# 3M Scotchshield™ Safety and Security Window Films

## Key Reasons Why Ultra Is Better:

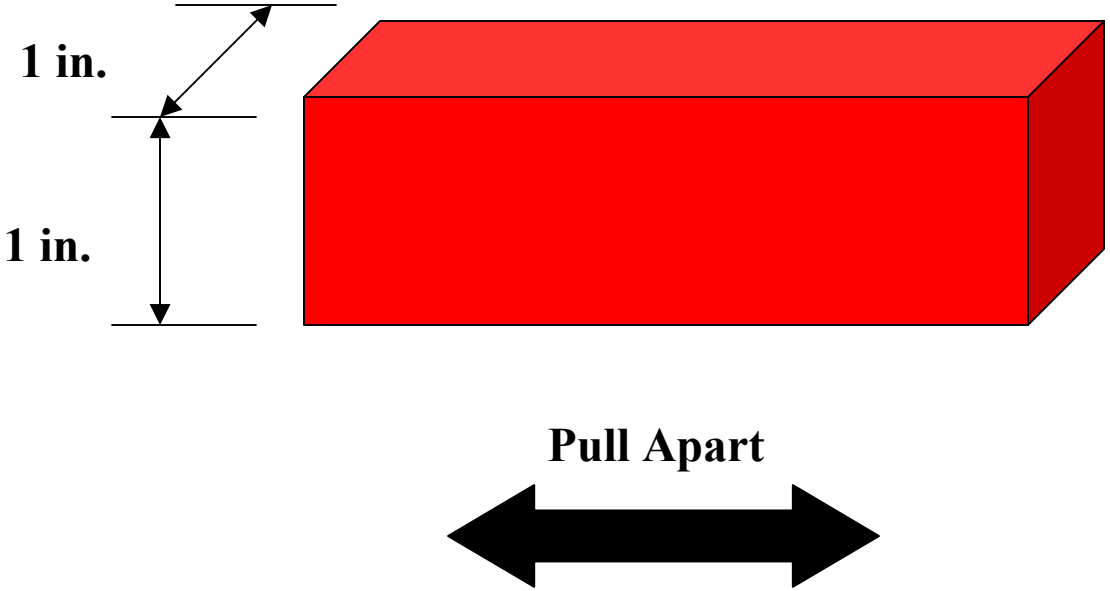
**Break Strength**
**Tensile Strength**
**Elongation**
**Graves Tear**
**Modulas**
**Puncture Propagation**

# Tensile Strength

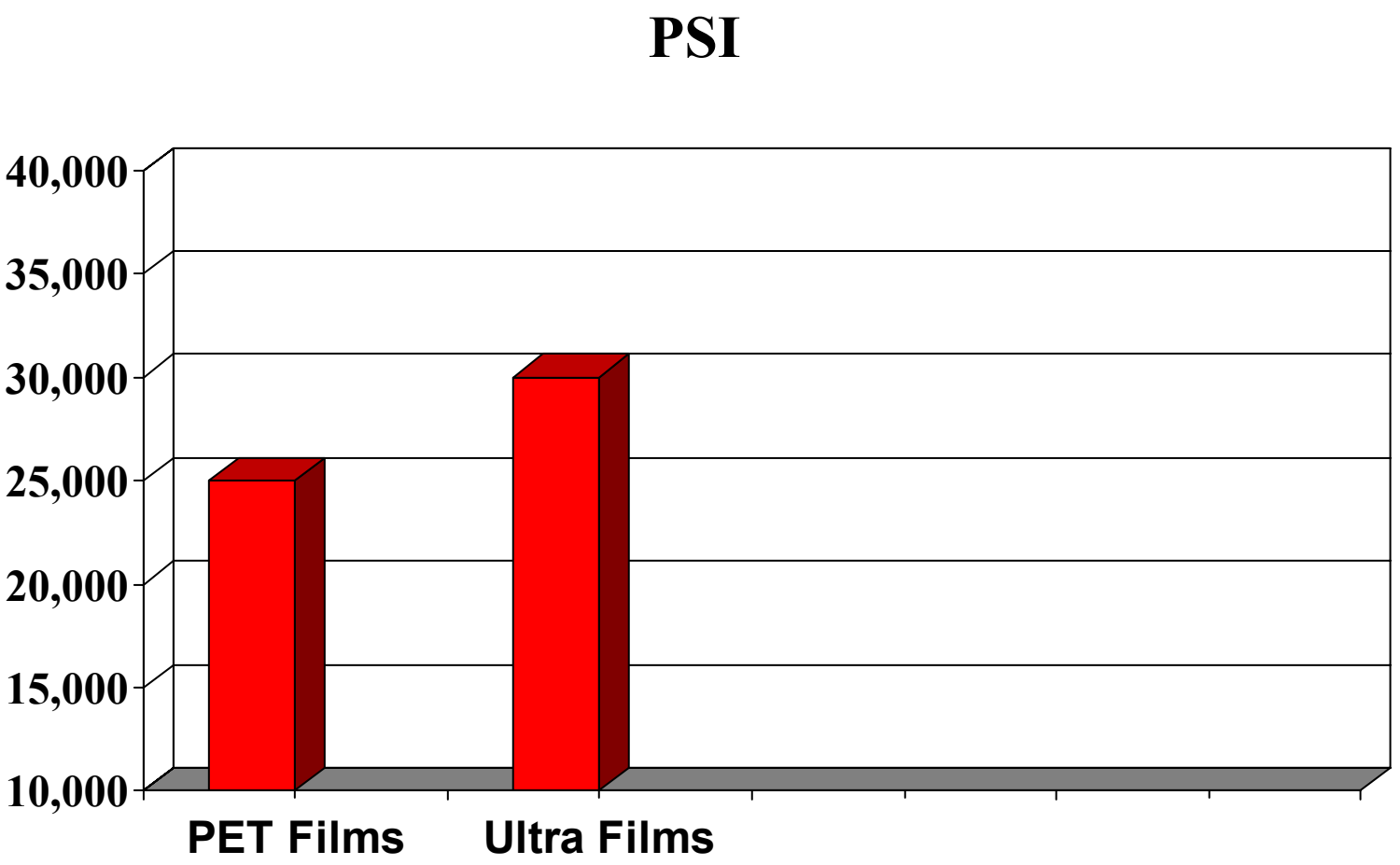
The resistance of a material to a force tending to pull it apart. Calculated from Break Strength.

