DESIGN AND ANALYSIS OF TRANSMISSION TOWER BY USING STAAD PRO SOFTWARE

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ABSTRACT
Design of Transmission tower in Electrical power is today playing an increasing the important role in the life of the community the development various sectors of economy. Developing countries are therefore a giving a high priority to power development programmers. The remote hydroelectric power plants have given rise to the need for extra high voltage. Prior to 1950, 150kv electric transmission lines are considered and still higher voltages are being considered in these days. Hence it has given rise to the need for relatively tall structures such a towers. Does the study of designing and erection of steel towers has become a challenging task.

The purpose of transmission line towers is to support conductors carrying electric power and one or two ground wires at suitable distances. The cost of the transmission towers comes to about 30 – 40% of the total cost of transmission lines and therefore it is necessity to be economical in the design criteria.

This project is a study on design of 220kv transmission towers. The tower consist of 25m height arranged in 12 height panels and contains 225 members. The wind load on tower for zone – ii conditions calculated according to IS CODE: IS 800. The tower is analysed as spaced truss for full load condition using STAAD PRO - 2007. The towers were modelled as 3D frame and the analysis were carried out using STAAD software applying the loads at the nodes.

1. INTRODUCTION
Transmission lines are constructed to evacuate Electric Power generated in power stations
over long distances across the country to substations for further transmission and distribution to various load centres.

The power is carried in three phase supply through three separate conductors for each of the circuit. Hence the towers are required to be designed for single circuit, double circuit and or multi circuit as per the required technical specifications of Customers. The tower configuration and geometry depends upon the requirement of the technical specifications.

Power is transmitted through flexible metallic conductors strung at safe heights over towers. Towers are usually self-supported four legged cantilever steel structures holding the power conductors with the use of insulators at required positions on cross arms.

1.2. TYPES OF TOWERS

The selection of the most suitable types of tower for transmission lines depends on the actual terrain through which the line traverses. Experience has, however, shown that any combinations of the following types of towers are generally suitable for most of the lines.

2.0 BRACING SYSTEMS

Once the width of the tower at the top and also the level at which the batter should start are determined, the next step is to select the system of bracings. The following bracing systems are usually adopted for transmission line towers.

2.1 Single web system:

It comprises either diagonals and struts or all diagonals. This system is particularly used for narrow-based towers, in cross-arm girders and for portal type of towers.
Except for 66 kV single circuit towers, this system has little application for wide-based towers at higher voltages.

2.2 Double web or Warren system:

This system is made up of diagonal cross bracings. Shear is equally distributed between the two diagonals, one in compression and the other in tension. Both the diagonals are designed for compression and tension in order to permit reversal of externally applied shear. The diagonal braces are connected at their cross points. Since the shear preface is carried by two members and critical length is approximately half that of a corresponding single web system. This system is used for both large and small towers and can be economically adopted throughout the shaft except in the lower one or two panels, where diamond or portal system of bracings is more suitable.

2.3 Pratt system:

This system also contains diagonal cross bracings and, in addition, it has horizontal struts. These struts are subjected to compression and the shear is taken entirely by one diagonal in tension, the other diagonal acting like a redundant member.

It is often economical to use the Pratt bracings for the bottom two or three panels and Warren bracings for the rest of the tower.

2.4 Portal system:

The diagonals are necessarily designed for both tension and compression and, therefore, this arrangement provides more stiffness than the Pratt system. The advantage of this system is that the horizontal struts are supported at mid length by the diagonals.

Like the Pratt system, this arrangement is also used for the bottom two or three panels in conjunction with the Warren system for the other panels. It is especially
useful for heavy river-crossing towers.

3. **STAAD - PRO**

**OBJECTIVE:**

A five storied symmetrical residential building located in seismic zone III is analyzed and design for earthquake forces.

**ADOPTION OF THE BUILDING:**

In the fast developing countries these days the population is also increasing rapidly. So small towns and cities are changing into metropolitan cities there is scarcity of land and business is growing and expanding very fast. Therefore, huge multi-storied or commercial organizations are being constructed and the number of such complex increasing fast day by day. So buildings for such commercial purposes have become expensive.

