DELHI JAL BOARD
GOVT. OF NCT OF DELHI
OFFICE OF THE MEMBER (WS)
VARUNALAYA PH-II: KAROL BAGH, NEW DELHI-05

No.F- 15 /DJB/M(WS)/2014/ 2850 to 2862   Dated: 31.07.2014

CIRCULAR

Regarding formation and monitoring of DMAs to reduce NRW in each maintenance zone.

All Chief Engineer Maintenance were directed to implement DMA approach for NRW reduction in the areas under their respective jurisdictions. It was decided that each Executive Engineer Maintenance will establish two DMAs as pilot projects. It is observed that not much progress has been made in this direction by the divisions so far. A set of guidelines on creation of DMAs along with step by step procedure to be followed is being enclosed as Annexure "A" for reference of all concerned for developing more clarity and expediting implementation of DMAs. Initially step, a broader level target to achieve billing for 400 MGD water has already been set. This has been instructed repeatedly in the meeting of the Focus Group at the level of CEO.

General NRW reduction : To achieve the overall target, it is necessary to achieve an increase of billed volume in each of the Zones/Circles/Divisions by at least 30%. Each CE/SE/EE and their revenue counterpart will make a presentation on the progress already achieved in respect of their jurisdiction since the beginning of this financial year and the plan to achieve this by the end of the financial year. The presentation will also cover SLBs (list enclosed in the annexure) as set by UD ministry in terms of their current status and targets for the

entire year including the progress made since the beginning of the financial year.

Detailed presentation will be started from 1st week of August'14. Points / issues to be included in the presentations are attached for reference. All Chief Engineers will ensure regular monitoring of the NRW reduction measures and other critical parameters regarding billing, water supply status, leakages, unauthorized connections etc in their respective areas.

Encl : <u>As above.</u>

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MEMBER (WS)
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<u>All Chief Engineers (Maintenance).</u>

Copy to :

1. CEO for kind information.
2. Mem(A) / Mem (F) / Mem (Dr.).
3. Addl. CEO / CE(W)Proj. / CE(WW).
4. Secy. DJB.

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MEMBER (WS)
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MoUD SLBs for WATER SUPPLY

S. No.	Indicator	Benchmark
1.	Coverage of Water Supply connections	100%
2.	Per Capita Supply of Water	135 lpcd
3.	Extent of Non-revenue Water	15%
4.	Extent of Metering	100%
5.	Continuity of Water supplied	24 Hours
6.	Efficiency in redressal of customer complaints	80%
7.	Quality of Water Supplied	100%
8.	Cost Recovery	100%
9.	Efficiency in Collection of Water Charges	90%

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Guideline on NRW Reduction with DMA Approach

This guideline describes briefly the steps involved in NRW reduction activities by District Metered Area (DMA) approach.

The main steps are outlined below and each step is explained in more detail in the following sections.

1. Obtain/prepare map with planned DMAs
2. Select a DMA
3. Update pipe network drawing/information
4. Update and analyze customer data, conduct household survey
5. Prepare DMA; procure and install bulk meters, install isolation valves
6. Conduct NRW baseline survey by water balance, measure MNF in case of 24 hrs supply
7. Implement countermeasures
   ✓ Detect and repair leaks
   ✓ Replace defective meters
   ✓ Regularize illegal connections, eliminate missing customers
   ✓ Change house connections
8. Evaluate result by repeating water balance and MNF measurement

Step 1: Obtain/prepare map with planned DMAs

1.1 The JICA Water Master Plan has tentatively identified DMAs in whole Delhi. If you do not have the map showing the DMAs in your area obtain one for your division from mapping cell.

1.2 The map should also show general features such as roads, railway lines, drains and network features such as pipe, valves, and tubewells in a single sheet of paper.

1.3 Check the DMA boundaries planned in the Master Plan and identify three or four whole DMAs from the plan.

1.4 In some cases it may not be practical to take whole DMAs planned in the Master Plan because of the sizes. In such case take a part of one planned DMA rather than taking segments from more than one DMA.

1.5 Fine tuning of DMA boundaries may be required for several reasons such as to use an existing valve as isolation valve, or to avoid important clusters being divided into two DMAs. Refine the boundary as needed and mark the DMAs on the map.