Relates to how strong the product is when subjected to impact.

# Tensile Strength



# Tensile Strength




Only 3M Has this Technology

# Break Strength

Relates to the force needed to pull a safety film product apart. Tensile comes from this number.

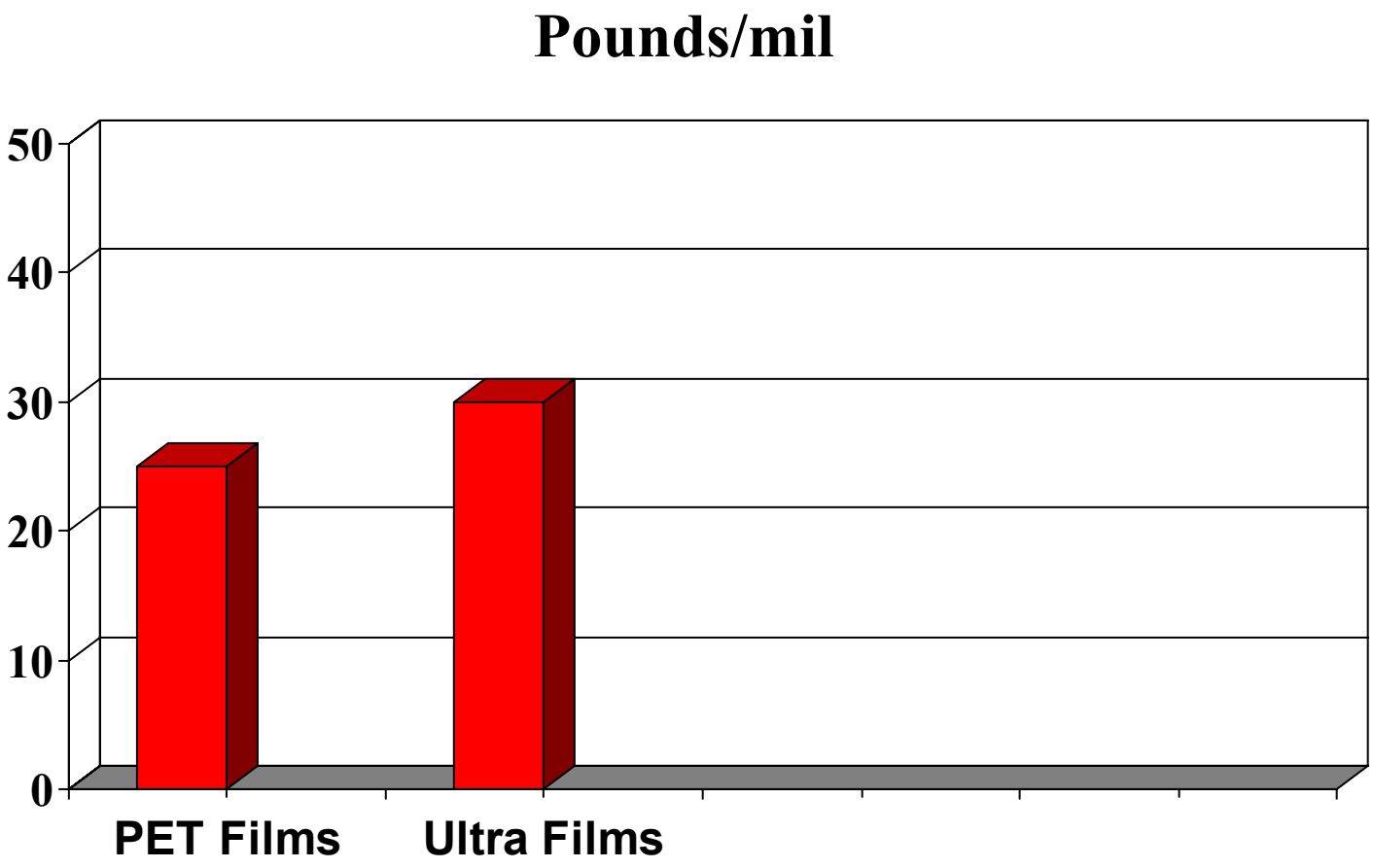
Ultra films mil per mil have a higher Break Strength than PET.

