PREPARATION OF AEs FOR UTILITY SERVICES

1. Though a plethora of policies/instructions already exist for planning and designing of utility services which have been stressed upon by this HQ from time to time, but still the quality of BPs and AEs received in this HQ are far from satisfaction. In this connection our letters No 61748/PL/E4 (U) dated 05 Jun 03 and 61748/PL/E4 (U) dated 17 Jun 11 may be referred. Moreover, the documents like NBC code, IS codes, STEC pamphlets and TIs are not being followed in true spirit.

2. Some of the mistakes observed during the scrutiny of AEs at this HQ are as under:-
   (a) The basic input data for electric and water supply ie electric load and water requirement is either incorrect or even not found enclosed at times.
   (b) The unscaled site plans are attached without showing existing and proposed services in different colors.
   (c) Head loss and voltage drop calculation are not being enclosed.
   (d) Air-conditioning load is not calculated properly resulting into severe effect on total electric load requirement of the project.
   (e) The CFEES report for fire fighting and CGWB report for bore well are not found enclosed
   (f) Estimates from the concerned civil agencies/departments are not found enclosed.

3. Similarly, the common mistakes are observed as under during scrutiny of sewer lines and Sewage Treatment Plants (STPs):-
   (a) The criteria for self-cleansing velocity is not adhered to.
   (b) Incorrect condition of initial load for various sections, at the start of sewer are considered.

Contd...2/-
(c) No cognisance is paid towards contour plan while planning sewer network.
(d) Hydraulic design details of sewer and STPs are not forwarded.
(e) Huge unit size are planned without paying attention to Hydraulic Retention Time (HRT), media sizes etc.
(f) Oxygen for aeration is calculated instead of air calculation.
(g) Long stretches are proposed involving large number of Sewage Pumping Stations (SPS)/Lift wells.

4. Due to above mentioned shortcomings, considerable time is wasted on correspondence related to the observations/replies till their rectification which not only invites criticism from staff authorities but also puts CEA in embarrassing situation at times. In order to streamline and to expedite submission of AEs to CFA, checklist/guidelines are attached at Appendices ‘A’ & ‘B’ which are very important for sound design of utility services and to adhere the time frame.

5. Keeping the above aspects in view and to ensure proper preparation, scrutiny and submission of AEs, a certificate duly signed by Director E/M on the format enclosed at Appendix ‘C’ is to be forwarded to this HQ along with AEs.

6. Please acknowledge the receipt and ensure that these instructions are disseminated up to JE level.

(Sanjay Sharma, IDSE)
SE
Offg Jt DGW (U)
For Engineer-in-Chief

Encls:- (14 Sheets)

Copy to:-
Internal
E2W (PPC)
E2W (Army)
E2W (Navy)
E2W (Air)
DPR (Cell)/Spl Proj
Automation Cell

With a copy of enclosures to upload on MES website for wide Publicity please.
CHECK LIST/GUIDELINES FOR PREPARATION OF E/M ESTIMATES

1. General Points

(a) The AEs are to be priced on ED and SSR. The items which are not available in ED and SSR are to be priced on market rates duly supported with price list / quotation. Rates from sanctioned jobs can also be adopted in exceptional cases.

(b) Market variation to be applied over SSR is circulated quarterly by the CE Zones and communicated to all concerned. The same should be applied except some special cases where higher percentages can be allowed which should be clearly justified in BPs through SoC.

(c) The AEs should accompany the estimates from civil agencies for providing electric/water connection. Contingencies are not allowed over these estimates. Therefore, these should be added in AE part-I after adding contingencies on all other items.

(d) The BPs invariably must have firm requirements of the users to ensure correct estimates. The requirement which is not mentioned in the BPs, must be obtained from the users and submitted along with the AEs.

(e) While preparing the AEs, if the deviation from provisions mentioned in Board proceedings is apprehended, the Board Proceedings must be got amended before submission of AEs to this HQ. Amendments must have the approval of the Competent Authority.

(f) If the provision is not as per authorized scales, give details of user's special requirements.

