Sub: Construction Management System: Circular – 3
Ref: Guidelines for “As built drawings” submission for projects in Phase-III under RUSDP.

“As built drawings” are usually the original design drawings revised to reflect any changes made in the field, i.e., design changes issued by change order, component relocations required for coordination, rerouting of distribution systems etc. These drawings are important for following purposes:

i. They are a record from which future system changes and/or additions can be designed. Future renovation projects will be more efficient and less disruptive if the as built documents can be depended upon for critical information such as pipe and duct routing and sizing, terminal unit locations, control system sensor and instrument locations, etc.

ii. “As built drawings” can be a valuable tool for the O&M staff.

iii. “As built drawings” are very important document for any sub-project, which helps later on in getting details and locating the status of created assets like sewerage network, pipe line net work, water tanks, STP’s & WTP’s drains, bridges, etc. on ground and their salient features.

It has been observed earlier in the Contracts of RUIDP that contractors find it difficult to submit “As built drawings” after completion of the sub-project and the final payments and closure of contracts get delayed. Therefore, it is essential to prepare these drawings simultaneously as the work proceeds to avoid any confusion at later stage. If it is not being prepared simultaneously, it may lead to either incomplete or wrong information on the “As built drawings”. The following guidelines should be followed in this regard:

1. The contractors are required to prepare and keep up-to-date record of “As built drawings” during execution of works in accordance with the requirement of Contract Agreement. These drawings are to be submitted by the contractor for the completed part works with each running bill during execution and final detailed “As-built drawings” with the final bill after completion of the works as a necessary requirement for getting “Taking-over-certificate” as detailed in the respective clause of the Contract Agreement.

2. SE-PIU should ensure that “As-built drawings” are prepared simultaneously and checked for its correctness and the same should be submitted by the Contractor for the completed part works with each running bill along with soft copy so that the same may be used for updating of available digitized town base maps.

3. “As-built drawings” shall be marked on digitized town base maps by the Contractor and be checked by PMDSC for its correctness. Package In-charge, PIU and SE, PIU
shall ensure that “As-built drawings” are being prepared by Contractor and updated on digitized base maps by PMDSC regularly.

4. SE, PIU should ensure that as soon as the work is completed final detailed drawings are submitted by the contractor after detailed checking by the Employer’s Representative along with the final bill.

5. The drawing shall be Stamped “AS BUILT” with dated seal & signature of contractor’s & Employer’s Representatives.

A. Water Distribution System

6. The “As-built drawings” shall be prepared for each individual District Metered Area (DMA) as a unique map. As new consumer connections will be effected or any of the exiting consumer connection disconnected any time after the system is declared commissioned, the “As-Built drawings” of individual DMA shall be duly replaced by end of every quarter of the financial year duly incorporating the modifications carried out during the quarter of the year under reference.

7. While preparing the “As-Built drawings” for reporting the completion of pipe laying work of the water distribution pipelines in each DMA shall contain the details of types of pipes, pipe length, joints etc. It is necessary to differentiate the drawings in different pipe stretches in different types of pipes.

8. Consumer communication pipes are also laid including ball valves and consumer water meters. It is required to provide the details on the map of the consumer communication pipes, i.e. the consumer service connection pipeline between ferrule and the ball valve giving:

   A. Detailed geo-referenced alignment of the completed pipeline,
   B. Details of consumer connections shifted on these pipes including:
      a) consumer number as in PHED records;
      b) the new consumer number as per the circular of PHED,
      c) pipe size and material, pressure class, node nos as assumed for the distribution system design;
      d) separate lists pertaining to consumer connections giving:
         i. the consumer connection number in PHED record;
         ii. the new consumer number as per the PHED Circular;
         iii. old consumer meter serial no. and its reading at the time it is made defunct with date and time of reading;
         iv. new consumer meter make, model & serial number and its reading at the time of installation with date and time of reading;
         v. reading of the water meter at the end of the month which shall be sent to the Employer with date and time of reading;
         vi. readings of the water meter used for the calculation of NRW during the NRW test with date and time of reading. Kindly note that it will be preferred if the readings of any water meter for consecutive months are taken at the same time of the day and all water meters in any DMA are read in as short time duration as possible.

9. The number of consumers supplied on commencement of supply to the consumers in the DMA shall be clearly marked in bold in a Text Box. The date of commencement of supply with a system found performing as per the performance criteria shall be also marked in bold below the no. of consumers supplied. Employer’s Representative shall endorse the Date of Commencement of Supply conforming to the Performance of the distribution system. Any new consumers connected to this newly built system before end of the calendar-month shall also be indicated with date of commencement of
supply to that connection. Any disconnection done before the month-end shall be duly marked with the date of disconnection.