# Break Strength

**Film Sample**

**Pull Apart**

# Break Strength

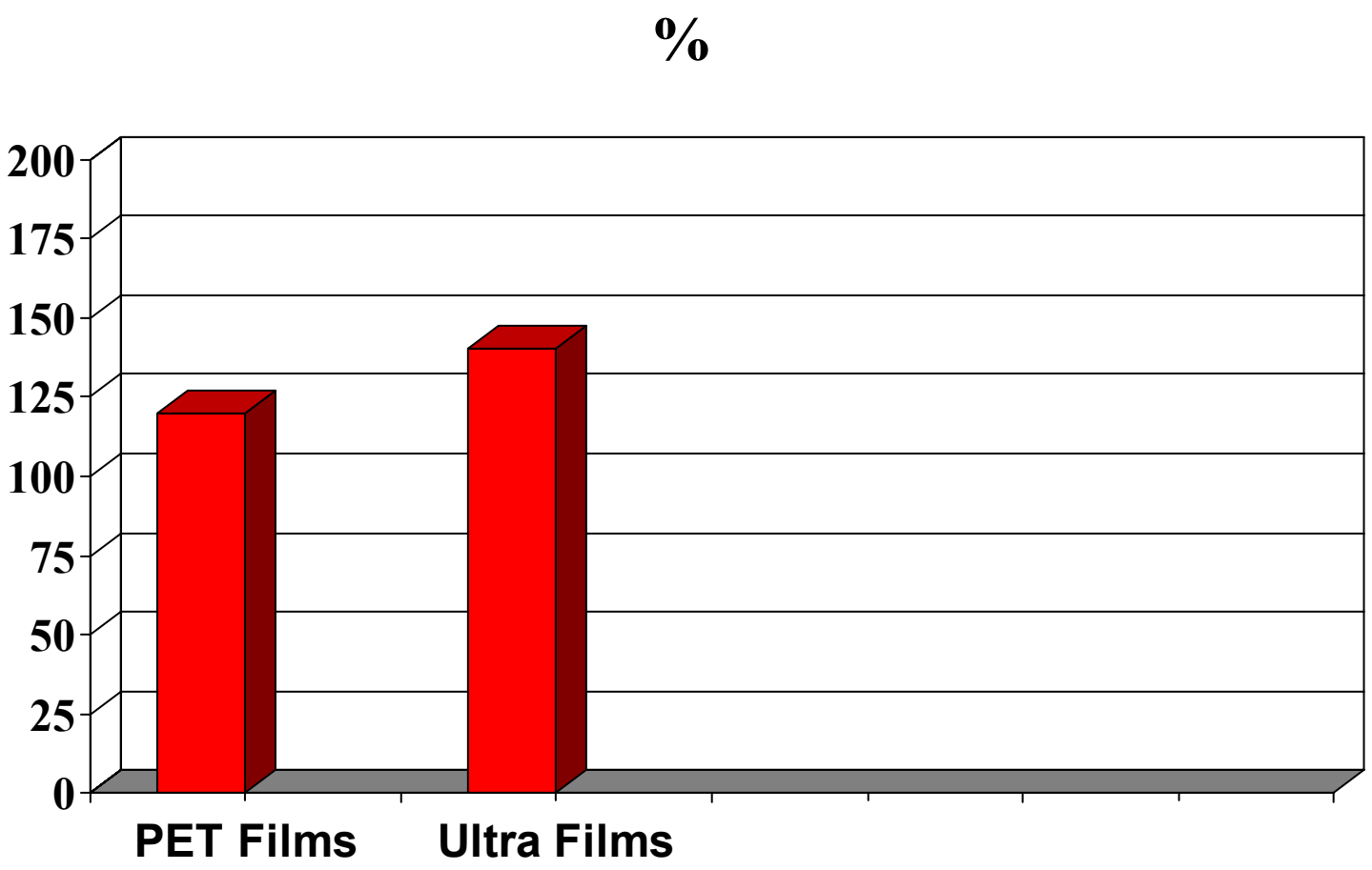



# Elongation

Ability to stretch

Greater Elongation allows the film to hold the glass together by stretching and absorbing energy.

