Advanced Simulation Summit

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DASSAULT SYSTEMES

Tips and Tricks

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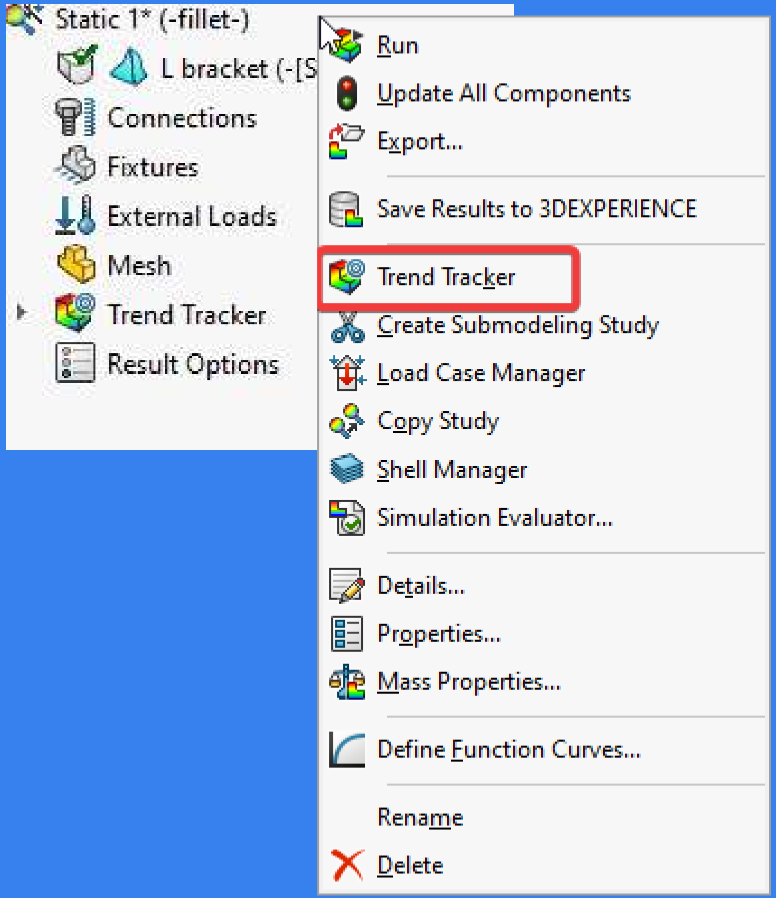
DASSAULT SYSTEMES

Trend Tracker

- Creates a Trend Journal
- Tracks changes made in study
- Not helpful for tracking fashion trends



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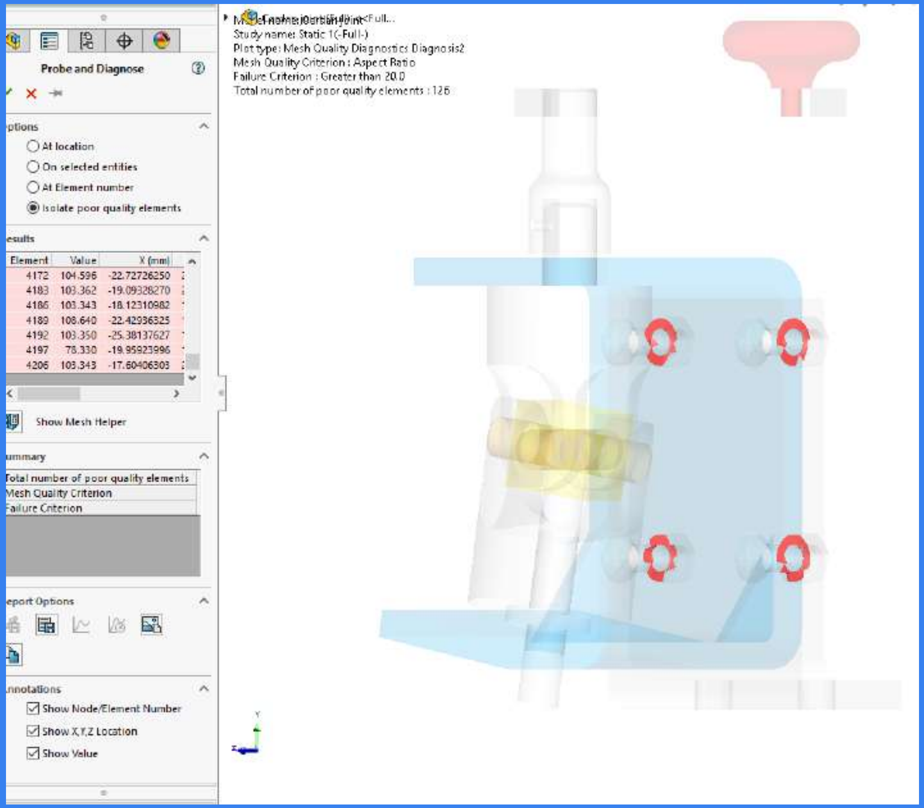
Mesh Quality Diagnostics

