

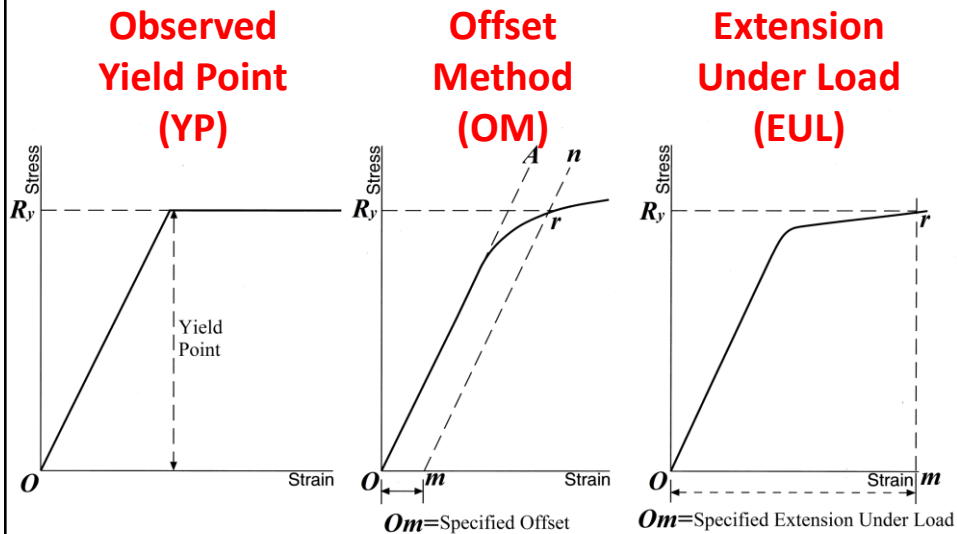
# Brief Historical Overview of Yield Strength Determination in ACI 318

Hot Topic Session: High-Strength Reinforcing Bars –  
Balancing Design Requirements with  
Achievable Material Properties  
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## Methods for Measuring Yield Stress



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## When did ACI 318 first specify a method?

- ACI 318-63: “When reinforcement is used that has a yield strength,  $f_y$ , in excess of 60,000 psi, at a proof stress equal to the specified yield strength,  $f_y$ , the strain does not exceed 0.003.”
  - The “exception” can be associated with the progression to USD (ultimate strength design) because, in ACI 318-63, the “exception” applied only to members designed using the USD method.
- ACI 318-71: “For reinforcing bars with a specified yield strength,  $f_y$ , exceeding 60,000 psi,  $f_y$  shall be the stress corresponding to a strain of 0.35 percent.”
  - This is based on the recommendations of a 1968 “Ad Hoc Group on Reinforcement.”
- ACI 318-14: Currently anticipated to be essentially the same.
  - However, a code change submittal currently under ballot proposes to change to the 0.2% offset method

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## Arguably, Code Provision is Obsolete

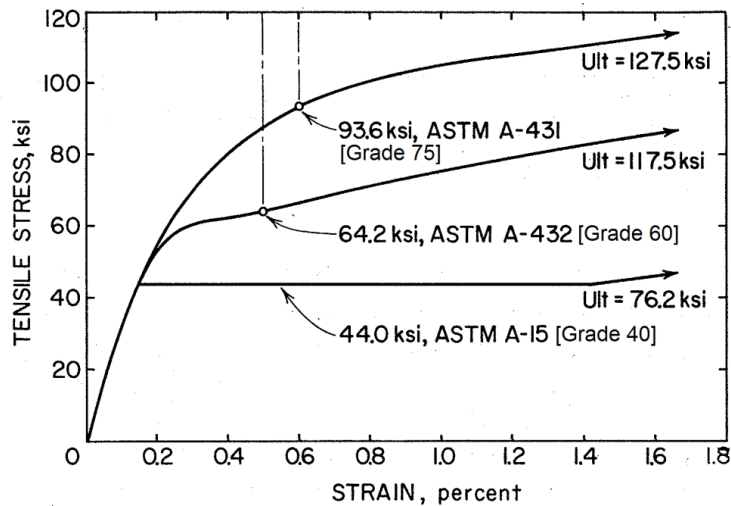
This provision first appeared about 50 years ago, and is based on actual stress-strain behavior of bars as manufactured in the 1960s.

Much has changed since then: manufacturing processes are different, and numerous other reinforcement products now included; these other products have differing stress-strain behaviors.

Time has come to change the yield method provisions within ACI 318.

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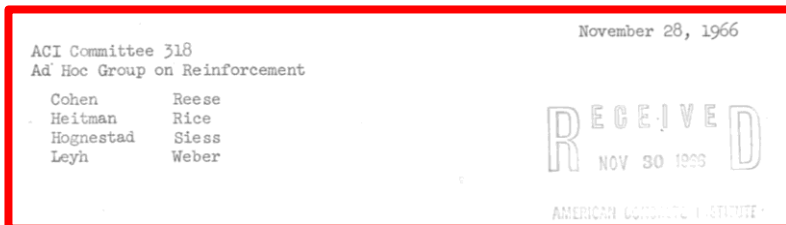
## Circa 1963 Actual Stress Strain Curves



- Grade 75 ASTM A431 bars **never exhibited** a distinct yield point
- Grade 60 ASTM A432 bars exhibited in-between stress-strain behavior
- Grade 40 ASTM A15 bars were **always** sharply-yielding materials

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## ACI 318 Ad Hoc Group on Reinforcement



- In early 2013, the records of “Ad Hoc Group on Reinforcement” were found in the committee correspondence archives at ACI headquarters
- The ad hoc group appears to have operated during 1966, 1967, 1968
- “DRAFT of a Report” issued March 8, 1967
- “Report” issued April 10, 1967
- 1967 and 1968: Interaction with ASTM committees and follow-up laboratory testing; ad hoc group expanded in size at that time to include steel producers and others

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