1.6 Provide identification numbers to each DMA.

Step 2: Select DMAs

2.1   From the identified three or four candidate DMAs from Setp 1, consider the following factors:
   - Less number of inlet and outlets
   - Number of water connections
   - Longer duration of supply
   - Higher leakage
   - Old pipes
   - More contamination complaints

2.2   Prepare a brief comparison table for these candidate DMAs with respect to the above factors.

2.3   Select two DMAs from the list in consideration with the above factors. If necessary, get second opinion of higher authority or experts from ongoing JICA Assisted Delhi Water Supply Improvement Project in Chandrawal WTP Command Area.

Step 3: Update Pipe Network Drawing/ Information for the DMA

3.1   Prepare/obtain an enlarged map of the selected DMAs.

3.2   Perform a thorough check of pipe network, valves, existing bulk meters, and tubewells on the map. Use available records such as as-built drawings; get input from field staff of the corresponding area to update.

3.3   Mark items that no more exit in the field but are still shown in the map. Similarly add new items not shown in the map. Also mark the items that need further investigation.

3.4   Conduct field survey by mobilizing staff knowledgeable of the area to verify the items requiring investigation.

3.5   Use of pipe and valve locating devices or even excavation of trial pits may be required during field survey. You may need the help from LDI cell.

3.6   Prepare the updated map incorporating field investigation result.

3.7   Identify inlet, outlet, and isolation points. Note pipe material and sizes at these locations. Aim for a single inlet and no outlet as far as possible.

Step 4: Update and Analyze Customer Data/ Conduct Household Survey

4.1   Collect customer and billing data for at least one year from the Revenue Management System

4.2   Analyze the data
   - Categorywise breakdown of customers
   - Metered and unmetered customers

- Consumption analysis; total quantity of water invoiced
- Comparison of billed quantity in each house at successive cycle
- Large customers: numbers, consumption, etc
- Special customers such as hospitals in the DMA

4.3   Conduct household survey. Prepare a list of all connections in the DMA and mobilize field staff to visit each household with this list and update data. The main data to be collected/updated include:
- Unserved households
- Illegal connection
- Unmetered connections
- Defective meters
- Household population

Household survey can also be conducted in parallel with the following step (DMA Preparation).

Step 5: Prepare the DMA

5.1   Procure and install bulk meter at inlet and outlet points.

5.2   Construct chambers to house the bulk meters.

5.3   Prepare ½ inch tapping on inlet and outlet pipes for pressure measurement.

5.4   Procure and install bulk meters in tubewells.

5.5   Install isolation valve(s) on pipe(s) crossing the DMA boundary. These valves need to be closed completely during the study period.

5.6   Make sure all the bulk meters and valves are working properly before starting next step.

5.7   Also make sure there remains no unknown connection crossing the DMA boundary and the DMA can be hydraulically isolated by closing isolation valves installed in above step.

Step 6: Conduct NRW Baseline Survey by Water Balance

'Water Balance' is the process by which we know how much water is supplied to the DMA and how much is used by customers as indicated by their meters. Purpose of this step is to estimate existing NRW in the DMA. This should be done before implementing any correctional works such as visible leak repair, defective meter replacement etc. NRW is defined as:

NRW = (System Input – Billed Authorized Consumption)/System Input

6.1 'System input' or water supplied to the DMA is measured by bulk meters installed at inlet, outlet, and tubewells. Read and record the readings of these bulk meters twice; at the time of starting first house meter reading and after completing second house meter reading (explained in sub-step 6.2).

6.2 Customer consumption is calculated from customer meter readings done twice, at the beginning and end of a defined period. This period can be a week.
- Organize first readings of house meters on a convenient day of the week. All the customer meters in the DMA should be read in one day and when there is no supply in the area. For total connection of about 1500 as many as 20 meter readers will be required to finish the reading in one day.
- Repeat the reading after one week.
- Calculate the consumption recorded by each meter from the two readings.

6.3 Calculate overall NRW
- Calculate total water supplied to the DMA during the period between the first and the second house meter readings from bulk meters reading data.
- Calculate total metered consumption from house meter readings data.
- For unmetered, defective meters, and unable-to-read meters, estimate consumption using the procedure that DJB would follow during regular billing.
- Calculate NRW from the above equation.

6.4 Night flow measurement and analysis
Purpose of night flow measurement is to estimate real loss (leakage) in the distribution network. This sub-step is applicable only to those DMAs where the supply is continuous or can be continued for four (or at least three) consecutive nights without any interruption. For those DMAs which do not meet the above criteria please skip this sub-step.