(g) While preparing the AEs, provisions contained in Scales of Accommodation, E-in-Cs Standing orders, Technical Instructions, relevant IS codes on the subject, STEC Pamphlets and National Building Code are to be kept in mind and be followed in true spirit.

(h) Site plan, Layout plan, Schematic diagram etc should be self-explanatory using proper legend, different colours/ proper colour code.

2. External Electrification

(a) Indicate power requirement and details of electric load calculation on proper format.

(b) Indicate source of electric supply.

Contd...2./-
(c) Is electricity available from the existing source, if not, how it is proposed to meet the requirement?

(d) Does the electrification scheme fit in the overall plan for the station to avoid any infructuous expenditure at later date?

(e) Are the following documents enclosed:-

   (i) Scaled layout plan showing existing and proposed services with take over points duly marked in different colours including integration with adjoining areas for scrutiny of the estimates technically as well as quantitatively.

   (ii) Schematic diagram showing the existing and proposed equipment ie substation, generating station etc duly marked in different colours.

   (iii) Voltage drop calculations to justify the size of cables/ OH lines alongwith a certificate to the effect that sizes of cables and overhead lines provided are adequate and economical.

   (iv) Schedule of cables to justify the quantity catered in estimates.

   (v) Estimates from SEB alongwith the break down details in case the supply is to be taken from outside source or enhancement of load on existing source is proposed.

   (vi) Details of essential loads where standby DG set supply is to be provided as per SoA.

   (vii) Line plan/ layout plan of Sub-station and power house buildings to justify the plinth area considered in AEs.

   (viii) Details of existing and proposed installations to justify the provision of key personnel qtrs proposed.

   (ix) Schedule of existing and proposed internal wiring and sketches of the buildings showing internal electrical points where the cost is not included in PA rates of the buildings.

(f) In case the E/M services are to be augmented, the details of existing assets with source of supply, layout, capacities and sizes must be submitted along with the estimates.

(g) Provision of capacitor bank of adequate capacity for improvement of power factor must be catered in AEs to avoid penal charges by supplying agencies.

Contd...3/-
(h) Capacity of transformers, voltage stabilizers and DG sets must be supported with load details and their standard capacities should be proposed. Moreover, their requirements must be mentioned clearly in BPs.

(j) As per IE Rules, VCBs are to be provided for transformers of capacity 1000 KVA and above. Keeping this aspect in view, VCBs should not be proposed for small capacity of transformers like 200, 300 KVA and so on to avoid infructuous expenditure unless the requirement of the same is justified.

(k) Size of the HT cables considered in the AEs should be justified based on current carrying capacity, fault level and short circuit current rating and should be techno economical.

(l) While preparing the electrical load sheet, it must be ensured that necessary electrical load of the lifts/ cranes/ water and sewerage installations/ firefighting pumps/AC plant/heating plant/ street lights should not be left out due to overlook.

(m) The requirement and justification based on technical reasons for provision of Servo Voltage stabilizers must be highlighted in BPs.

3. External Water Supply

(a) What is the total requirement of water for the project? Have the breakdown details based on water supply scales given in SoA been attached?

(b) Is the water requirement available from the existing source or otherwise?

(c) Furnish the following information:-

   (i) Yield of the existing source/ sources.

   (ii) Number and capacity of existing storage tanks.

   (iii) Number and capacity of existing sumps.

   (iv) Number and capacity of existing pumping sets (also indicate “drive”). What are the standby arrangements?

   (v) Existing treatment units i.e. sedimentation tank, filtration plants, chlorination plants etc.

(d) What is the water requirement for the existing accommodation based on authorized scales?

Contd...4/-
(e) What are the surpluses, deficiencies both in source and storage? (Ground sumps should NOT be taken as storage). The capacity of existing water treatment plants and storage tanks should be kept in mind before resorting to new provisions and should be fully justified.

(f) Have the possibility of obtaining water from civil sources with or without augmentation of their source been fully investigated before considering development of our own source for the project under consideration?

