Govt. of Jharkhand

DRINKING WATER & SANITATION DEPARTMENT

MANUAL FOR PREPARATION OF

DETAILED PROJECT REPORT

FOR RURAL PIPED WATER SUPPLY SCHEMES

State Water & Sanitation Mission

MANUAL FOR PREPARATION OF DETAILED PROJECT REPORT FOR RURAL PIPED WATER SUPPLY SCHEMES

INDEX

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Following are the essential components of a DPR preparation for a Standalone Village /Multi Villages Rural Piped Water Supply Scheme

1. Executive Summary

1.1 Executive summary should consist of the brief of the scheme viz. essential features of proposed scheme – project area with location & communication, existing water supply status, identification of problem in terms of quantity, quality and source as well as system sustainability of existing system in use, basic planning strategy with approach adopted w.r.t design period, details of project proposed components in brief including utilization existing assets in best possible manner with sustainability measures as per NRDWP guidelines, need of capacity building & IEC strategy for sustainability of system. Financial details including capital cost, recovery cost/ tariff, income and expenditure statement during operation and maintenance phase in brief (Not more than two pages).

1.2 Project at a glance

S.N.	Description	Details
1	District	
2	Block	
3	No. of Village(s) / Habitation(s) under proposed scheme (Enclose Drawing)	
4	Latitude/Longitude of proposed village(s)/ Habitation(s)	
5	Population of proposed village(s)/ Habitation(s)/ No of Households 2011	
6	Population of proposed village(s)/ Habitation(s)/ No of Households Present	
7	Proposed Execution period (Years)	
8	Design village(s) / Population / Habitation(s)/ No of Households on expected date of commissioning.	
9	Design village(s)/ population / Habitation(s)/ No of Households after (a) 10 years. (b) 15 years	
10	Design village(s)/ population / Habitation(s)/ No of Households after 20 years	
11	Design village(s)/ population / Habitation(s)/ No of Households after 30 years	
12	Total Water Demand for all purposes for village /s (I) Immediately after completion (MLD) (II) After 10 years(MLD) (III) After 15 years (MLD)	

	(IV) After 20 years(MLD) (V) After 30 years(MLD)	
13	Proposed Water Supply System	
14	(i) Availability Three phase Electricity in Hours/day	
15	(ii) Source – GW / Surface	
16	(iii – A) in case TW (a) Type/ No TW (existing + proposed) Dia /Depth/ design Yield/ of each TW (b) Type of Pump proposed- Submersible Electric driven / solar operated or in combination / other (c) Head (Total Discharge Head) & Discharge (LPD/LPM) for each proposed pump (d) Required PV array P max in watts of each pump in case of solar pumps (e) No. of pump house for TW (f) Major Litho- geomorphic (g) stage of Ground water development	
17	(III - B) In case of Surface source (a) Type of source – River with name/WRD Reservoir/ Check Dam /Pond (b) Catchment Area (c) Average Rainfall in mm (d) Perennial/when flow seizes based on gauging data (f) State level Water Reservation NOC obtained? (g) If impound reservoir to be created specify L x W x D in meters/and Capacity at Full Reservoir Level (FRL) Note: Strike out whichever is not applicable	
18	Intake well cum pump house Depth and Dia / capacity of gantry	
19	Raw Water Pumps – Type of Pump/ TDH / discharge (lpd) /Nos. /HP /in case solar P max of PV array	
20	Raw Water Pumping Main – Type of Pipe/Length/Dia	
21	Water Treatment Plant (WTP) – Type of Plant / Capacity / CW Sump capacity / Size of clear water pump house L x W x H / capacity of gantry / disinfection system	
22	Clear Water Pumps – Type of Pump/ TDH / discharge (lpd) /Nos./HP /in case solar Pmax of PV array	
23	Clear Water Pumping Main/s – Type of Pipe/Length/Dia	
24	Storage Reservoir/s – Capacity/Staging	
25	Water Distribution Network - Type of Pipe/Length/Dia	
26	Raw Water Quality Monitoring a) Pre monsoon b) post monsoon	

27	Consumer Water connection line cost (with /without water meter)	
28	Total Estimated Cost	
29	Per capita cost on present population	
30	Per capita cost on design population	
31	Annual O&M cost	
32	Per capita cost of O&M	
33	Proposed tariff : Domestic / Commercial	
34	Proposed Water Supply at different stages – no of domestic connection/ stand posts / Commercial	
35	Anticipated Revenue at different Stages	
36	Agency for O & M	
37	Amount for awareness generation and Capacity building of GP/VWS C	
38	Amount for Source sustainability measures	
39	Provision for safe disposal of waste water	

2. Location

2.1 Indicate details of the village or villages included along with en route villages in scheme i.e., location - latitude & longitude based on GPS, Panchayat, Block, Tehsil, District, distances from important places, Legislative assembly , Parliamentary constituency etc.