“**EARTH QUAKES**” are natural hazards under which disaster are mainly caused or collapse of buildings and other man-made
structures. Earthquake damage depends on parameters including intensity, duration and frequency, content of ground motivation and soil earthquakes has occurred due to collapse of building.

A structure is an assembly of a number of members such as slabs, columns, beams. The members are proportional to resist the loads and forces, changes in climate such as temperature, frost, chemical attack, etc.

So the structure thus constructed must be able to resist earthquakes.

Experience in past earthquakes has demonstrated that many common buildings and typical methods of construction lack basic resistance to earthquake forces. In most cases this resistance can be achieved by following simple, inexpensive principles of good building construction practice.

Adherence to these simple rules will not prevent all damage in
moderate or large earthquakes, but life threatening collapses should be prevented, and damage limited to repairable proportions.

These principles fall into several broad categories:

i. Planning and layout of the building involving consideration of the location of rooms and walls, openings such as doors and windows, the number of stories, etc. At this stage, site and foundation aspects should also be considered.

ii. Lay out and general design of the structural framing system with special attention to furnishing lateral resistance, and

iii. Consideration of highly loaded and critical sections with provision of reinforcement as required.

It has provided a good overview of structural action, mechanism of damage and modes of
failure of buildings. From these studies, certain general principles have emerged:

i. Structures should not be brittle or collapse suddenly. Rather, they should be tough, able to deflect or deform a considerable amount.

ii. Resisting elements, such as bracing or shear walls, must be provided evenly throughout the building, in both directions side-to-side, as well as top to bottom.

iii. All elements, such as walls and the roof, should be tied together so as to act as an integrated unit during earthquake shaking, transferring forces across connections and preventing separation.

iv. The building must be well connected to a good foundation and the earth. Wet, soft soils should be avoided, and the foundation must be well tied together as well as
tied to the wall. Where soft soils cannot be avoided, special strengthening must be provided.

v. Care must be taken that all materials used are of good quality and are protected from rain, sun, insects and other weakening actions, so that their strength lasts.

vi. Unreinforced earth and masonry have no reliable strength in tension, and are brittle in compression. Generally, they must be suitably reinforced by steel or wood.

4. CATEGORIES:

For categorizing the buildings with the purpose of achieving seismic resistance at economical cost, three parameters turn out to be significant:

i. Seismic intensity zone where the building is located,

ii. How important the building is, and
iii. How stiff is the foundation soil.

A combination of these parameters will determine the extent of appropriate seismic strengthening of the building.

The importance of the building should be a factor in grading it for strengthening purposes and the following buildings are suggested as specially important:

IMPORTANT: Hospitals, clinics, communication buildings, fire and police stations, water supply facilities, cinemas, theatres and meeting halls, schools, dormitories, cultural treasures such as museums, monuments and temples, etc.

ORDINARY: Housings, hostels, offices, warehouses, factories, etc.

Earthquake resistant structures are designed and constructed to withstand various hazardous earthquake exposures at the sites of their particular location.


The work was divided in the following parts:

The entire building was fed into the computer using graphical input generator of Staad Pro V.08

i. The members were loaded for dead loads and live loads.

ii. The process of analysis was carried out.
ii. The design of beam and columns was done.

iv. The design results were presented in the form of figures and AutoCAD

5. CONCLUSIONS

On the whole, this study has attempted to provide an insight into the soil properties, design of foundation and staad analysis. The study yielded the following conclusions based on the laboratory experimentation carried out in this investigations.

- We observed that the properties of soil after determination of laboratory tests, the sol is red clay and it is comes under wet clay soil.

- After knowing the type of soil, we selected wet type of foundation.

- We observed during the design process, all the design criteria’s satisfied as per is code provisions.

- After designing the foundation, then we are going to design seismic and wind analysis by using staad pro.

- After observing HUDHUD cyclone, we are assign
220kmph in wind analysis.
We observed in analysis of seismic the transmission tower was stable.

6. REFERENCES


of FRP Pultruded Sections in
overhead transmission line Towers”


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