(g) What proposals for the development of sources have been considered and what are the salient points for recommending a particular proposal?

(h) Does the proposal fit in the KLP of the station? If not, state the reasons there of.

(i) Is there any acquisition of land required for the proposed scheme? If so, give details.

(k) Do the specification and rates conform the estimating data? If not, give details in support of assessed rates.

(l) Have provisions for key personnel quarters been made in the estimates? If so what is the basis for these provisions in relation to the existing and proposed E/M installations and existing quarters?

(m) The following documents should be furnished:

(i) Schedule of daily water requirement.

(ii) Scaled layout plan showing existing and proposed water supply installations, source, treatment, pump houses, storage tanks, rising/distribution mains duly marked in different colours for integration with adjoining areas for the scrutiny of the estimates technically as well as quantitatively.

(iii) Frictional head loss calculations to justify the size and length of proposed pipeline.

(iv) Schedule of pipes, valves, valve pits etc. to justify the quantities catered in estimates.

(v) Line plan/layout plan of pump house buildings to justify the plinth area considered in AEs.

(vi) Schedule of internal water supply and line plan of the building showing water supply mains where internal supply is not included in plinth area rates.

Contd...5/-
(n) **CGWB report** should be attached with AEs in case the water supply is proposed through bore wells to justify the items and their quantities catered in AEs.

(o) The justification for capacity of submersible pump must be based on the expected yield and depth of water table given in the CGWB Report.

4. **Air Conditioning**

(a) Does the building/rooms layout indicate suitability for central type, package type, split type or window type?

(b) Has the orientation of the building been checked to minimize the effect of solar heat gains?

(c) Building estimates for air conditioned space do not cover insulation to roof/ceiling and double glazed windows to cut down A/C load. It should be considered while working out the cost of building. While preparing the AEs for replacement of A/C plants, the system of air conditioning and its capacity should not be changed without any justification.

(d) Has the provision of false ceiling of suitable insulating material been catered to reduce the room height to requisite minimum and also to provide insulation?

(e) Has attic space been provided with proper natural ventilation (in case of cooling)?

(f) **Plant Room:-**

   (i) Has the plant room been located at the Centre of the load and in a place from where supply and return ducts can be taken with ease and fresh air can be taken from outside?

   (ii) Has sufficient space been provided around the package type plant for carrying out repairs?

   (iii) Has adequate size of the central air-conditioning plant room and AHU Room been considered and their cost included in the estimates? Attach line plan/layout plan to justify the plinth area considered in AEs.

(g) Have the ambient dry bulb (DB) and wet bulb (WB) temperatures been correctly taken based either on Metrological Data or from E&M Pamphlet issued from CME or from Instructions issued by E-in-C’s Branch.

(h) Inside design conditions ie temperature, humidity, occupancy, equipment load and fresh air requirements must be based on Instructions issued by Air HQ/Army HQ/Naval HQ for the functioning of equipment and personal comfort. The same be obtained from the Users in writing in the form of User’s data sheet.

Contd...6/-
(j) Has the variation in inside temperature and humidity correctly been mentioned in the Design Data?

(k) Have the heat load calculations, survey sheets, building drawing and board proceedings been enclosed?

(l) Has the availability of electricity and water supply required for air conditioning been checked and suitable provisions made in electric and water supply schemes?

(m) Has suitable provisions for air curtains/ air showers/ HEPA filters/ winter heating/ chemical dehumidifiers etc been made in estimates wherever required?

(n) ED rates for centralized A/C plants are inclusive of ducting/piping etc. However, cost of standby unit should be taken as 50% of rate given in ED for each ton where the plant is to be designed for round the clock operation.

(o) Accn for plant room and AHUs is required to be covered under the air conditioning estimates. Separate estimates for this B/R portion of the work should be prepared and should be covered under air-conditioning portion of the work.

(p) The following points should be kept in mind for air conditioning to auditoriums:-

(i) The approval of CFA has to be obtained for provisioning of air conditioning to auditorium and attached with the BPs in compliance to Para 8.1.5 of SOA-2009.

