

Asset Management in Establishment of New EHV Substation

Trivedi Urvashi,
M Tech student
Electrical Department,
Parul University, Vadodara, India

Abstract: In this paper, Practical power is the need of present day quickly developing human advancement. As the overall interest for electric power continues developing on a scale basically incomprehensible a couple of decades back, new additional high voltage substation is required to guarantee solid power framework. These substations ought to be profoundly efficient in task and support all through their whole administration life just as with space having turned out to be massively valuable, particularly in the quickly developing megacities and conurbations around the globe, space-sparing plan is fundamental. To guarantee unwavering quality of intensity framework and give ideal substation plan substation robotization and gas protected substation are the key arrangement of present day substation structure. The paper displays about new foundation of various switchyard like Air protected substation, Gas protected substation, Hybrid substation with the benefit the board.

Index Terms - Extra high voltage (EHV), Asset management, Establishment.

I. INTRODUCTION

All manuscripts must be in English. These guidelines include complete descriptions of the fonts, spacing, and related information for producing your Transmission resources work at exceptionally high voltages and the result of their disappointment can possibly influence numerous clients. Similarly, contrasted with circulation, there are moderately couple of transmission resources, and their age and condition are commonly surely knowing. The age of the system gives a valuable sign of the requirement for resource restoration. [1] Substations are the most basic piece of any electrical supply lattice. A substation is a piece of an electrical framework as a media for transmitting the created Power to different burden focuses and furthermore for further circulation at different voltage levels. Foundation of 400/220kV Sub Station. Five classifications are there for foundation of new EHV substation:

1. Design Engineering Work
2. Purchase
3. Construction
4. Testing
5. Commissioning

Design of Engineering

Drawing

For a fundamental dissemination substation, a "Solitary Line Diagram" and "Plan Layout" might be the main illustrations that should be specially crafted by the architect. For instance, if a substation is little, it might be conceivable to demonstrate establishment subtleties on the "Plot Plan." Similarly, the establishing design and subtleties may likewise be appeared on a "Plan Layout." Larger substations will, of need, require progressively broad documentation. "Building Services Contract— Electric Substation Design and Construction," subtleties a fundamental rundown of illustrations frequently vital. Following are the principle sorts of substation reference illustrations regularly required. In this structure building work covering the substance of certain kinds of illustrations. It is prescribed that the designer use agendas as a structure quality control apparatus.

- Single Line Diagram
- Plan Layout
- Section Elevation
- Control Room Layout
- Auxiliary Power Layout (SLD of ACDB, DCDB, LDBI)

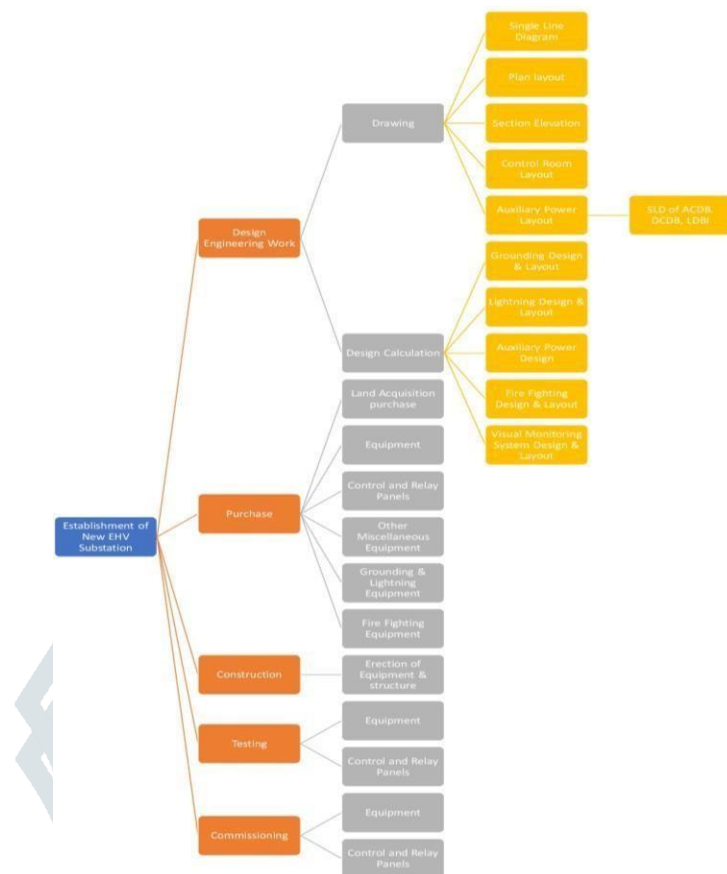


Figure 1 Block Diagram of Asset Management

Drawing Calculation

At the point when single line outline and Plan design is prepared then in the wake of ascertaining:

- Grounding Design & Layout
- Lightning Design & Layout
- Auxiliary Power Design
- Fire fighting Design
- Visual Monitoring

Purchase

As a matter of first importance, complete the structure and format drawing and afterward after experience the part configuration, rating and costing and afterward the buy list for substation:

- Land Acquisition
- Equipment
- Control and Relay Panels
- Other Miscellaneous Equipment
- Grounding & Lightning Equipment
- Fire fighting Equipment

Construction

Preceding the beginning of development plan, a few components ought to be assessed that may influence the decision of material and part type chose for the structure. Variables affecting determination of material and part type incorporate originally cost, cost of erection, diversion attributes, cost of support, accessibility, protection from erosion and other decay, opportunity from flame risk, appearance, size of income delivering load served, and transitory or changeless nature of structure. Establishment configuration principally relies upon the set up thickness and quality/strain properties of the dirt on or in which establishments are found. The heterogeneous qualities of soils or their limited fluctuation make establishment plan a substantially less demanding building issue than auxiliary structure or a few aspects of electrical structure, yet the vagary of soil mechanics need not be an explanation behind ultra-conservatism and exorbitant establishments. Further, with the upgrades of helpful PC programs, dull reiteration of configuration rehearses for establishment configuration has been decreased.

Testing

Trial of substation hardware are required to satisfy in any event the accompanying capacities:

- To demonstrate the trustworthiness of a bit of hardware at the season of acknowledgment
- At occasional interims, to check the proceeded with accessibility of the hardware
- At the season of disappointment of a bit of gear, to have the capacity to decide the particular prerequisites for fix

The sorts of tests to be performed for every one of the above classes fluctuate. In substation significantly testing required in this two classifications:

- Equipment
- Control and relay panel

Commissioning

When testing is done on the panel and equipment then after commissioning do on that two categories:

- Equipment
- Control and relay panel

II. ESTABLISHMENT OF EHV SUBSTATION

Establishment of 400/220kV Sub Station. The following selection criteria have been adopted:

- The area of the land shall be adequate so as accommodate the 400/220 kV substation.
- The proposed land should be accessible and preferably be near to National, state highway or major road.
- The substation shall have the land provisions for accommodating the residential colony, club, green areas and roads.
- The area should be fairly flat and clearly demarcated.
- The land shall have minimum interference with habitation, industrial area, airport, railway etc.
- Forest areas and other restricted areas have been avoided.
- The land shall have minimum legal owners and shall be free from encumbrances
- As far as possible, the area shall free from any built-up structure.

Land requirement of substation:

Proposed New Sub Station 400/220 kV Pooling Substation is an AIS sub-station. Keeping in view the provision for expansion by 2x500 MVA transformers, the land required for the new sub-station would be about 40 acres.

Identification of land for 400 kV Substation:

- The land sighting and land selection procedure for 400/220 kV substation has been done on the basis of total land requirement as indicated under item 2 above.
- Three parcels of land have been identified keeping in mind the minimum land cost near and its approachability.
- Params like line approaches and take-offs have also been considered as there would be 400 kV and 220 kV lines entering and emanating from this substation.
- The identified land has minimum interference with existing habitations and other structures. The proposed land would need a mild grading to be done before construction.

Advantages of the selected land:

- The selected land has easy accessibility which shall be helpful in avoiding delays during construction.
- Planning of routes for incoming & outgoing lines can be done with ease.
- Approvals from statutory and regulatory aspects can be easier and will save time in land acquisition.
- Land with clear titles will be easier for acquisition.

III. EQUIPMENT USED IN EHV SUBSTATION

Substation has distinctive types of gear which are utilized for diverse capacities; they are utilized in changing voltage and types of gear for the insurance of substations which shield the substation from the flaws which happen. Following are the distinctive types of gear utilized in EHV substation.