- Highlights poor quality elements
- Allows creation of mesh controls in areas of lower quality



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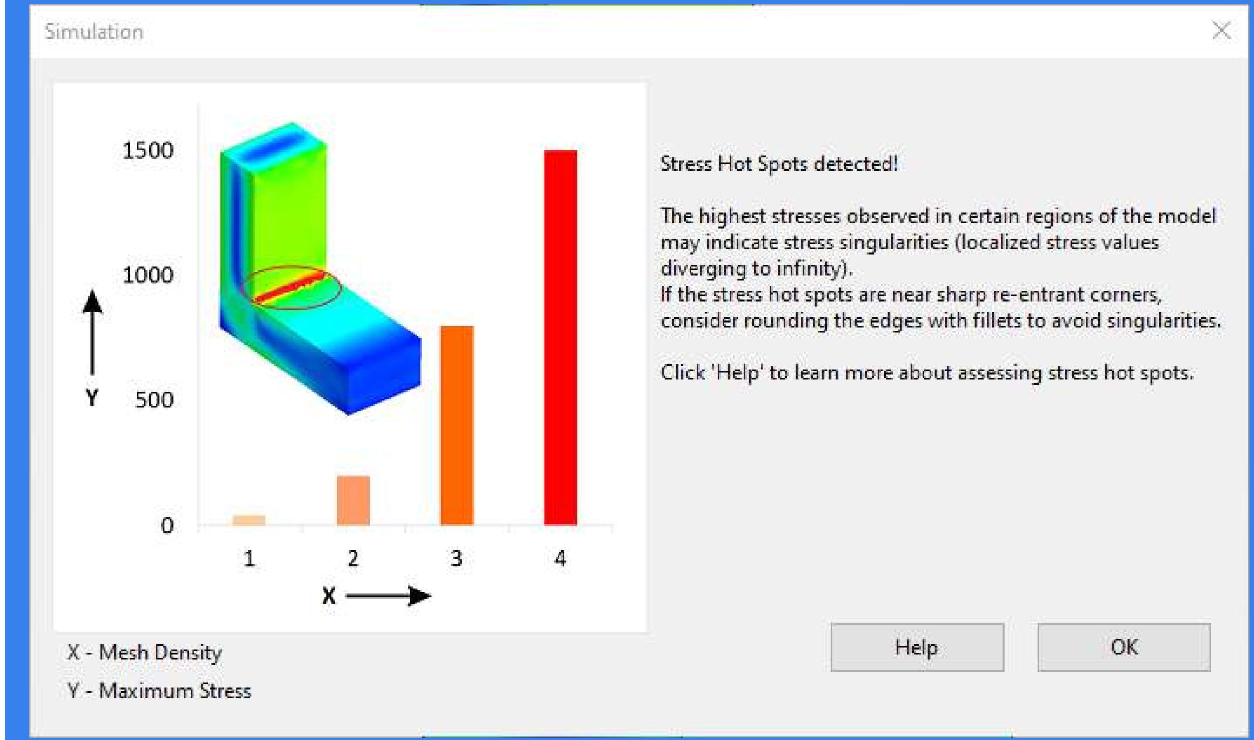
Hot Spot Diagnostics