# Elongation



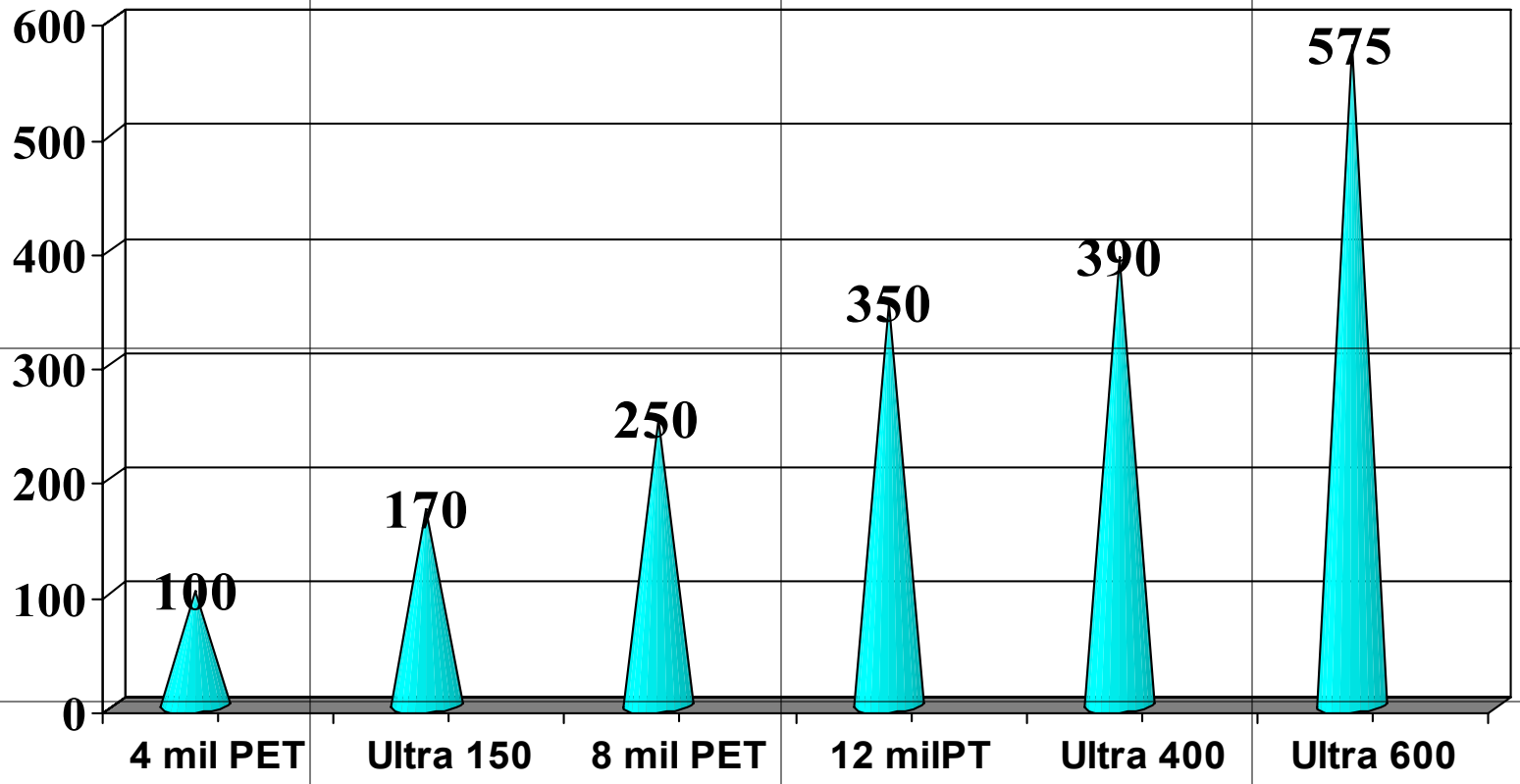

# Graves Tear

**Combination of Break Strength and Elongation**