2.2 Topographical maps with total station survey must be got prepared before preparation of the scheme as the maps prepared by Survey of India do not show all the streets, also the length of the streets and nodal levels may not match with ground reality and new habitations may not be included in these maps. Topographical maps must include all habitations of the census village, existing water sources, road network with existing side drains, all built up structures such as human settlements institutions etc.

2.3 Some more details of the village, main activities like water sources, any commercial activities or industries, any historical importance, natural resources, rail and road connectivity, details of bus stand, railway station, market, schools and Anganwadis etc.

2.4 Long Period average rainfall and details of actual rainfall of at least last five years be taken. The details may be based on data of rain gauges installed at tehsil / block headquarters, if rain gauges are not installed there then data of rain gages installed at nearby Irrigation dams/ reservoirs. However where there is no such facilities available, the district rainfall data is the only source to be used. A provision of automatic weather station comprising of temperature meter, Rain-gauge, relative humidity meter, evaporation meter to be incorporated in comprehensive piped water supply scheme.

3. Project Execution and Design Period

a) Project Execution Period

The time lag between Preparation design, tendering, Construction and Completion/ Commissioning of the proposed scheme should not exceed as specified under:-

i). Mini pipe water supply scheme up to 01 years
ii). Standalone water supply scheme 01 to 02 years

iii). Multi village water Supply scheme 02 to 03 years

b) Project Design Period

Project components may be designed to meet the requirements of the following design period

Sl. N.	Item	Design period years
1	Source a. Surface b. Ground Water	 30 20
2	Intake works	30
3	Pumping i. Pump house (Civil works) ii. Electric Motor and Pumps*	 30 15
4	Water Treatment Units**	15 Provision of land for expansion for 30 years.
5	Pipe connection to several treatment units and other small appurtenances	15
6	Raw Water and Clear water conveying mains	30
7	Clear water reservoirs at the head works, balancing tanks and service reservoirs (overhead or ground level). **	15 Provision of land for expansion for 30 years.
8	Distribution system	30

* The stars rated (electric motors- energy efficient and pumps may be used

** For schemes up to 2 MLD WTP and ESR will be constructed for 30 years demand.

** If WTU proposed as Slow Sand Filter, its design period shall be 10 years.

4. Population

4.1 Total no of revenue villages and all their habitations should be listed with their code nos. in the schemes and the total population specifying the population of SC/ST/OBC and minority population separately. Latest census (2011) population, likely present population as per GP records, no. of households should also be used.

4.2 Estimation of design population for the proposed water supply scheme size by considering the census data of past decades, for population projections with different mathematical models as shown under:

S. No.	Mathematical Models
1	Arithmetical Increase Method
2	Geometrical Increase Method
3	Incremental Increase Method
4	Line-fit Graphical Method a. Exponential Trend Curve b. Linear Trend Line
5	Decadal growth Method

The design population will have to be estimated with due regard to all the factors governing the future growth and development of the project area in the industrial, urbanization, commercial, educational, social and administrative spheres. Special factors causing sudden emigration or influx of population should also be foreseen to the extent possible. Lag period shall be considered 1-3 years depending on the project. A judgment based on these factors will help in selecting the most suitable probable trend of population and shall be adopted accordingly and its logical justification should be given. This design population figure should then be used to calculate water demand for the proposed water supply scheme.

5. Water Demand

a. Domestic Needs: Recommended per capita water supply level for designing of the scheme for domestic purpose shall be adopted @ minimum *55* LPCD (desirable 70 LPCD) or *as decided by community with water security and safety plan* for household connections.

b. Institutional/Industries and Commercial Demands: The water requirement for the institutions shall be provided in addition to domestic water demands with due consideration to present and likely upcoming institutions during design period like government and other offices, hospitals, hostels, nursing homes, boarding and day schools/ colleges, residential hotels cinema, concert halls, tourist influx etc subject to minimum provision of 5% of domestic needs (or actual situation based demand). The forecast of water requirement for the small scale industries and commercial establishment shall be based on nature and magnitude of the future development of the area with due consideration to the natural resources and other desired factors during the design period etc depending upon the potential/ growth.

c. Fire Fighting Demands : Provision for fire fighting demand to be met through hydrants shall be governed by the mathematical formula 100P where P is population in thousands and quantity shall be in kilolitres subject to minimum provision of 5% of total water demand (a+b+c) with reference to IS:166A.

d. Line losses: Provision for losses of water in pipe lines (raising mains and distribution system) including UFW/ NRW shall be limited to 20% of the total water demand. In addition to this 3% to 5% provision shall be made on account of backwash in case of WTP only of total water demand.

e. Live Stock Demand: The water requirement for the live stock shall be met from alternate existing sources, if such source is not available, demand shall be provided in addition to domestic water demands with due consideration to present and likely population of livestock (habitation wise) shall be accessed over the design period subject to minimum provision of 30 liters per unit per day in addition to domestic needs.

The DPR may also include:

- Details of proposed sources, details of proposed conjunctive use of water for different purposes from surface water, ground water, rain water, recycled water.