- Identifies irregular stress gradients
- Refines to find singularities



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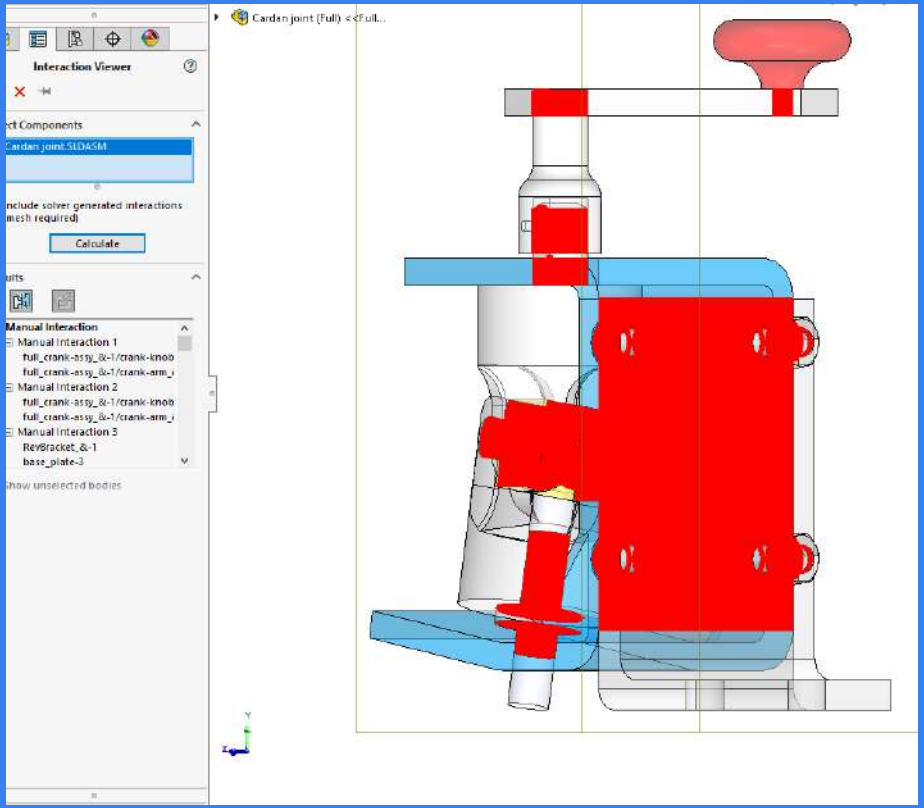
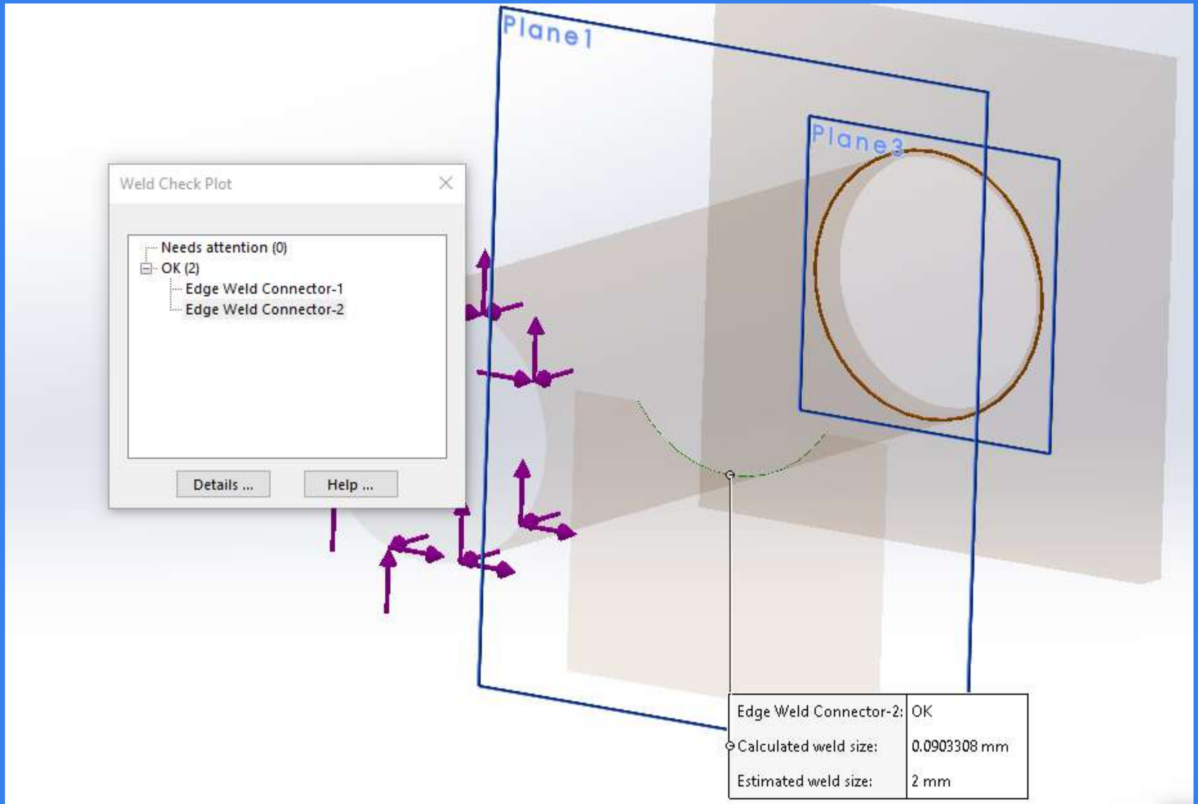
Interaction Viewer