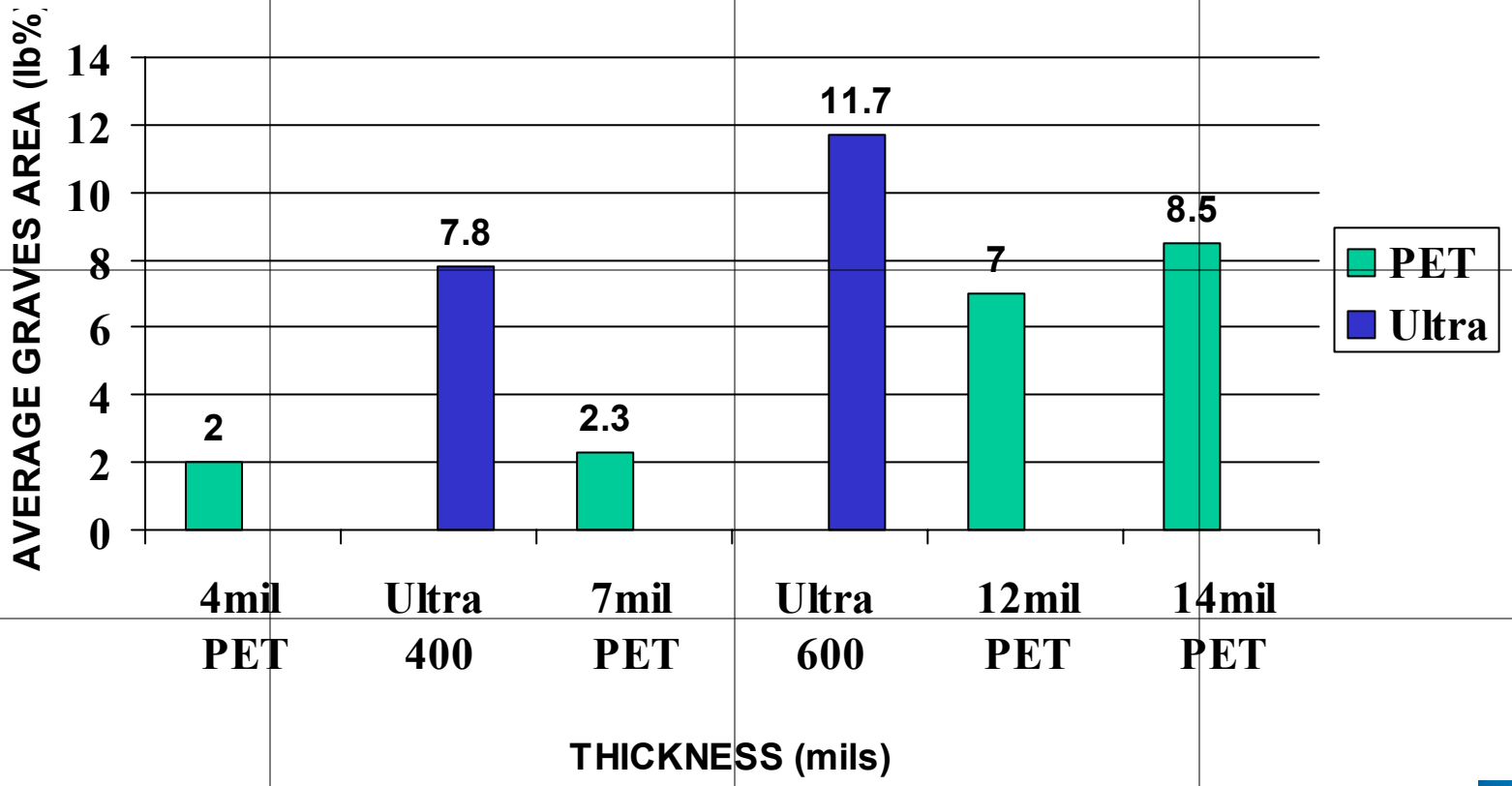
***When punctured Ultra film will continue to have high strength.***