- Details of traditional sources of water in the village, present use, proposed use, revival, repairs or augmentation of any such sources proposed in the scheme.
- Details of assessment of safe yield for all the new or existing sources, proposed to be used as source of scheme.
- Water quality parameters for pre and post monsoon period of various sources including all proposed sources should be annexed.

6. Present status of Water supply and Sanitation

6.1 Details of all present sources including Open Wells, Tube wells, Hand pumps, Ponds, Reservoirs, Lakes, Springs etc. with approximate sizes and capacities.

6.2 Water use from all above sources. Water levels and yield with seasonal variations. General geology of the area, Hydro geo morphological details etc.

6.3 Present arrangements of drinking water supply in the village, per capita availability with seasonal variations, general water quality and problems related to drinking water supply.

6.4 Details of Sanitation status including coverage through Individual household toilets and details of existing Solid waste and waste water disposal systems, NGP status and health issues, if any.

6.5 Details of all the schools and Anganwadis in the village, private or Govt. and details of their existing water supply and sanitation arrangements.

6.6 Present O & M arrangements for water supply scheme of the village, Agency for O & M, no of private household/ other connections (commercial/industrial etc) if any, no of public stand posts, status of metering, water rates, cycle of billing (once in a month or once in two months etc.), percentage recovery against billing, annual expenditure on O&M against revenue recovery. Any Govt. subsidies or grants such as O&M grant or electricity subsidy etc, Central or State Finance Commission funds received during last few years and details of their use.

7. Institutional set up and details of formation of VWSC

Give details of institutional setup including the formation of the Village Water and Sanitation Committee (VWSC) with details of women members etc. as per NRDWP guidelines, role of VWSC in present O&M activities, if exiting, in preparation of this scheme and proposed role in its O&M should be described clearly. Gram Panchayat/ VWSC shall be willing for preparation and construction of the new scheme. In initial stage, at least 75% households shall have willingness to take individual tap connection.

Give details of awareness generation and training activities cost and agency proposed formation and capacity building of VWSC, about 2-3% of project cost can be set apart for this.

The G.P. /VWSC shall have a willingness to contribute 5% of the cost of the scheme upfront as

corpus fund for O&M of scheme, which shall be return back by State to concerned GP/VWSC every year in part (in next 5 years), if the scheme is operated and maintained properly throughout that year. This will result in regular operation of the scheme and also help in supporting the expenditure incurred for its maintenance.

8. Details of preparation of Water Safety and Security Plans

The plans must be prepared in accordance with NRDWP guidelines. List out the agencies involved in preparation of the Water Security Plan such as GP, any NGO, any CSO, SHGs, Govt. departments or other govt. agencies such as Ground Water Board etc, any other youth club/ agency involved with their roles and contribution.

8.1 Community participation - Details of community participation in planning of the scheme, in need assessment, proposed role in implementation and O&M etc, using Service Delivery Approach (SDA) with due consideration to life cycle cost LCC of each component in integrated manner of proposed water supply system based on techno-economical feasibility over the design period to ensure sustainability.

8.2 Details of women participation and consultations with them, either as members of VWSC or otherwise, for all the above activities.

8.3 List the no. and details of HGM maps used, other resources in preparation of the VWSP.

8.4 Water Safety Plan- A Water Safety Plan will also be made as a part of this village water security plan using scientific planning tools i.e. remote sensing / GIS in conjunction with watershed. This Water Safety Plan can be prepared specific to a scheme as per standard methods, prescribed for it. The water safety Plans are primarily made to prevent contamination of source waters, to treat the water to reduce or remove the contaminants that could be present and to prevent recontamination during storage, distribution and handling of drinking water. Developing a water safety plan would involve conducting hazard analysis of the water supply scheme, identification of the control measures, defining operational limits, establishing monitoring system, establishing corrective actions and incident response, establishing record keeping and validation &verification.

8.5 Water Security Plan- Details of the final Village Security Plan including the Water Safety Plan, availability of various water resources and their proposed conjunctive use for different activities, details of Water recharging and conservation measures proposed, rain water harvesting, convergence with other programmes and how drinking water security is proposed to be achieved by implementation of the VWSP. A Copy of the VWSP is to be annexed with the DPR.

9. **Proposed Scheme** – Details of Scheme Components

Hydraulic and Structural (where ever necessary) designs of all the major components of the scheme, such as dam / anicut or pickup weir/ intake well cum pump house, infiltration gallery, pump houses, raw

and clear water pumping mains / water treatment plant including underground sump / raw and clears pumps and motors / transformers and solar systems, conveyance mains, distribution system including over head or ground reservoirs, any sustainability structures such as check dams or dykes etc. must be done as per standard engineering practices and applicable manuals and codes of the Bureau of Indian Standards IS-3370 part I to IV to be used for water retaining structures. Based on such designs, details of the following major components should be given in the scheme:

9.1 **Source**: It shall be ensured that source/s so selected shall be capable of meeting water requirement of the system for the design period with due consideration to climate change & anticipated activities in & around as well as in the upstream of the source. Normally, source dependability shall not be less than 100%.