- Highlight interactions in study
- Shows under constrained bodies



Weld Connectors

- Connectors approximate welds in the assembly
- Includes weld check plot
- Available in Simulation Professional



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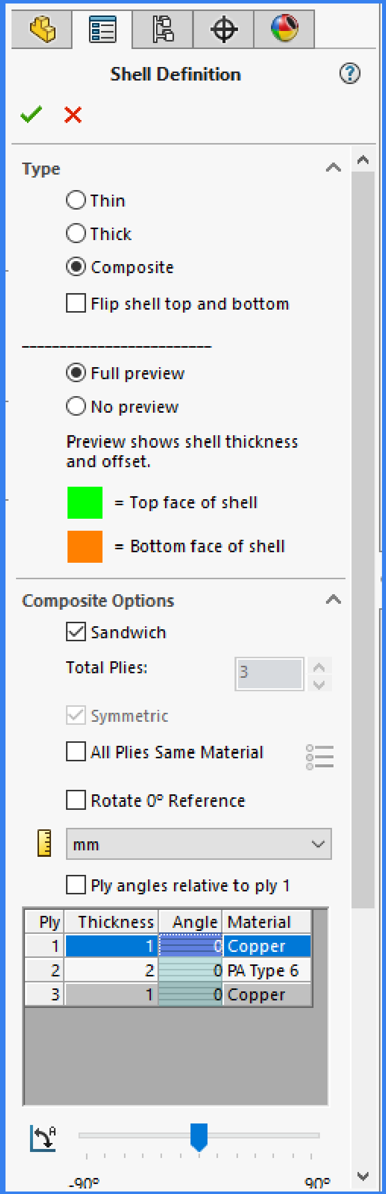
Composite Analysis

- Requires Simulation Premium
- Layered composites can be represented
- Available in Static, Buckling, and Frequency Analyses



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Bonus

- Material Search
- Copy between studies
- Copy Study
- Simulation Evaluator

What and Why Simulation API?

- SOLIDWORKS Simulation API…A Hidden Gem!
- Application Programming Interface
  - Set of routines, protocols for building custom software applications
- A toolset for
  - **A**utomation
  - **P**roductivity
  - **I**mprove Process

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Who and When of Simulation API?