# Graves Area, Lb%

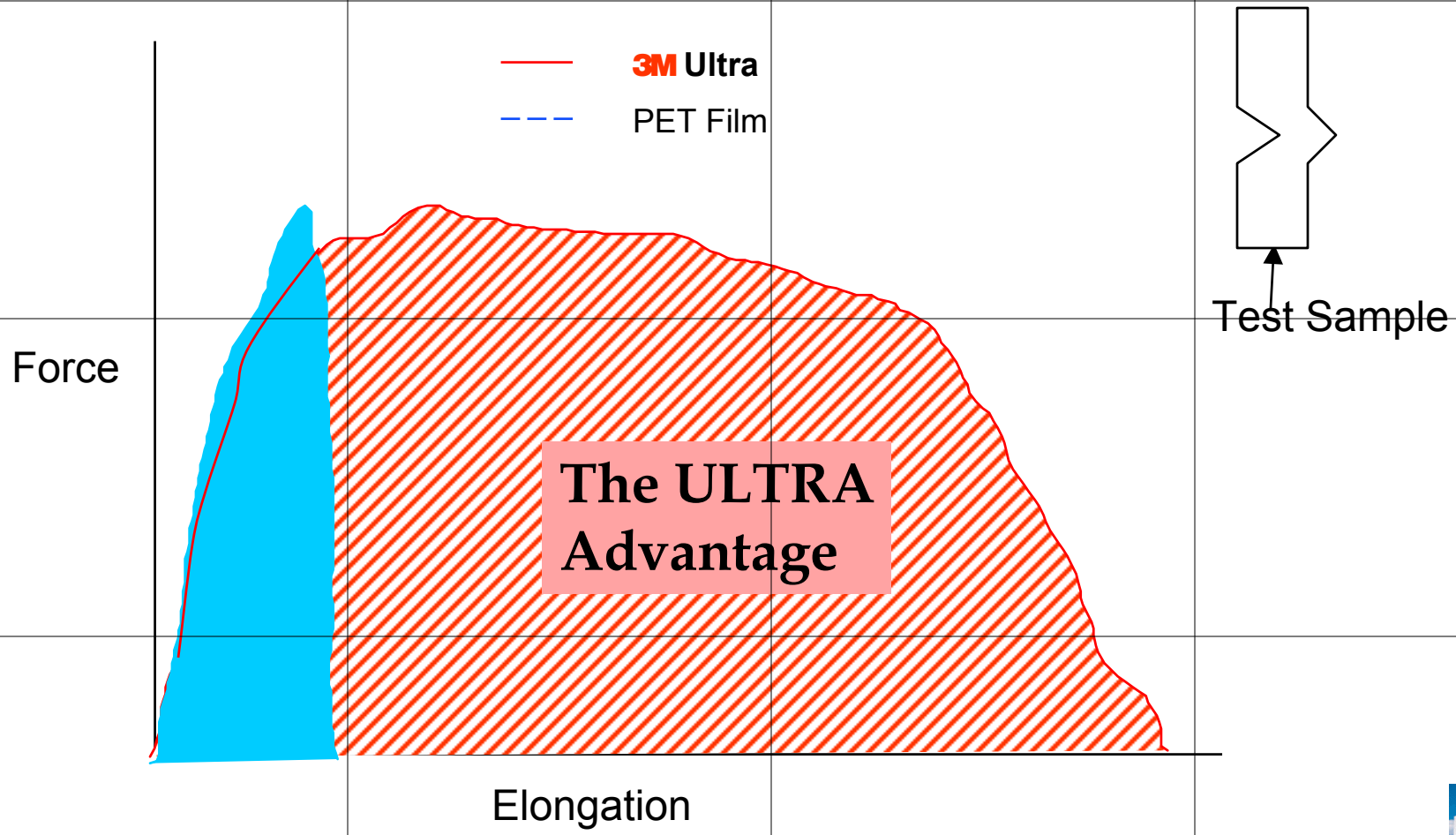
## ASTM D1004-94a




# GRAVES AREA
# 3M Ultra VS. PET




# GRAVES TEAR TEST



