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Mechanical Engineering Division - Tower Testing Station

The Mechanical Engineering Division established in 1976 and prior to this, the Model Tower Testing Laboratory was also established and was operational. All though some of the tower manufacturers have tower testing facilities and being captive in nature and not available to others in the field and experiencing delay in commissioning of transmission projects, the Government of India decided to setup a tower testing station under CPRI.

Based on the requirements and foreseeing the future power demand and forecast for new power projects in the country, Prototype Tower Testing Station (PTTS) was established and commissioned during 1976 (Inaugurated by Ministry of Power).

The station was opened to commercial tests as third party certification as well as for R&D oriented tests with the concept of development of new designs in transmission towers and a full fledged model tower testing laboratory was strengthened/established during 1982.

The requirement for testing other transmission components like conductors, insulators, etc. Vibration Laboratory was established during 1978. Further, due to installation of new transmission lines of higher rating of 400 kV and above, for studying the Vibration characteristics of hardware/accessories Wake Simulation Laboratory established during 1985. Further, during the year 1990 Foundation Testing Centre was established.

Over the years the division has been augmented to facilitate higher category/rating of transmission towers and its components in line with growth of power industry. CPRI is an R&D Institute and for catering to the needs of utilities to facilitate the design, development and testing of the various components of overhead transmission line system under one roof, the division established a design and consultancy wing. The standardization of transmission towers, design and analysis of transmission towers were facilitated since 1980.

1.0 PREAMBLE

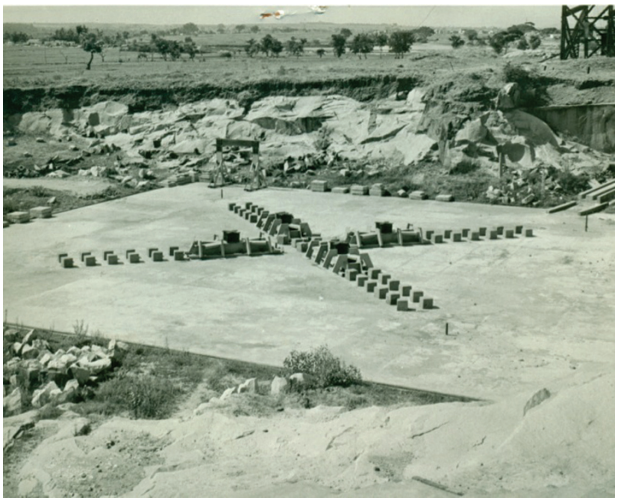
1.1 Model Tower Testing Laboratory and Prototype Tower Testing Station (1976–1980)

During the year 1976, the Indian standards Institution (BIS) has setup a sub committee under Civil Engineering to formulate the testing standards for transmission line structures. In the year 1978, IS standard for Testing of transmission line towers was introduced wherein CPRI was also a representing body for finalization of the same.

1.2 Prototype Tower Testing Station

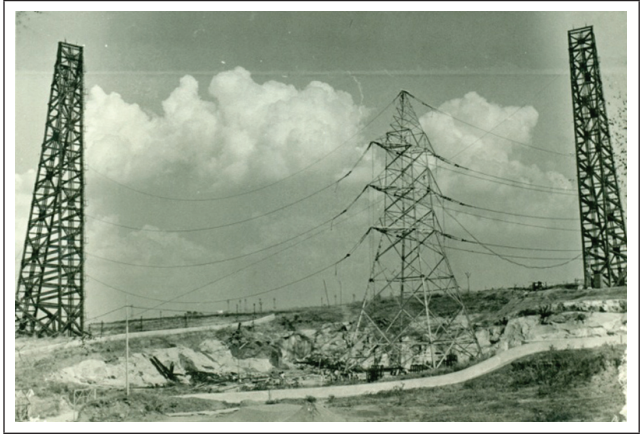
CPRI established "Model Tower Testing Laboratory" initially for catering to development of new designs of structures and for verification of its designs scaled down models were prepared and tested before manufacturing prototype structures. Numerable case studies were carried out as part of commercial testing and R&D for developing reliable designs of transmission structures. However, at present due to change of utility of lab, facility has been now withdrawn for testing of model towers.