10. All appurtenances such as in-line valves, air valves, scour valves, any other special appurtenances, flow meters with their identification nos. in the asset register etc. shall be presented on the drawing along with the detailed table of each type of appurtenances and a copy of the Asset Register. All details of the specials used shall also be elaborated.

11. All test results of (a) Zero Flow Tests, (b) Step Tests for sub-DMA wise results of physical loss and NRW for the DMA, Supply values to the DMA, consumption within the DMA etc. shall be produced alongwith the As-Built drawing. Road restoration and type of road surface shall be submitted in a separate drawing of road layout with road names and road width to gauge the road restoration work. Roads where work has not been done, but are forming part of the project area shall also be marked in these maps. This inclusion will be useful during subsequent extension of the network later during the O&M phase.

12. Early preparation of these drawings will be useful in processing Design-Build claims when raised. Adherence to the above guidelines to the best possible while reporting of work execution shall be preferred.

B. Waste Water Collection System:

13. Layout plan of sewer network showing location of manholes and sewers with flow direction.

14. Following basic details should be shown at Manhole and Sewer pipes:
   A. Manhole :
      i. Manhole Number
      ii. Ground Level (m)
      iii. Invert level (m)
      iv. Type of manhole
      v. MOC
   B. Sewer Pipe :
      i. Pipe No.
      ii. Colour Coding for Pipe Diameter
      iii. Material of Pipe (DWC/HDPE/RCC/DI)
      iv. Slope provided

15. Details of Property Chambers should also relate with Manholes, i.e. how many chambers are connected with a manhole and length of PVC-U pipes joining to Manhole chamber and Property chamber.

16. Each property chamber should be detailed with the plot no. connected to the particular property chamber.

17. Details of Nallah crossing/canal crossing/ river crossing etc. if any, shall be shown distinctly. Details of encased sewers / sewer laid on pillars etc. shall also marked separately.

18. All the observations conveyed at the time of approval and thereafter shall be incorporated in execution as well as built drawing.

19. L-Section with plan of all the sewers shall also be a part of as built.

20. Recording details of CCTV camera survey of all the sewers shall be part of as built.

21. Whole record of sectional hydro testing of laid sewers.

22. Detailed drawing of all vendor items, plants and machineries shall be part of as built drawings.

23. All above details shall be linked with GIS data base.
"As-Built" reflects what is actually there at the plant site, correctly representing the plant or unit as it is built. To conclude, the entire exercise of "As-Built" design/drawings needs to be considered as a very important task for completion of any plant/equipment engineering.

C. Structural drawings

24. Co-ordinate of any one corner of the building/structure shall be indicated to physically locate the building/structure.
25. Actual Finished Ground Level (FGL), depth of foundation from natural ground level and plinth level should be mentioned in the As-built drawing.
26. Any modification/alteration like ramp, staircase, etc. as per site requirement which were not initially in the original drawings shall be incorporated.
27. All the RED marked observations on the drawings shall be incorporated in the As-built drawings.
28. In As-built drawings never remove old values or details those are not follow during execution, just line or "X" through them.
29. If there is any change in reinforcement detailing, as per site requirement then the same shall be incorporated in the As-built drawing.
30. Actual details/locations of construction joints, if any shall be incorporated in As-built drawings.
31. Cross out words like Typical, equivalent to, similar to and replace them with the specific information used during the installation/construction process.
32. Appropriate cross-section with all actual final levels/dimensions should be shown in As-built drawing.
33. Detailed drawing of all vendor items like Clariflocculator Bridge, cranes, MS stairs, etc. shall be part of As-built drawings.
34. It is essential to prepare Structural as built drawings simultaneously as the work proceeds to avoid any confusion at later stage. The Contractor are required to prepare and keep up-to date record of "As Built drawings" during execution of structural works and checked for its correctness by concerned Engineer in charge time to time.

D. Electrical systems

35. Grid & Bay marking shall be done as each structure and building particularly as layout drawings.
36. All the information i.e. dimensions, levels etc. shall be same in electrical/mechanical/civil drawings.
37. Normally all the work shall be carried out as per approved drawings but due to any obstruction in the route of cable, earthing & lightning etc. the necessary modification can be done in drawing.
38. The modification will be marked under the red ink on the drawing. The construction drawing shall be kept in record by putting the signature contractor’s representative and employer’s representative & PIU.
39. After incorporates the entire connections final as built drawing shall be submitted for record purpose and Employers Representative shall put the signature as acceptance of the as built drawing.