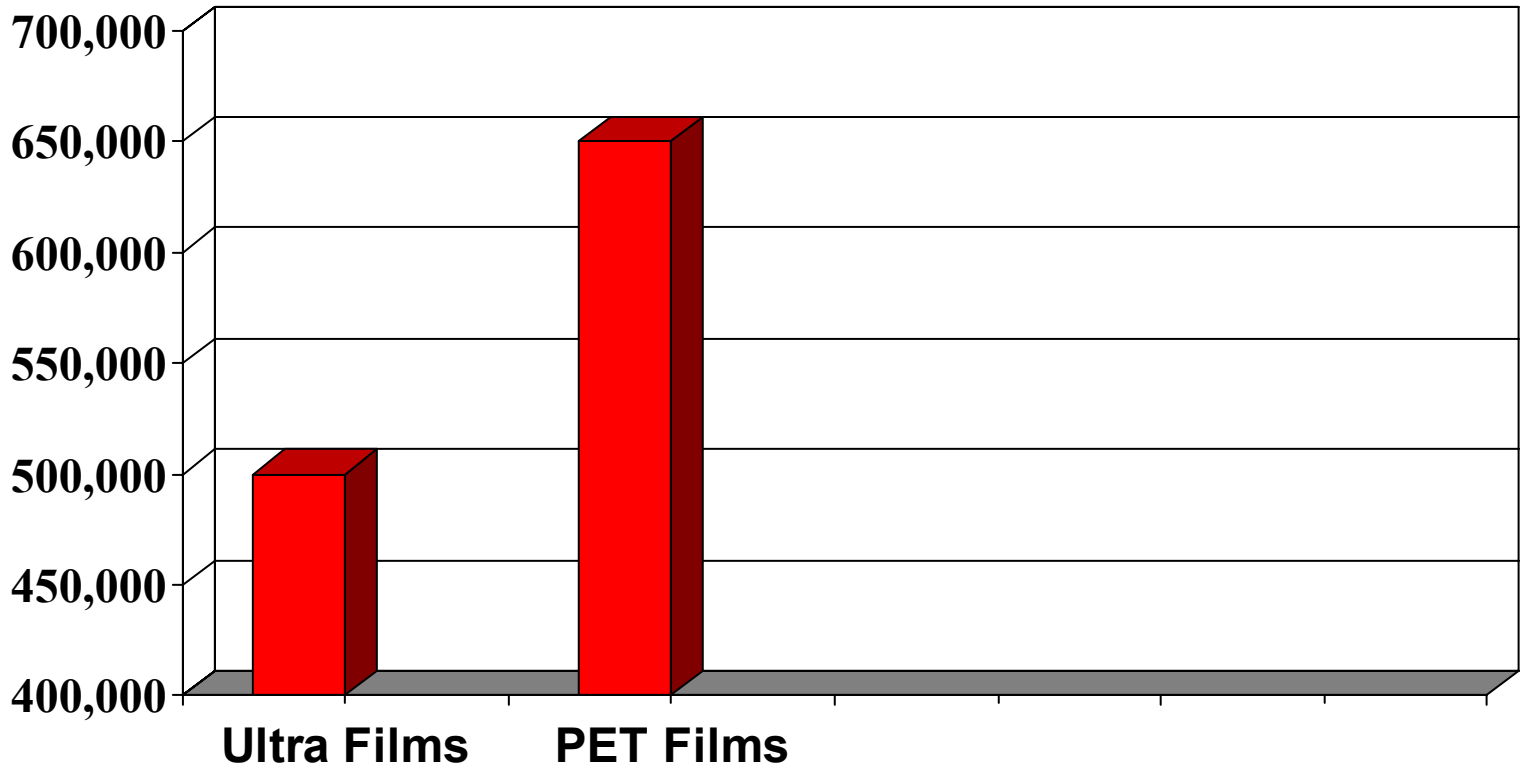

# Modulus

A measurement of polymer flexibility

A more flexible (less boardy) film is easier to install.

