



IS 4454 (Part 2): 2001 Steel wires for mechanical springs, Part 2 Oil hardened and Tempered steel wire

The steel wire with or without adding alloying elements are processed through cold drawing, which involves pulling the steel through one or more drawing dies to reduce its diameter followed by oil hardened and tempered to optimize its mechanical properties.

Steel wire intended for use in springs for **static and dynamic Stress** applications that provide resistance or energy storage in mechanical systems, such as in automotive applications like **Clutch and Valve springs**.

High-quality Steel Wires for Mechanical Springs shall have adequate **tensile strength, ductility & torsional rigidity, accurate chemical composition and consistent dimensional accuracy**. It must be **free from defects** to ensure reliability, durability, and performance in mechanical spring applications.

The Indian Standard IS 4454(Part 2): 2001 addresses the above quality parameters in the following ways:

- i) IS 4454 (Part 2) specifies **low, medium and high tensile strength** requirements for different wire diameters to ensure the wire can withstand the loads typically encountered in spring applications. Tensile strength requirements are categorized by **wire diameter and intended spring application**, providing a benchmark for **durability and resilience**.
- ii) The standard includes tolerances for **wire diameter**, specifying acceptable limits for variation based on the nominal diameter. These tolerances ensure dimensional accuracy, which is crucial for maintaining consistent spring characteristics and compatibility with manufacturing processes.
- iii) IS 4454 (Part 2) specifies that wires should have a **smooth, defect-free surface** and must be free from defects, such as **grooves, seams, tears, rust, scale, scratches, pits, die-marks, and any other harmful defects**, which may have a noticeable adverse effect on the application of the wire.
- iv) The standard specifies wrapping test that ensure **sufficient elasticity and controlled ductility**, allowing the wire to be formed into springs that can return to their original shape after deformation. This helps achieve the spring's necessary functional properties, such as resilience and flexibility.

It is concluded that IS 4454 (Part 2): 2001 helps manufacturers and users ensure that Oil hardened and tempered steel wires used in mechanical springs perform reliably and consistently.