- Basic scripting knowledge
  - Eg:VB, VBA, VB.NET, C++ 6.0, C++.NET, and C#.NET
- Simulation API = SOLIDWORKS API
- Build custom application: custom inputs / outputs
- Work past User Interface limits
- Optimize by automating “What if” scenarios

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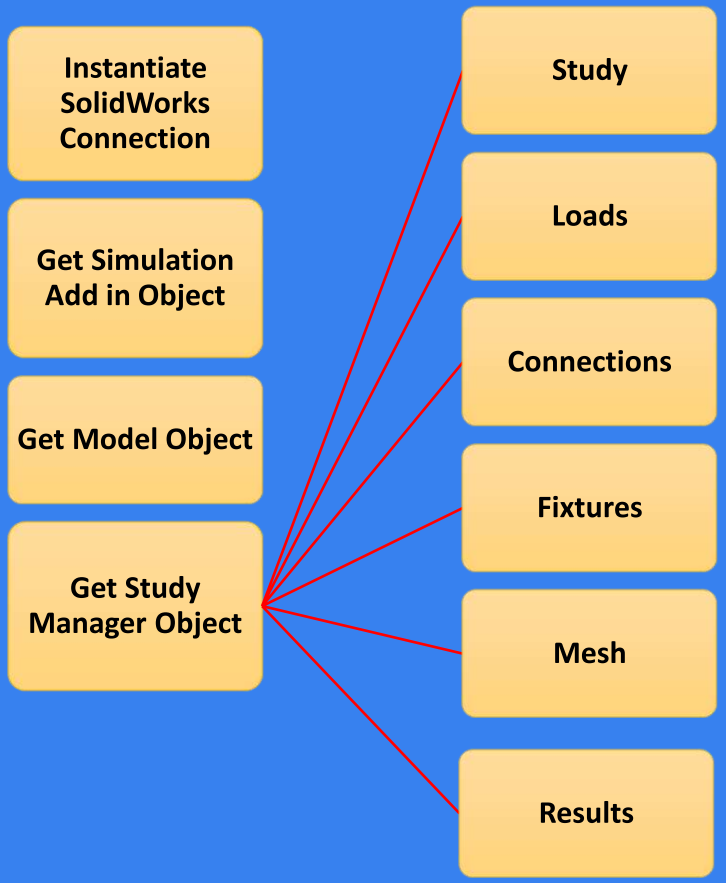
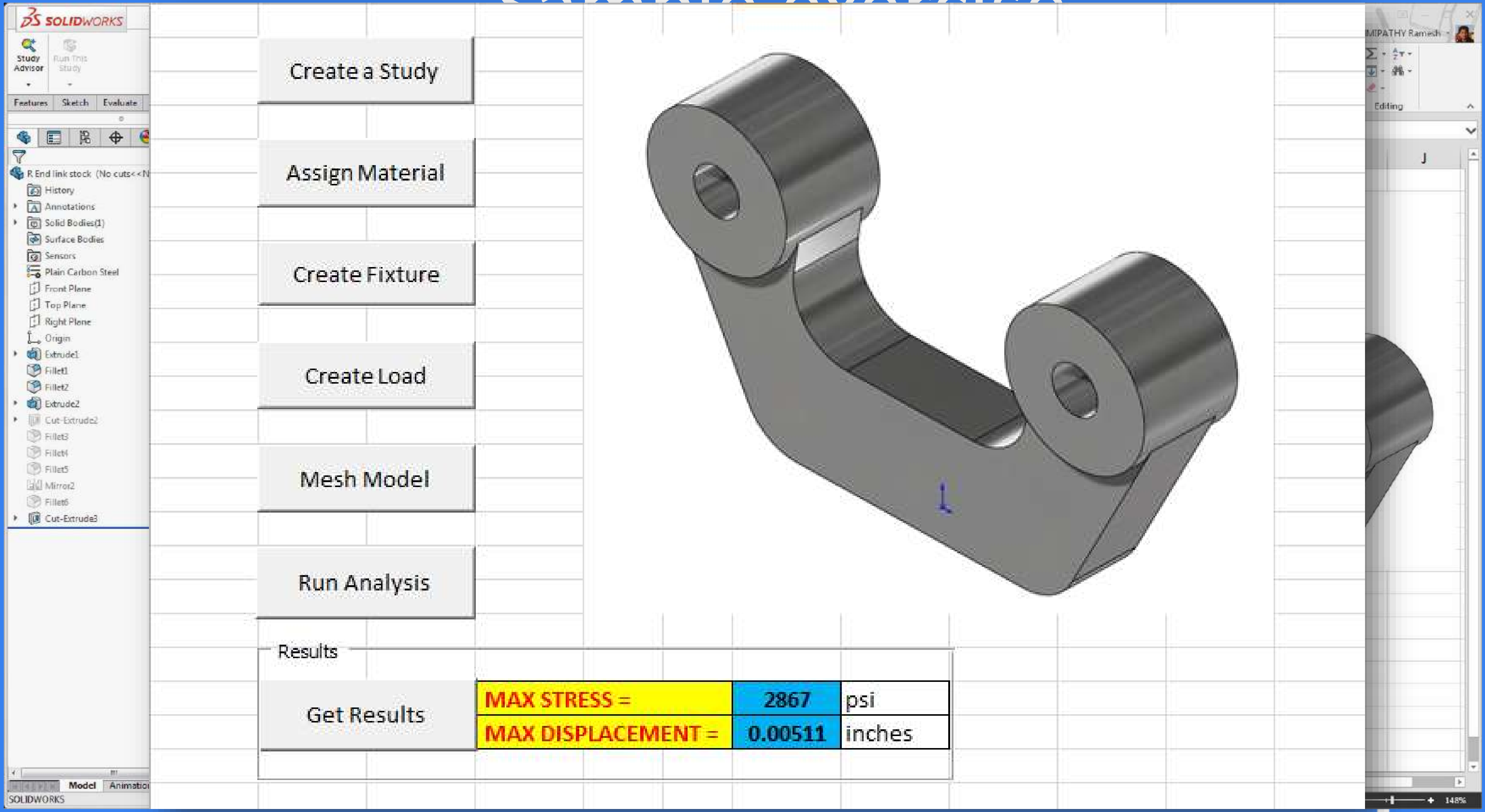
How to of Simulation API

