

Title: Sustainable and Reliable Steel Lattice Structures (SaRSS)

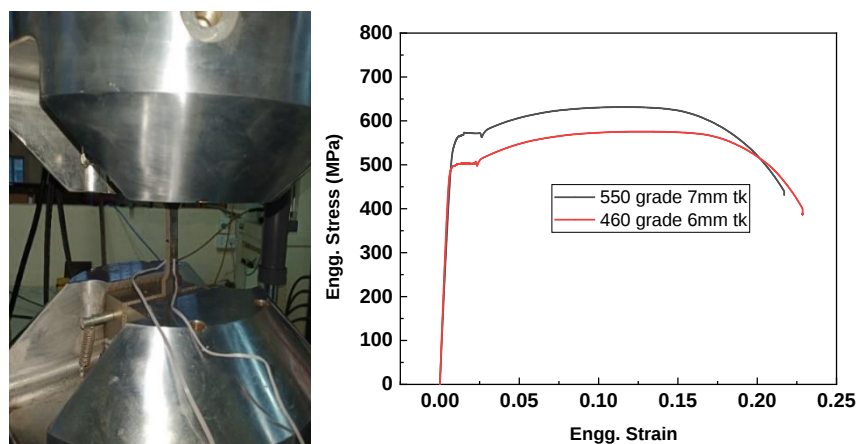
Duration: April 2023 to March 2026

Objectives:

- Behaviour of High Strength Steel (HSS) members under axial loads
- Component level behaviour of High Strength Steel (HSS) structural connections
- Reliability-based design of Transmission Line (TL) Towers
- Progressive collapse analysis of Transmission Line (TL) Towers

Progress Highlights:

- ❖ Mechanical Characterization of HSS grades of yield strength 450, 550, and 750 MPa
- ❖ Development of an elastoplastic analysis procedure incorporating isotropic hardening with linear and nonlinear hardening terms to establish the constitutive model for HSS under monotonic loading
- ❖ Strength of bolted connections experiencing block shear failure in HSS plate elements
- ❖ Creation of a test database for TL tower members in compression & statistical analysis for determination of modelling error for the design standards
- ❖ Experimental studies on the buckling capacity of cross-arm lower member
- ❖ Case study on failure analysis of 220 kV double circuit medium angle prototype tested TL tower and numerical investigations for revised wind zone loads
- ❖ Case study on a 110-kV suspension and tension-type guyed TL tower to study the mechanical behavior under broken conductor load



Mechanical characterization of high strength steel



Test set-up

Buckling of CALM with $\lambda = 40$ & $\lambda = 100$

Buckling test on TL tower Cross Arm Lower Member (CALM)

Future Programme:

- Mechanical characterization and testing of HSS materials through experimental studies
- Experimental studies on HSS tension and compression member
- Experimental studies on HSS bolted connection
- Creation of a test database for TL tower members in tension and connections and experimental studies to bridge the gaps in the test database
- Evaluation of broken conductor loads for progressive collapse analysis of transmission line towers
- Numerical investigations on the progressive collapse of 220 kV transmission tower subjected to dust storms and broken conductor loads

PI and Co-PI

- Dr. P. Prabha (PI)
- Dr. R.P. Rokade (Co-PI)

Team:

• Behaviour of High Strength Steel (HSS) members under axial loads • Component level behaviour of High Strength Steel (HSS) structural connections	• Reliability-based design of Transmission Line (TL) Towers • Progressive collapse analysis of Transmission Line (TL) Towers
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