- Install pressure loggers/ meters in all inlets and outlets, if not already installed.
- Select a time frame covering four (or at least three) consecutive nights.
- Stop all the tubewells.
- On the second night, start taking reading for pressure and totalized flow from each bulk meter at 15 minutes interval at about 8 pm and continue until 4 or 5 am. Repeat this exercise on the third and fourth nights as well.
- If the bulk meters are mechanical type without data logging facility the meters should be read manually at each 15-minute period. If the bulk meters are the one with data logging facility then the data should be logged at 15 minutes intervals.
- From the recorded data calculate flow rate in suitable units (like m^3/h). Arrange and plot flow rate and pressure data.
- Note the lowest flow rate which generally occurs at around 2 am. This is called Minimum Night Flow (MNF).
- More on this topic including analysis of MNF and estimation of leakage can be obtained from related experts of ongoing Chandrawal project.

Step 7: Implement Countermeasures

7.1 Detect and repair leaks

The leak detection survey procedure is briefly outlined below:

- Prepare network map to the scale at which sufficient details of network is visible. Usually a map of 1:500 is required for densely inhabited areas.
- For the intermittent system leak detection survey timing is dictated by water supply time in the area. Conduct survey for visible leaks by moving along the pipe routes and carefully observing any sign of water leak.
- For underground leak detection help may be required from LDI cell because it requires trained personnel and equipment which are available in the cell.
- Leak repair
  - Leaks (except major bursts) should only be repaired after NRW baseline determination.
  - Always use quality materials for leak repair. Method of leak repair depends upon the place of leak occurrence and pipe material. If it is from pipe body, leak can be repaired by leak repair clamp, or cutting the leaking section and connecting with new pipe. If the leak is occurring from joints repacking of the joint will be required.

7.2 Replace defective house meters

Replace all defective house meters. Follow the DJB procedure. List of customers with defective meters will be available from the customer database prepared at earlier step. The first and second house meter readings will also indicate defective meters.

7.3 Regularize illegal connections, eliminate missing customers

Follow DJB procedure to regularize illegal connections found during house to house customer survey. Register/initiate the process of registering missing customers as new customers by following due procedure of DJB.

7.4 Change house connections

House connections with the following characteristics should be given priority for replacement:

- House connection which shows greater difference between LPCD supplied and LPCD billed.
- House connection which is visibly worn-out and corroded.
- Repairing the leak but not replacing the whole connection may be considered for house connection which is still in good condition but leaking from some point.

Step 8: Evaluate Result

8.1 Repeat water balance and calculate new NRW.

8.2 If applicable, measure MNF and calculate real loss.

8.3 Compare with NRW and real loss levels measured earlier (before countermeasures).

8.4 Calculate cost effectiveness by comparing total cost incurred and NRW reduced. An example unit for this is Rs X spent per kL of water saved per day.

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Points and issues to be covered in the DMA Presentation by EEs.

1. Lay out of DMA

2. Mark Incoming & outgoing pipelines in DMA.

3. Number of water Connections

4. How many metered, working & non working meters details

5. Billed volume in DMA against supplied volume (if there is no meter on inlet & outlet pipes at present, then assess quantity in best possible manner)

6. Duration and timings of water supply in Mng & Evng.

7. Visual leakages observed during recent inspection (give date) by ZE during supply hrs.

8. How many bills issued on average basis.

9. Survey report of inspection done in supply time to get first hand Status of tank overflow within DMA

10. How many chalian issued in DMA in last 6 months.

11. How many leakages attended in last one year & which type. (From ferrule, from distribution pipe etc)

12. Material of distribution network & it's age.

13. Photographs showing critical points in DMA which EE wishes to attract attention.

14. How many consumers are defaulters in making payment with total arrears pending in DMA.

15. How many illegal connections detected in DMA in last one year as per record.

16. Any specific checking done to see if consumer has drawn service pipe ahead of meter.

17. What is the billing cycle or how many times bills were issued in last one year.

18. Whether all meters are DJB owned ? If yes when provided. If no when the pvt meter was installed by consumer irrespective of the fact whether working or not working. (to know age of meters)

19. Timelines to be given against each deficiency for taking corrective measures.

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