Whether surface source if so selected is perennial or non-perennial. If non-perennial then desired impounding reservoir shall be created with necessary structural protection works to meet the lean period demands considering rainfall data of the catchment area and available gauging data so as to ensure sustainable source in accordance desired guidelines with due consideration to losses like seepage, evaporation and upstream activities with 100% dependability of the live storage. Catchment area treatment and protection shall be given top priority to ensure the source sustainability with due consideration to design period.

If surface source including impounding reservoirs/ dams (present / upcoming reservoir) which belongs to Water Resource Department (WRD) is selected, the salient features of the source and necessary permission of WRD for providing desired quantity of water for drinking water system proposed shall be enclosed.

In case of ground water sources, the decision for providing no of tube wells shall be considered based on availability of 3 phase electricity (in hours per day). To ensure the sustainability of ground water source long term summer yield test should be conducted to access specific yield. Considering summer draw down and accordingly cone of interference spacing between two tube-wells shall invariably preferably be 500 meters. For the selection of proposed T.W's advance geophysical /resistivity survey technique shall be adopted for estimation of the yield.

Water Quality test results for both chemical and bacteriological of existing sources and proposed sources shall be conducted as per BIS to meet requirement of standards of drinking water. The details may be furnished as per Annexure-I.

9.2 **Intake System**: Preferably stationary bank /appropriate RCC intake for river as a source shall be provided in case of surface source with approach if required. Capacity of intake shall be provided for 45 min of the total water demand. Diameter shall be fixed in such a way to accommodate at least 3 pumps in a row with the clear spacing of 1.5 m in between. Considering the future requirement and expansion from time to time space for additional row of 2 / 3 pumps and 3 inlet port sluice valve with spindles shall be provided. Depth of intake well shall be decided in such a way that floor of the pump house shall be 1.5 m above HFL. Provision for siltation chamber shall be made in the bottom of intake well. In case of reservoir as a source provision of head up / diversion weir shall be considered along-with

appropriate intake system. Clear head room of pump house over intake shall not less than 6m. Suitable manually operated gantry shall be provided subject to minimum of 5MT.

9.3 **Raw Water Pumps**: Suitable raw water pumps (specify type of pump) shall be provided 50% standby (at least minimum one unit additional) arrangement (Number of pumps shall be selected in a such manner to ensure optimal running considering required water demands over the period subject to minimum of 3 pumps) including installation and testing commissioning in accordance with norms and the required discharge (considering availability of electricity) and total design head along with all necessary accessories like cables, control panels, safety equipments, valves and fittings etc.

In case of erratic/ failure of electricity provision for solar based pumping system shall be made in conjunction to ensure minimum water requirement for drinking and cooking etc as per BIS norms and manual specification for multi village piped water supply scheme and dual pump mini solar based water supply systems. Solar pumping systems which consist of photovoltaic array (PV panels) with auto tracking system confirming to BIS/ MNRE/IEC guidelines duly certified as well as pumps powered with DC motors with controller including mounting structure, accessories and fittings, foundation etc with required specifications shall be provided. In case of solar based dual – pump mini water supply schemes water system shall be planned in accordance with guidelines issued by DDWS subject to validation and requirement of field data (Attach hydraulic designs).

9.4 **Electric Sub Station for Raw Water Pumps**: Based on the requirement of Pumps load and other accessories suitable step down transformers shall be provided including all accessories and fittings with 50% standby (at least minimum one unit additional) arrangement. Suitable provision shall be made for extension of HT line from existing available point to intake site in consultation with electricity board / agencies, provision for dedicated power feeder from nearby 133/33 KVA sub-station to intake site to be incorporated in case of very large sized/ mega projects and as per site techno-economic feasibility.

9.5 **Raw water Pumping/ Gravity Main**: Raw Water conveying main shall be designed in accordance with the laid down norms for ultimate design period (calculation supported by appropriate software considering the different stages water demand etc), based on the principle of techno-economic feasibility and financial viability with due consideration to number of factors/ parameters which affects the design. The minimum and maximum velocity shall be considered 0.60m/sec to 2m/sec while designing conveying main. Provision for necessary sluice valves, scour valves, air valves, zero velocity valves, required surged devices etc shall be considered and provided in accordance with requirement of topography and technical norms

Village piped water supply systems covering population 10,000 persons or more in the habitations to be covered, preferably using durable and good quality pipe shall be provided to ensure the sustainability with due consideration to pressure requirement including water hammer, necessary surface protections and higher pipe carrying capacity etc.

9.6 **Electric Sub Station for Clear Water Pumps**: Based on the requirement of Pumps load and other accessories suitable step down transformers shall be provided including all accessories and fittings with 50% standby (at least minimum one set unit additional) arrangement. Suitable provision shall be made for extension of HT line from existing available point to WTP site in accordance with laid down norms in consultation with electricity board / agencies. Provision for dedicated power feeder from near by 133/33 KVA sub-station to water treatment plant be incorporated in case of very large sized/ mega projects and as per site techno-economic feasibility.