With the experience of model tower testing and considering the need of Power Sector, CPRI has established "Proto type tower testing station". It was open to commercial tests as well as R&D oriented tests during 1976. The establishment of PTTS was justified as about 80 no's of towers were tested in a span of three years. Initially with basic features to accommodate transmission towers up to 13 m × 13 m base width and 30 no's of pull off points.



1.3 Layout Plan of old Tower Testing Station

The operation of the tower testing was Semi-automatic where the partial operations were controlled at remote control station and some of them (Vertical loading) were manually operated (initially dead weights were used before installing manually operated winches).



1.4 Anchor Structure Transverse and Longitudinal (Single Central Mast)

ELECTRICAL WINCHES

OLD CONTROL ROOM

With the limited facility, the first 400 kV Double Circuit tower tested during June 1979 for super thermal project of NTPC (Singrauli project)

2. TOWER TESTING STATION (1980–1990)

The Tower Testing Station was further augmented by expanding for accommodation of base width of towers up to 20 m × 20 m, also the movable footings with cruciform were replaced with I-beam girder fixed to the foundation bolts over which the movable footings were used for mounting of stubs of test tower. The load application winches having double speed motors were acquired as part of augmentation of equipment and load measuring services (analogdisplay) being phased

out to accommodate digital readouts and load cells of higher capacity in line with the change in technology of instrumentation. Similarly, the Universal Testing M/C of 600 kN Capacity was installed for catering to test hardware and calibration of load cells being used for testing of towers.

NEW LONGITUDINAL ANCHOR STRUCTURE

3.0 TOWER TESTING STATION (1991–2005)

As the Indian power sector was growing and catering to the demand for testing higher rating towers, MED division planned further augmentation of tower testing facility for accommodating larger base width towers and also to meet the testing challenges to accommodate suspension towers designed with probability approach. To facilitate these towers the augmentation of longitudinal anchor structure was taken up in a phased manner. Further, the base width capacity of test bed is increased to 26 m × 26 m by way of extending foundation anchorage and fabrication of permanent footings. With this augmented facility many 800 kV/ 765 kV towers and multi-circuit power of four circuit configuration could be tested successfully. Further, additional loading winches of double speed category were procured to facilitate testing of Quadruplex circuit towers up to 220 kV/ 400 kV rating and having up to 48 pull off points.

4.0 TTS BETWEEN 2006–2011

Further, the division had ambitious plan of further augmenting the state of the art test facilities in the field of transmission line structures and line components/hardware to meet the needs of Indian power transmission Sector. Further, the concreting of test bed surrounding has been undertaken to facilitate working area for parallel activities of proto-assembly and dismantling of tower structures for quicker testing and to reduce waiting period for customers. The anchor foundations are strengthened to resist uplift loads up to 1200 kV category towers. The transverse winch house is also being renovated and expanded for above purpose. The transverse and longitudinal anchor structures are also augmented to enable testing of taller towers, 400 kV M/C towers and 1200 kV towers.

The division was continuously proposing the modernization and augmentation of the division facilities under National five year plan, since IX plan and onwards.

However, due to non allocation of sufficient funds some of the proposals were postponed and under X plan proposals, funds were allocated for modernization of tower testing wherein PLC and SCADA system operation with video recording system were established. A 100 tonne capacity test rig and also hydraulic ram of equal capacity was also established during the above period for conducting tests on insulators string assemblies and hardware.

PLC CONTROL FACILITY, VIDEO FACILITY

Further, during XI plan, a heavy duty self supporting tower crane of height of 78 m with capacity of 16 tonne was installed during 2009–2010 which facilitates for safer and faster erection/dismantling of test towers. The facility has enabled testing of more number of towers and also has resulted in lesser waiting period for customers as parallel activities regarding assembly/dismantling can be taken up simultaneously utilizing the reach of the tower crane all around the test bed boundary for all the related activities.

5.0 MILE STONES

As R&D Institute, major contributions are

1. Development of Narrow based towers for future needs of Compaction.
2. Study of different bracing pattern and experimental analysis of optimal bracing pattern.
3. Development of guyed tower, studies on rectangular based, triangular based towers.
4. Testing of India's first 400 kV AC and 800 kV AC and HVDC rating towers.
5. Testing of about 500 no's of towers of various ratings from33kv to 800 kV.

6.0 FUTURE PLANS

1. Augmentation of tower testing station for accommodating prototype tower testing up to 1200 kV rating.
2. Study on adoptability of new material for transmission/substation structures.