(ii) The radiant effect of the upper wall (above the side wall grills) and roof load (about 33%) reaches the occupied space. Stratification occurs when air is admitted and returned at a sufficiently low elevation because it doesn’t mix with the upper air. This condition occurs in case of auditoriums and hangers (high ceiling height buildings). Keeping these aspects in view, only 50 to 60% of the auditorium height should be considered for required tonnage calculations.

(iii) The thumb rule, \((4V + 5A)/10000\); where \(V\) is volume in Cubic feet and \(A\) is total surface area in Sq feet is somewhat suitable for rough estimation of tonnage for Central AC Plants with addition of suitable percentage to cater for human occupancy, equipment load and depending upon climatic conditions of the station.

(q) The requirement of water for AC plants should be considered as 10 liters per ton per hour.

5. Firefighting

(a) Fire Adviser should be associated with the project at the Board of Officers stage itself for giving the complete arrangement for fire detection, alarm and fighting system in compliance to Para 62(k) of E-in-C’s Standing Orders. In case the Fire Adviser has not been associated at Board of Officers Stage, the entire scheme must be got approved from the CFEES before submission of the AEs and the items catered in the AEs should be covered under air-conditioning portion of the work.
be in accordance with the CFEES report. The schedules prepared should be supported with inventory of items being incorporated based on layout plan.

(b) For Fire Fighting Schemes, the requirement of water for filling the tanks should be worked out as per Scale of Accn- 2009 and CFEES recommendations and pumping capacity be decided accordingly.

(c) The fire detection and alarm system is to be designed as per TI No 6/2002 and schedule is to be priced on ED rates as far as possible.

6. EOT Cranes

(a) The span (cross travel), lift, load capacity, traverse (long travel), location and type of crane must be clearly mentioned in the BPs.

(b) The specifications for EOT Crane are not being given correctly, even the pricing is given on adhoc basis. As far as possible, the specifications, span and rates should be as per ED. In case of deviation, proper justification and price with market rate analysis should be given.

7. Lifts

(a) Provision of lifts is explicitly clear in the Scales of Accommodation. It should be accordingly recorded in BPs and AEs prepared. In case of luggage lifts, the load to be carried at a time, should be specified in BPs to avoid over/under provisioning at the time of preparation of AEs. No of stores and passenger capacity should invariably be mentioned in the BPs.

(b) The specifications/ description of lifts should be as described in ED and BIS. Safety aspect such as infrared sensors, built-in-intercom system and Automatic Rescue Device (ARD) should be provisioned in estimates.

8. Lightning Protection

(a) Is the provisioning of the lightning protection based on CFEES STEC Pamphlet No 17 and IS/ IEC 62305-1 to 4 which supersedes IS 2309 of 1989? If so, attach building drawings showing protection systems/ zones.

(b) Is the layout plan and design of lightning protection system enclosed to justify the items and quantity catered in AEs?

9. Mechanical Laundry

(a) Capacity of mechanical laundry should be worked out based on linen available for wash, cycle of mechanical laundry equipment and number of working hours for laundry.

Contd...8/-
(b) Provision of room for housing the mechanical laundry including water pipes, electric cables and drain out network are to be considered at Board of Officers stage. AEs should be prepared accordingly.

10. Geysers and Solar Water Heating System

(a) Number, capacity and type of geysers should be worked out as per Scales of Accn.

(b) Wherever solar heating system is proposed, complete details of capacity should be selected as per TI No 03/2009.

11. Desert Coolers, Refrigerators, Deep Freezers and Water Coolers

(a) The AEs for refrigerators and deep freezers need to be prepared on the basis of Para 56.1.3 of SOA.

(b) The quantity and capacity of desert coolers are to be decided considering 30 to 50 air changes per hour depending upon the climatic conditions and calculation details be enclosed.