9.7 **Clear water Pumping/ Gravity Main** : Clear Water conveying main shall be designed economically for ultimate design period (calculation supported by appropriate software considering the different stages water demand etc), based on the principle of techno-economic feasibility with due consideration to number of factors/parameters which affects the design. The minimum and maximum velocity shall be considered 0.60m/sec to 2m/sec while designing conveying main. Provision for necessary sluice valves, scour valves, air valves, zero velocity valves, required surged devices etc shall be considered and provided in accordance with requirement of topography and technical norms.

Multi village water supply systems consisting of more than 15 villages/100 habitations or so may preferably be design on star pattern to ensure the sustainability. With due consideration to pressure requirement including water hammer, necessary surface protections and higher pipe carrying capacity etc.

9.8 **Clear Water Pumps**: Suitable clear water centrifugal pumps shall be provided 50% standby (at least minimum one unit additional) with the required design discharge (considering availability of electricity) and total design head along with all necessary accessories like cables, control panels, safety equipments, valves and fittings etc.

In case of lack of electricity, provision for solar based pumping system may be made considered. Solar pumping system which consist of photovoltaic array (PV panels) with auto tracking system confirming to BIS/MNRE/IEC guidelines duly certified as well as pumps powered with DC motors with controller including mounting structure, accessories and fittings, foundation etc with required specifications shall be provided. Solar based mini water supply schemes shall be planned in accordance with guidelines issued by DDWS subject to validation and requirement of field data.

9.9 **Water Treatment Plant**: Based on the raw quality requirement necessary unit for the water treatment system shall be decided as per the prevailing engineering practices so that it will deliver desired quality of treated water. It shall be ensured that WTP components shall be so designed to permit a 20% overload preferably positive suction head should be considered.

Considering the system sustainability of O&M, preferably for the rural water supply smaller systems slow sand filters (SSF) technology may be adopted in conjunction with horizontal roughening filters (HRF) and or plain sedimentation (PS) as well as aeration unit if required as a pre treatment system as per requirement of raw water quality. Rate of filtration for SSF shall be adopted 0.1 to 0.2 m/hr. For HRF rate of filtration will be 0.8 to 1.2 m/hr including

gravity feed disinfection system. Collecting sump well capacity shall be kept in between 45 min to 60 min. The hydraulic design need to be attached. All filter components shall be designed in accordance with the laid down norms. For larger scheme provision of rapid gravity filters shall be adopted.

9.10 **Over Head Reservoir (OHR)**: The capacity of service reservoir shall be 1/2 of total designed demand based on 15 years of design period. The design of service reservoir shall be based on safe bearing capacity of the soil; a due consideration shall be taken for type of soil (Black cotton soil) to avoid unequal settlement and for seismic requirements of the area, preferably raft foundation may be considered in the designs of the reservoir. The staging of overhead service reservoir shall be decided on the basis of Total frictional losses in the carrying system + Residual head required - /+ Positive / Negative static level difference (ground level of service reservoir – maximum ground level of distribution mains). The residual pressure (Terminal head) shall be consider in view with the trend of growth of the village (may be from 7 to 12 meter). GL Overhead tank shall be preferably placed on higher altitude/ elevated ground as well centrally located in consideration with availability of land(attach structural design).

9.11 **Water Distribution Network (WDN)**: The distribution system shall be designed as gravity system but not be as pumping system. Network of distribution mains along both sides of the Railways and National Highways falling within habitation/village, and bulk water meters, valves, specials, valve chambers etc. shall be incorporated in the proposal. The distribution layout should be such as to facilitate isolation of sections, metering for assessment and control of leakage and wastage. Elevation of service reservoir shall be kept so as to maintain minimum residual pressure. Zoning in the distribution system ensures equalization of water supply in the area. It shall be ensured that zones shall be interconnected. Also necessary provision for equitable water distribution to each house shall be made using modern techno-economical technology options especially in hilly terrain where pressure variation is high.

The friction losses on account of fittings; valves, specials etc. to the extent of 15% maximum may be added to calculate total losses (attach hydraulic Design).

Design norms for Water Distribution Network

a.	Peak factor	3
b.	Minimum Pipe Size	80 mm/ 63mm (velocity in pipes 0.6 to 1m)
c.	Minimum residual Pressure	(i) 7 m for single storey (ii) 12 m for double storey

d. Type of pipe: the pipe materials to be used in rising & transmission mains, distribution network etc. shall be selected, based on the specific design requirements including local conditions as per Jharkhand DWSD direction(Letter No. 3979 dated 24.9.12).

e. Mode of House Connection: Provision for giving households connection through ferrule in WDN or metered as per community acceptance.

9.12 Minimum House Connection:- Minimum 50 % households of project area shall be provided with service connection with completion of project within their premises which will be increased to 100% household within next five years.

