control Board, License from explosive department, Removal of encroachment and their resettlement.
 - iii **Time line for clearance** from concerned department
 - iv **Shifting of under ground utilities** (sub-project wise) - Details of concerned department, Mode of shifting, Clearance from line agency, Likely impact of shifting
 - v **Deposit works** to be executed by other departments for execution of the sub-project.

This circular should be abided by all members of PMU, IPIU, IPMC & DSC.


(Karni Singh Rathore)

Project Director

F3 (106)(32)/RUSDIP/PMU/CMS/2007/10680-99

Dated: 5.10.2007

Copy to following for information and necessary action:

1. Addl. PD -I & II/ FA/ SE (D-I)/ Dy. PD (T)/ Dy. PD (Adm.)/ SE (WW)/ SE(R&B)/ SE (Mon) / PO (all)/ Sr. AO / All APOs / AAO/ PA to PD PMU, RUIDP, Jaipur.
2. SE PIU, Ajmer, Bikaner, Kota, Jaipur, Jodhpur and Udaipur.
3. Team Leader PMC/ Team Leader CTA Consultant/ IPMC, IPIU, DSC's RUSDIP.
4. ACP, PMU, RUIDP, Jaipur to send by e-mail.


Dy. Project Director (T)