E. Mechanical Systems

40. All the information i.e. exact dimension of all equipment, exact clearance between adjacent equipment, side & vertical clearances, & exact levels of installed equipment
etc. considering hydraulics and maintenance point of view as per actual site condition shall be incorporated in the as-built drawing.

41. If there is any change in layout of equipment and piping arrangement during erection as per actual site condition & constraints even after GA drawing are approved, then the same shall be incorporated in the as-built drawing.

42. Standard colour scheme shall be used for various mechanical equipment for air, water, sewage & chemicals etc.

43. Detailed dimensional drawings of all mechanical equipment shall be part of As-built drawings.

44. The modification shall be marked under the red ink on the drawing. The installation drawing shall be kept in record by putting the seal & signature of contractor's & employer's Representatives.

F. Instrumentation Control & Automation (IC&A)

45. From the Instrumentation engineering perspective all critical Instrumentation Control & Automation (IC&A) drawing/documents like Functional Design Specification (FDS), Instrument Loop Drawings, PLC panel wiring and installation drawings, I/O list, PLC control logic, SCADA screens, Control room equipment layout, instrumentation cable routing, instrumentation earthing layout, etc. are important. Few typical examples of what requires to be marked-up on an "As built" are mentioned below. There could be many more which the contractor shall draw in order to elaborate details of the completed structure/system.

a) The As-Built drawings/documents shall be accurate and complete.

b) All the changed set points shall be duly marked as approved during plant commissioning.

c) Change in physical location of the instrument due to site constraints which were not envisaged during the engineering phase. This typically involves elevation changes of equipment from one floor level to another.

d) Addition or deletion of permanent instruments based on process requirements.

e) Cross out words like typical, equivalent to, similar to and replace them with the specific information used during the installation/construction process.

f) Use the same scale when adding details to the drawings, as the original drawing scale.

g) Never remove old values or details, just line or “X” through them.

h) Provide the exact details of changes or additional information, including but not limited to fabrication, erection, installation, location, sizing, material, dimension, etc.

i) Record all unexpected obstructions found in the contract area.

j) Changes made from the final inspection and commissioning process.

k) If possible As-Built drawings shall be recorded with three base colors, with a legend indicator; RED- deleted items; GREEN- added items, BLUE-special information or details

l) Use written explanation to describe changes.

m) Add all related shop drawings to As-built drawings as an appendix to the drawings.

n) Specifically make notes to underground utilities, showing exact location, depth and material used.

o) All Embedded component details such as size depth of embedment, material, c/c distance etc. shall be clearly marked and tabulated.
G. GIS Integration

46. Migration of the final as built drawing data of water supply network distribution and Waste Water network onto the GIS System after verification of the data at site with exact spatial locations of Latitude and Longitudes (Northing and Easting) by Geo referencing with the Satellite image.

47. The attribute information of all the network components of water supply and sewerage shall be fed in to GIS System as per the data base structure with as built data.

48. This system enables the identification of the consumers, spatial data, non-spatial data and for statistical analysis with the unique visualization.

49. This provides a spatial dimension to the network systems of Water Supply, Sewerage and presentation of results in both graphic and report format.

50. The final output shall be in Arc GIS shape file or Geo database file format.

51. The same data shall be displayed on to the Web GIS along with the Consumer House hold data, Topography in Web based GIS mode and interlinking the GIS Property data, GIS Consumer data and GIS Network of pipe lines installations. This application will cater to the viewing, analysis and utilizing the geographic information needs of the concerned department. This should also play a role of decision support system for urban local body.

All the members of PMU, PIU & PMDSC should abide this circular.

Project Director

Copy to following for information & necessary action:-

1. Addl. PD/ Financial Advisor/CE/ SE(WS)/ SE(WW)/SE-IV, PMU, RUIDP, Jaipur
2. SE/ EE, PIU-RUSSDP, RUIDP (Concerned town____________________)
3. POs/APOs, PMU, RUIDP, Jaipur
4. Project Coordinator/Team Leader/Dy. CM/ACM, PMDSC____________________
5. Team Leader, CAPC, Jaipur
6. ACP, RUIDP, Jaipur to send by e-mail and put up the Guidelines on the website.

Superintending Engineer-IV

Circular 3: As built drawings