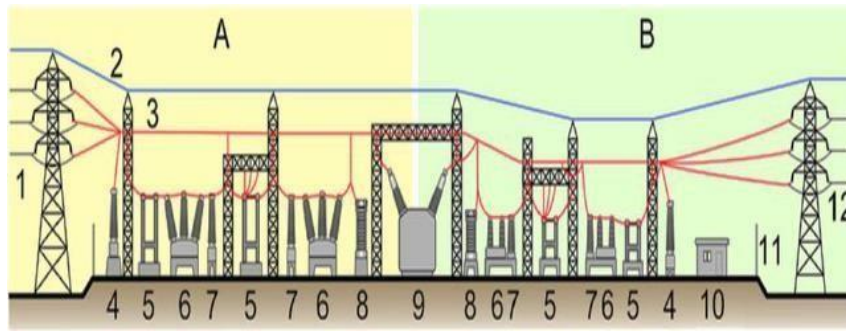


Figure.2 A: Primary power lines' side B: Secondary power lines' side

1. Primary power lines 2. Ground wire 3. Overhead lines 4. Transformer for measurement of electric voltage 5. Disconnect switch 6. Circuit breaker 7. Current transformer 8. Lightning arrester 9. Main transformer 10. Control building 11. Security fence 12. Secondary power lines.

IV. MULTI APPROACH CRITERIA

Technical Criteria

Table 4.1: Technical Criteria

- Rated operational voltage [V]
- Equipment location
- Rated current [A]
- Type of circuit breaker
- When the commissioning took place [years]
- Operating condition and installation recommendation
- Overload relay trip-current setting [A]
- Breaking capacity [kVA]
- Rated ultimate short circuit breaking capacity [kA]
- Rated service short circuit breaking capacity [kA]
- Service life (mechanical and electrical) [c/o cycles]
- Expect service life [years]
- Number of maintenance interventions [1/year]
- Failure rate [1/hours]
- Mean time to repair
- Mean time between repairs
- Failure number
- Equipment utilization rate from the total lifetime
- Power failure duration [hours]

	- The type of affected circuit (coupling, zonally distribution line, power transformer, the power consumption areas, connecting line of a power plant)	
	- Power supply not delivered considering the voltage	

Economic Criteria

Table 4.2: Economic Criteria

- Maintenance cost per kWh transported/distributed
- Penalties for non-delivery of electrical power [€/kVAh]
- Quality and execution time
- Estimated replaced value [€]
- Infrastructure repairing cost and cost of equipment transportation in a workshop [€] etc.

Social Criteria

Table 4.3: Social Criteria

- Substation configurations
- Maintenance team response
- Safe power supply
- Kind of customers
- No. of residential areas affected
- No. of industrial consumers
- Losses due to company image
- Psychological impact (sense of fear) etc.

V. RELIABILITY

The Reliability is significant worry for any EHV substation. EHV substations feed substantial measure of burden. Disappointment of any EHV substation will make extensive intrusion in supply and may make aggravation in a framework to a substantial degree. All EHV substations must be planned with larger amount of unwavering quality. EHV substation considered for this paper must have higher dependability since all the 400 kV substations in Gujarat, India are associated with this substation and makes a noteworthy framework circle. In the event that there is disappointment or absolute closed down for support of this substation, there will be huge unsettling influence to different substations. This substation is exchanging power with Western Grid by means of tie line. In the event that this substation falls flat or put under support, at that point trading of huge measure of intensity between two frameworks won't be conceivable in crisis condition. This substation is getting power from one warm and two hydro control stations at 400 kV and furthermore does associated with other 400 kV substation also. At 220 kV voltage level, this substation supplies capacity to four substations and getting power from one substation through two 220 kV lines. Likewise, at 132

kV voltage level, this substation supplies capacity to three mechanical substations and one railroad substation, all associated by means of two parallel lines.

VI. CONCLUSION

Here, the authors have presented review of all parameter related to establishment of EHV sub station. Air Insulated Substation is most reasonable for the application where expansive territory is accessible. In any case, amid the lack of land region which is serious issue, these days, Gas Insulated Substation is the key arrangement of current substation structure. Prior substation typically involved Air Insulated Substation yet ongoing need of new power age unit with restricted accessibility of land prompts the advancement of new space-sparing Gas Insulated Substation. Cross breed unit might be utilized in any of transport design of transmission substation. Execution of half breed unit, just as the subsequent decrease of the measure of the substation, impacts on entire ideas of common and electromechanical works associated with the development of a substation. Cross breed framework can be effectively introduced in new substation or while overhauling a current substation

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