9.13 Source Sustainability structures: Sustainability structures with details of convergence with other programmes, works proposed to be done under MGNREGS. Block level action plan shall be developed for sustainability structures using GIS as a tool based on remote Sensing.

9.14 Waste water disposal arrangements: Details of waste water disposal arrangements/ management should be provided and should be incorporated in all DPRs through low cost measures like stabilisation ponds and other options by convergence with MNREGS, NBA, etc.

9.15 Water use efficiency: Provision of bulk water meters at rising main shall be made at the entrance of each gram Panchayat /habitation.

9.16 Reduction in NRW/UFW: The cost of the consumer's connection should be incorporated in the project cost, with water meter or without meter as decided by the community, which can be recovered from them with the water bills within three years, so as to provide water connection as per specification for reduction in NRW/UFW.

9.17 Provision of Automation & SCADA: Automation & SCADA may, preferably, be incorporated in case of multiple village scheme (Major /Mega schemes) depending upon techno-economic feasibility.

9.18 Leak Detection Provision: For efficient functioning of pipeline system of the project suitable provision shall be made for leak detection as well as swabbing instruments along with support of capacity building activities.

10. Cost Estimates

10.1 Detailed Estimate: Detailed estimates for each component of the scheme shall be prepared in accordance with design and drawing shall be enclosed. Life Cycle Cost Approach (LCCA) of each component in integrated manner of proposed water supply system based on techno-economical feasibility over the design period to ensure sustainability may be followed. For further details given in para-11 may be referred.

10.2 Rates In Estimate: Rates for each item of work shall be based on the current schedule of rates applicable in the area. If this schedule is not updated, then the prevailing rates above this schedule shall be used and as a proof of this (with rate analysis), copies of some sanction orders of approval of such rates for other neighbouring works shall be enclosed. Prevailing rates of materials for items like pipes and pumps etc shall be used in preparing these cost estimates and copies of relevant rate contracts/ price lists etc for such major components shall also be attached with the DPR.

10.3 Per capita cost, based on these cost estimates shall be worked out for the census population, for the present population and also for the design population and will be

compared with the prevailing per capita cost of other schemes in the area. Details of funding and year wise requirement of funds shall be given.

10.4 Land: The land required for construction of head works and other structures like overhead tanks, ground level reservoirs etc shall identified and be arranged by the Panchayat free of cost (Attach declarations of PRI/VWSC). In case Panchayat land/ GM land is not available, the land required shall be arranged/ purchased accordingly provision for land acquisition should also be made with the consent of user group/PRI/VWSC and land owner (Attach the declaration of land owner along with signature of PRI/ VWS member / user group as witness). In case of GM land proposal shall be submitted separately to competent authority with its full details so as the land can be got reserved for the purpose.

10.5 Approval of DPR is mandatory from SLSSC for all projects funded under NRDWP /external agency. Before placing the DPR to SLSSC, appraisal of same is mandatory from STA /CDO of the department (list of identified project should be get approved by CDO) DPR.

11. Life-Cycle Cost Approach

11.1 Given the project's objectives and after having arrived at the demand forecast, the next task is to identify the options or alternative ways of producing the required project output. The selection of the least-cost alternative in economic terms from the technically feasible options promotes production efficiency and ensures the most economically optimum choice. The alternatives considering factors like different designs and technologies; different scale (large/ mega projects) and time phasing of the same project; different sources of water supply, the project components in different feasible locations and also need not be limited to technical or physical ones only but could also include options related to policy of the Jharkhand State. Further, it must be noted that conventional least-cost analysis approach, while ensuring production efficiency, does not provide any indication of the economic feasibility of the project since even a least-cost alternative may have costs that exceed the benefits (in both financial and economic terms).

11.2 The options related to policy measures may include demand and supply management. The options considered must be realistic, not merely hypothetical and should be implementable.

11.3 Once the feasible alternatives are identified, the next step is to estimate the entire life-cycle costs (initial capital costs and future operating and maintenance costs) weighing for each option-first in financial prices and then in economic prices by applying appropriate shadow price conversion factors. Estimating the entire life-cycle costs involves close cooperation between the economist and the engineer and shall be done with the help of STA/ Expert.

11.4 Finally, the discounted value of the economic costs for each option is to be worked out using the prevailing economic discount rate. On this basis, the alternative with the least economic cost can be selected. The different methodological approaches may be followed.

11.5 Initially, the life-cycle cost approach shall be practiced in preparation of DPRs of medium/ large/mega projects including schemes for multi habitations. Further details are given in Annexure-II.

12. Operation and Maintenance

12.1 Annual Running and Maintenance estimate to be prepared giving details of estimated expenditure on all major components such as electricity, chemicals, manpower/ labour, repairs and maintenance of electrical / mechanical works, civil works and pipe lines etc. year wise, from the date of expected commissioning for 5 years & at intermediate stage i.e. 15years and ultimate stage i.e. 30 years.