# Modulus in PSI

**ASTM D882-95a**

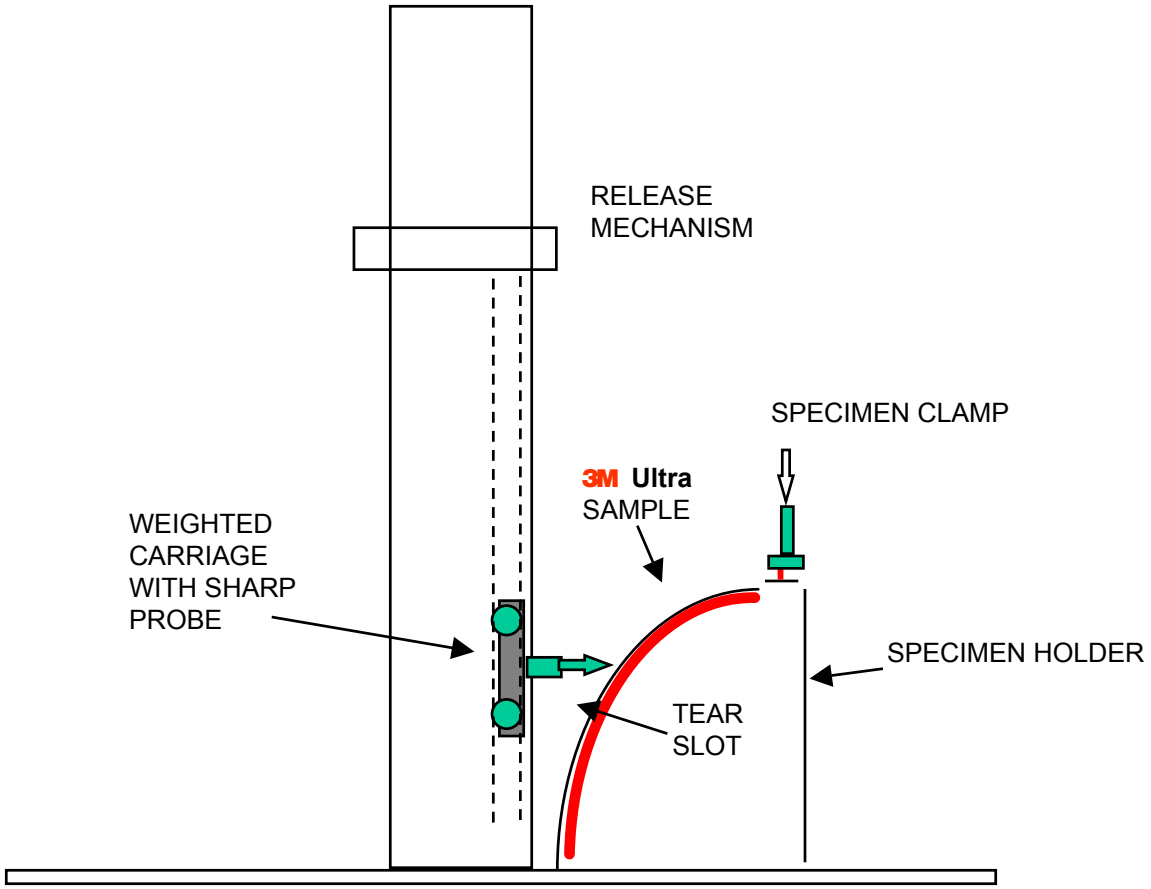



# Puncture Propagation

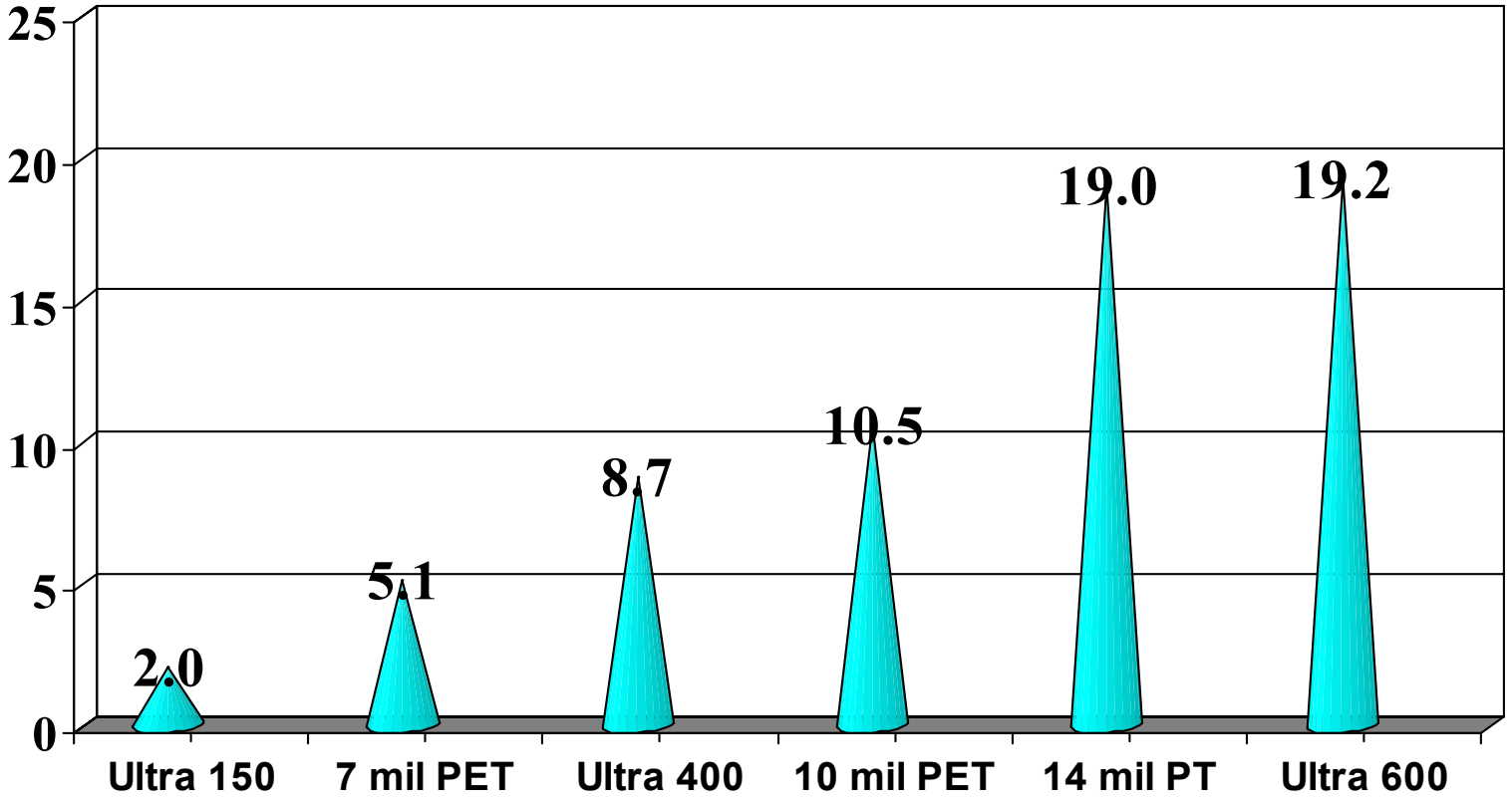
**Resistance to Puncture and Tear.**

***Greater resistance to Puncture and Tear means higher resistance to forced entry, bomb blast, storm cycling.***

# PUNCTURE-PROPAGATION-TEAR TEST (PPT)




# Puncture Propagation, lbs.
# ASTM D2582-93




# PPT
# 3M Ultra VS. PET