(c) The quantity and capacity of water coolers is to be decided based on Army Headquarters, QMG Branch Policy letter No A/39822/03 Wks (Policy) dated 16 Oct 1967 and depending upon the climatic conditions and activity involved. The quantity of drinking water of 2 to 3 liters per person per day will be adequate to meet the requirement.

(d) The capacity of voltage stabilizer for above appliances should be 1 KVA otherwise should be technically justified.

12. Bulk Petroleum Installation (BPI) Scheme

(a) What is the nature of proposed work? New/ Modification?

(b) What will be maximum number of Railway Transported Containers (RTCs) to be received daily and time available for decanting of RTCs at rail heads (information to be obtained from users).

(c) What type/quality of fuel is required to be handled?

(d) What is approximate quantity of the storage required?

(e) What will be the daily requirements of the POL?

(f) Is enough electric supply available to run the proposed installation? If not, what are the proposals?

Contd...9/-
(g) What type of POL tankage installation is recommended, with reasons thereof?
   (i) Above ground.
   (ii) Semi-underground.
   (iii) Fully underground.

(h) Are you incorporating flame proof fitting in your installations? Please give details of all such fittings.

(j) Are you recommending floating suctions for your POL installations? If so, why do you consider such provision necessary?

(k) What type of micro-filters do you recommend for the installation and why?

(l) Do you recommend the use of barrel/jerry can filling machines? If so, why? Mention types, size and capacity of such equipment. Give details of the sheds also, if required.

(m) Have users any special preferential requirements for the installation? If so, indicate the details giving its executional feasibility.

(n) Is the provisioning of the lightning protection based on CFEES STEC Pamphlet No 17 and IS/IEC 62305-1 to 4 which supersedes IS 2309 of 1989 if so, attach building drawings showing protection systems/zones.

(o) Is the layout strictly in accordance with Instructions and Plan of STEC Pamphlet No 17?

(p) Have you attached all the priced details in respect of all the work proposed?

(q) Have you catered sufficient measures against fire hazards? If so, what are your recommendations for the protection of:-
   (i) Pump House
   (ii) Distribution system
   (iii) POL storage
   (iv) Decanting and filling equipment's/ area.

(r) How far is your installation from rail head? How do you propose to carry your POL to your installation, by gravity main, pumping or user system give reasons of your choice?

(s) Will you require any acquisition of land for the proposed scheme, if so give details with anticipated difficulties, if any.
(t) Do the specifications and rates conform to E-in-C's Estimating Data? If not, give reasons for variation with details in support of the assessed rates.

(u) Have you attached the following documents:-

(i) Layout plans showing existing/ proposed scheme in different colours.

(ii) Schematic diagram of the whole system showing existing and proposed POL equipment in different colours.

(iii) Friction head loss calculations in the design of the proposed POL mains.

(v) Will the work be executed by MES or it will be executed through deposit work by Oil Company (PSU)? If so, then necessary estimates be obtained from the Oil Company and be made part of the AEs.

(w) Has necessary report from Fire Advisor/ CFEES obtained for firefighting scheme proposed in case of execution by MES?
CHECK LIST FOR SEWERAGE & SEWAGE TREATMENT PLANT

1. The design and planning of sewer networks & STPs should be carried out as per guidelines issued by this HQ letter No 86435/MISC/E4 (U3) dated 19 May 17 along with 'Essential Data'. It is also mandatory to take NOC from SPCB for “consent to establish” and 'consent to operate' on STP.

Sewer Network

2. A scaled layout plan of sewer network for existing and proposed must be categorically marked in different colour code, with critical location of Sewage Pumping Station (SPS)/Lift wells etc till STP. Plan a SPS/ lift well at a depth of 6 m to avoid ground water contamination.

3. In each branch of sewer, it must be ensured that the self-cleansing velocity (SCV) of 0.6 m/s in general and 0.8 m/s in hot climate area is achieved to avoid choking of sewer lines. If required SCV is not achieved, AFTs are to be installed judiciously. However, SCV must not be greater than 3 m/s in any case to avoid scouring of sewers.

4. Minimum slope of sanitary sewer for various size of pipe should be as per Table 3.13 of "Manual of Sewerage & Sewage treatment System" published by CPEEHO.