Further, suitable formats for maintenance of different activities shall be prepared in shape of job card and furnishing with all required information regularly, so as to assess annual material requirement, trend of preventive maintenance and activity wise frequency of breakdown which will help supervisor/ operator to check the frequency of breakdown and also to reduce the downtime which may also leads to reduce the maintenance cost of the scheme.

12.2 Cost of Installing Service connection: The cost of installing household water meters and initial household connection charges shall be levied to consumers in full or instalments or as decided by the DWSD, Jharkhand. Calculation of water rates and proposed tariff based on the estimated O&M expenditure should be indicated. Proposed mechanism of cost recovery with details of total annual expenditure, revenue to be realized from private connections/ stand posts/commercial connections, details of proposed deposits for new connections (for left out houses/ commercial connection as decided by community), subsidy structure for weaker sections, differential rates, any govt. subsidies or grants for O&M, Central/ State Finance Commission funds, shortfalls of expenditure and recovery, if any and how the balancing is proposed.

12.3 Details of institutional mechanism, details of personnel available for the proposed scheme, additional persons to be arranged/ hired, mechanism of billing, accounting, bank account to be opened or existing account to be used, account operation details.

12.4 Procedure of Audit to be followed for implementation and O&M, social audit and the financial audit by C.A.

12.5 Details of grievance redressal system may be given.

13. Water Quality Monitoring

13.1 Present status of water quality of drinking water sources to be given. If the scheme has been proposed for mitigation of any of the water quality problems, the latest water quality test reports of the affected sources are attached and full description be given in the DPR.

13.2 Present arrangement of WQ testing, availability of FTKs in the GP and its use and other available testing facilities, cross checking protocol is mentioned.

13.3 Present and proposed arrangement of community participation. Role of PRI, VWSC, Jal Sahia, ASHA workers, Anganwadi workers, any social workers, NGOs, schools or hospital/ PHC and trained persons of NRDW QMS programme be specified in water quality monitoring and surveillance of the scheme.

13.4 Display of Water Quality test results of drinking water sources for community knowledge & use and details of record keeping and reporting.

14. IEC and HRD activities

14.1 Brief description of the PRI structure, VWSC details and details of the O&M agency if it is different, available staff/ workers for activities related to the village water supply with their expertise & experience, available skills in the village and identification of improvement needs at different levels.

14.2 Details of proposed programmes and trainings for capacity building of the PRI & VWSC members, other workers and the O&M staff. These programmes and trainings or visits etc shall be designed to suit the specific local needs of the water supply system. Further, to ensure efficiency and sustainability swabbing and leak detection shall be the part of regular O&M of pipe line system for which necessary provision and capacity building shall be made.

15. Other Designs Norms & Practices

The attempts shall be made to follow well laid design and estimation norms published by BIS, the Government of India /State Government Jharkhand & Ministry of Drinking Water and Sanitation from time to time, the due reference should be provided in DPR adopting the same.

16. Scheme Completion Schedule

16.1 A time schedule for completion of the scheme works shall be prepared in form of CPM/ PERT chart and will form part of the DPR. Schedule of completion for each item of the scheme will be given in this. It shall be prepared in a simple Bar Chart format easily understood and used by the field staff of the implementing agency, PRI, the VWSC and the user groups.

This may be prepared taking the date of Administrative Sanction of the proposed scheme as day one and from that date, time requirement for various activities such as detailed survey, if required for some item of work, preparation of the detailed notice inviting tenders, issue of tender notices, receipt and processing of tenders, issue of work orders, various stages of material procurement like pipes, specials and pumps etc, actual construction activities, electrical connection, starting of trial run and commissioning, O&M period by the implementing agency during which the staff of the O&M agency will also be involved and trained on different aspects of maintenance of the scheme. All the local site conditions,

festivals, seasonal problems in labour availability etc. must be kept in mind while deciding the time periods for various activities so that a realistic completion schedule is made and adhered to.

16.2 IEC and HRD Time Schedule: This completion schedule shall also include the activities related to the IEC and HRD from beginning to the handing over of the scheme to the O&M agency/ PRI/VWSC/community.

17. Completion Reports (To be incorporated in Tender document of the Project)

17.1 Scheme Completion Report: The scheme implementing agency shall prepare a completion report and submit it to the O&M agency, this report shall be prepared even if both the agencies are same. These completion reports shall also include the following information/documents:

17.2 Details of actual works executed under the scheme with quantities, sizes, other specifications and item wise expenditure incurred with details of total expenditure on the execution of the scheme.

17.3 A map giving details of all the scheme components, pipelines, location of all the valves with types, sizes and lengths of all the pipes used. Drawings and designs of all the major works such as treatment plant pump houses, all the tanks etc must also be made available to the O&M agency.

17.4 A check list for regular O&M and essential items for preventive maintenance with a descriptive note on how the valves are to be operated, how various pumps are to be operated, treatment procedures, disinfection procedures with details of the chemicals, their specifications and shelf life, and quantities/ doses etc be clearly mentioned.

