

Nonuniform Yielding

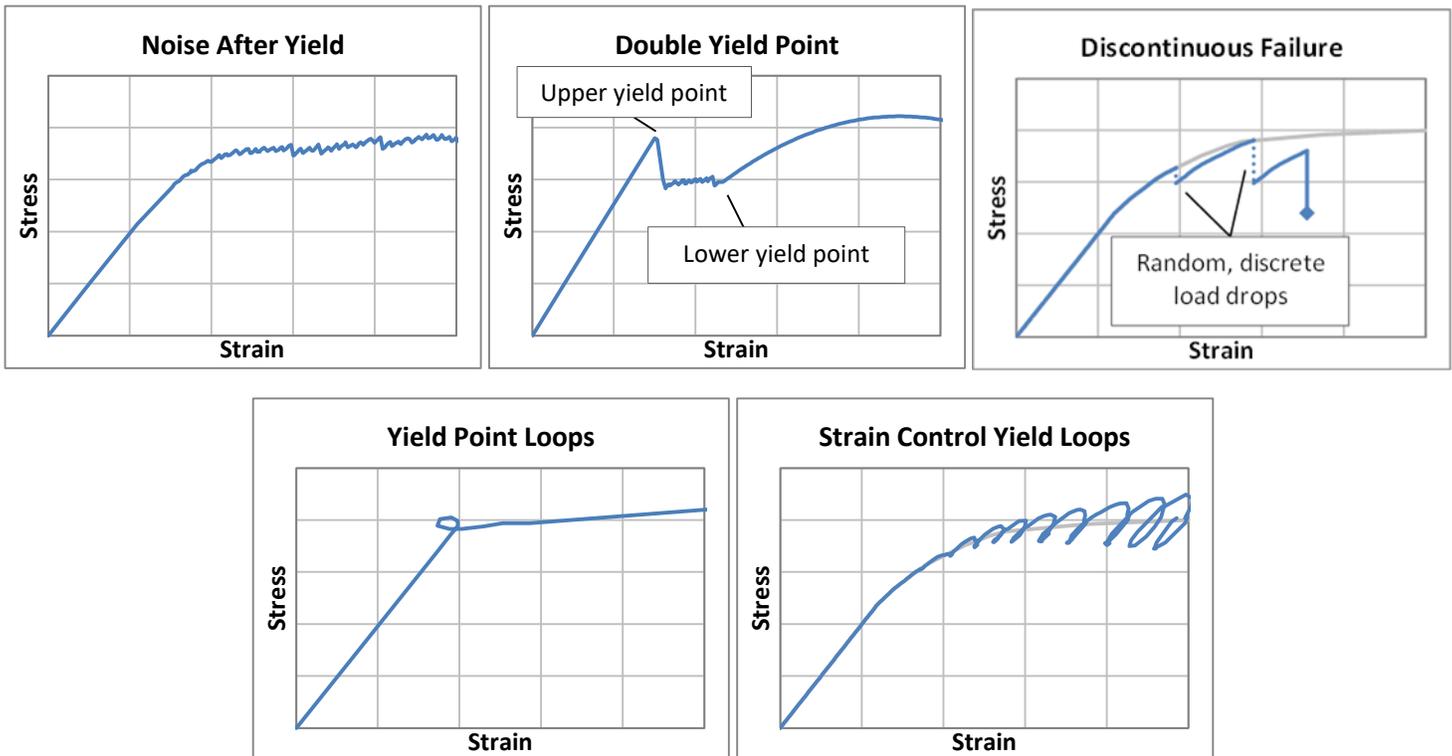
Various common yield point phenomena can cause unexpected test curves

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Nonuniform material behaviors

Some materials innately exhibit discontinuous or inhomogeneous deformation behavior such as discontinuous yielding, serrated yielding, and Lüders bands. These common phenomena can cause a variety of sometimes undesirable testing artifacts, including “noise” after yield and double yield point phenomena. Reversing load and/or elongation at the yield point (loops) may occur if yield onset occurs outside the gauge length of the extensometer. Some materials, such as composites, are prone to failure in an unpredictable discontinuous manner due to debonding or discrete fiber failure.

 These phenomena are often due to real material behavior, not strain measurement errors.



Effects of/on Test Control - Load and Strain control

It is not always possible to maintain the same control mode and parameters (PID) through yield, as the system compliance can change significantly, inducing post-yield loops even if the material is *not* discontinuous. A change in control mode or PIDs at yield, or more conservative PIDs throughout, may be necessary. Further, nonuniform materials can create significant challenges when testing in load- or strain-control rather than crosshead control – it is not always possible to use load or strain control through yield and post-yield, and a change in control mode is often necessary.



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