5. The four parameters ie flow, diameter, slope and self-cleansing velocity (SVC) are very important for design/ selection of any branch of sewer network. Hence, due care has to be exercised to achieve techno-economical scheme.

6. Whenever SPS/Lift Well are planned, the dia and material of pipe has to be selected as per normal procedure adopted for normal water supply pipeline.

7. Drop man-hole, if any, must be planned.

8. Station authorities/ executives must explore the possibility, if local municipal sewer facility exists nearby. If yes, mil stn sewage can be off-loaded to municipal corporation after due consideration on minimum applicable charges for carriage and treatment as per SPCB.

9. Complete hydraulic profile of sewers indicating pipe dia, sewer length, contributing population, rate of sewerage flow, gradient v/V, d/D, self-cleansing velocity (SCV) for each branch of sewer for peak flow must be provided as per CPEEHO manual.

Contd...2./-
10. Sewage Pumping Station (SPS) along with adequate non-clog pumps (working & standby) are to be proposed for effective storage with level sensors for smooth operations. The design must have hydraulic detention time of 15-30 mins, otherwise septic condition will develop.

11. The sewer network should ideally cover the entire area. However, some isolated and low lying pockets may not be techno-economically feasible for connection to Central Sewage System (CSS) due to very less load and long distance carriage/pumping. In such case, adequate capacity of septic tank (as per ED-2016) can be installed for the treatment.

**STP**

12. Lab reports of raw sewerage must be provided so as to analyse the type of treatment to be provided viz Moving Bed Bio-Reactor (MBBR), aeration in oxidation pond etc so as to arrive at correct sizing of units.

13. Hydraulic design of all the units from equalization tank to last unit (collection tank) must be provided.

14. Quality of treated waste water must be analyzed after commissioning to check the efficiency of the systems.

15. The BOD of treated waste water should be **30 ppm** for disposal in ponds/rivers and for use in arboriculture. However, it should be **10 ppm** after tertiary treatment where ever human touch is involved.

16. “No Objection Certificate” from the State Pollution Control Board must be obtained in case the treated effluent is to be let off in open/nallah or any nearby water body.

**Septic Tank**

17. Capacity of septic tanks, where ever proposed, should be restricted to 150 users as per ED-2016 and must be judiciously planned.

18. Soakage well/Soakage pit sizes should be computed based on percolation rate of soil. Soakage well/Soakage pits should be proposed to be above water table and confirmation to this effect be forwarded along with AEs.

19. In case of very shallow water areas, filter bed/reverse filter beds may be considered for secondary treatment of sewage.

20. Small isolated pockets can have packaged type treatment units/septic tanks.
Recycle & Reuse

21. Collection and Equalization tank must have aeration system to avoid septic conditions.

22. As per user’s requirement, size of collection tank must be worked out in case no natural ponding facility is existing in the area.

23. Arboriculture plan with adequate pumping and piping arrangement shall be provisioned. The pipe must be of different colour codes and marked as “water not for drinking” sign board at the point of tapping. The valves/ tapping points provided must have a detachable spindles to avoid any eventuality.

Adm & Safety Measures

24. Estimates for forced ventilation, flame proof light fittings and spark prevention in the SPS/ lift wells are to be included in the DPR.

25. Fresh potable/drinking water must be provided for washing and day to day activities for staff, at the STP area.

26. Adequate approach road and hard standing in the STP area is essential for all weather approachability for ease of maintenance and operation.
Appendix 'C'

(Ref Para 5 of E-in-C's Br letter No. 62888/ Gen-Misc Corres /E4 dated 20 Aug 18)

CERTIFICATE FROM DIR E/M: AEs

It is certified that the AEs pertaining to E/M Services have been prepared and submitted duly scrutinized as per E-in-C's Branch letter No. 62888/ Gen-Misc Corres /E4 dated 20 Aug 2018 and all necessary details/documents are enclosed.

Dir E/M of CE Zone

[Signature]