17.5 Details of main items and equipments used such as pipes, valves, water meters, pumps and other electrical equipments used in the scheme, their full technical specifications and manufacturer's warrantees etc with their copies be given.

17.6 Procedures and protocol for water quality testing, its frequency and parameters to be tested etc. and details of the action to be taken, if the test results are not found as per specifications.

17.7 Details and procedure of record keeping such as pump log books, register of chemicals and other consumables, valve operations, meter readings, water sample testing and financial accounting etc.

17.8 List of quantities of various consumables and other pipes and specials etc required for one year's operation and maintenance of the scheme and details of requirement of funds for annual O&M including energy charges, cost of chemicals and other consumables, civil and electrical & mechanical repairs and labour etc complete.

17.9 Details of land acquisition for the scheme, if any, with copies of the documents, copies of any other agreements, such as for electrical connection or for taking raw water from a reservoir etc.

18. Approval of Projects

18.1 The DPR prepared as suggested above by DWSD, Jharkhand /Consulting Agency must be signed by the competent authority after obtaining approval from concerned Panchayat Raj authorities etc. All future domestic water supply projects should invariably include all the components and aspects etc. referred herein this document.

18.2 A Project Appraisal Cell at the State level and the State Technical Agency (STA) or identified technical body by the DWSD, Jharkhand should vet the quality and design of the project proposals (DPRs) before placing them to the State level Scheme Sanctioning Committee (SLSSC).

18.3 The DWSD Jharkhand may initiate preliminary survey, preparation of pre-feasibility report having focus on water source sustainability and social aspect scoping as per Annual Action Plan (approved by SLSSC) for the state after which DPR should be prepared as envisaged in this document for obtaining approval of SLSSC.

ANNEXURE I

DETAILED OF DRINKING WATER SOURCES AND THEIR UTILIZATION FOR THE PROPOSED PROJECT

Sl. No.	Description of Drinking Water Sources	No. of Sources	Existing or New proposed Sources	Total Quantity of Water to be used for the Scheme(KLD)	Water Quality of Source	Remarks
1	Dug well/open wells					
2	Tube well/bore well					
3	Spring					
4	River					
5	Reservoir/pond/lakes					
6	Canal					
7	Infiltration gallery/ infiltration well/ Intake well					

Add other sources if needed.

ANNEXURE II

Brief on Life-Cycle Cost Approach

Methodology

1. Life-Cycle Cost (LCC) approach analyses the aggregate costs of ensuring the delivery of adequate, equitable and sustainable water supply services to a population in a specified area. Unlike the conventional Least Cost assessment, the life-cycle costs approach adopted for water supply cost does not address project evaluation, but adopts a service delivery approach, i.e., it assesses the costs for providing a certain level of service in a sustainable manner. It looks at the costs that have gone into service provision rather than incorporating all the costs that are demanded in a project evaluation frame. The costs assessed in water supply cost cover the construction and maintenance of systems in the short and long term, taking into account the need for hardware and software, operation and maintenance, the cost of capital, source protection, and the need for direct and indirect support costs, including training, planning and institutional pro-poor support. The delivery of sustainable services also requires that financial systems are in place to ensure that infrastructure can be renewed or replaced at the end of its useful life and to extend delivery systems in response to increases in demand.

Components of Life-Cycle Costs

2. Cost components include not only the construction and operational costs but also the capital maintenance and IEC (information, education and communication) costs.

Cost components and calculations

3. Capital expenditure (CapEx) has two components, namely hardware (CapEx-Hrd) and software (CapEx-Sft). CapEx-Hrd is the establishment of water infrastructure, water extracting elements, purification equipment, storage reservoirs, distribution systems, etc. CapEx-Sft includes the costs of planning and designing the water and sanitation schemes at habitation level. The capital costs, hardware as well as software are one-time costs. All the CapEx investments are cumulated over the years. All costs are converted to current values using the National GDP inflator for the specific years.

4. Capital maintenance expenditure (Cap-Man Ex) is another major expenditure head is spent on renewal and rehabilitation of systems i.e. Replacement of major equipment like pump sets; boreholes plant equipment, distribution systems, etc. Cap-Man Ex is also summed over the years and converted to current values.

5. Operational expenditure (OpEx) is spent on the regular maintenance of the systems. OpEx is the responsibility of the Panchayati raj (local government) institutions.

6. Expenditure on direct support (ExDS) is defined as the investments or expenditure on support during post implementation of the water supply systems. These could be in the form of IEC activities, demand management initiatives etc.

7. Expenditure on indirect support (ExIDS) is the costs associated with macro planning and policy making at the national and state level.

8. The cost of capital (CoC) is the interest payments on any borrowed money.

9. CapEx-Hrd and the CapManEx are annualised using the normative life span and actual life of the systems. The component normative life spans for hardware such as boreholes, pumps, pump houses, overhead reservoirs, hand pumps, etc. is the actual number of years the component lasts? Comparing these two one can assess whether the actual cost of provision is more or less than the estimated costs.