Basic API Calls



Excel Automation



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Example Applications – Beam Effective Lengths

Table 5.1 Effective length of compression members

Boundary conditions	Theory	Code value (Cl.7.2.2)
Both ends pin ended	1.0L	1.0L
Both ends fixed	0.5L	0.65L
One end fixed and the other end pinned	0.707L	0.8L
One end fixed, and the other free to sway	1.2L	1.2L
One end fixed and the other end free	2.0L	2.0L

Cut-List Folder Name	Beam Body Name	Description	Beam Column Boundary	Beam Length	Beam K Factor	Beam Effective Length
Cut-List-Item1	Structural Member1[1]	L8x8x0.75	Fixed - Fixed	288 inches	0.5	144 inches
Cut-List-Item1	Structural Member1[2]	L8x8x0.75	Fixed - Fixed	288 inches	0.5	144 inches
Cut-List-Item1	Structural Member1[3]	L8x8x0.75	Fixed - Fixed	288 inches	0.5	144 inches
Cut-List-Item1	Structural Member1[4]	L8x8x0.75	Fixed - Fixed	288 inches	0.5	144 inches
Cut-List-Item2	Trim/Extend3[1]	W12x40	Fixed - Fixed	72 inches	0.5	36 inches
Cut-List-Item2	Trim/Extend3[2]	W12x40	Fixed - Fixed	72 inches	0.5	36 inches
Cut-List-Item2	Trim/Extend3[3]	W12x40	Fixed - Fixed	72 inches	0.5	36 inches
Cut-List-Item2	Trim/Extend3[4]	W12x40	Fixed - Fixed	72 inches	0.5	36 inches
Cut-List-Item3	Trim/Extend4	L4x4x0.375	Fixed - Fixed	114.695 inches	0.5	57.3475 inches
Cut-List-Item16	Trim/Extend2[1]	W6x20	Fixed - Fixed	59.31 inches	0.5	29.655 inches
Cut-List-Item16	Trim/Extend2[2]	W6x20	Fixed - Fixed	59.31 inches	0.5	29.655 inches
Cut-List-Item16	Trim/Extend2[3]	W6x20	Fixed - Fixed	59.31 inches	0.5	29.655 inches
Cut-List-Item16	Trim/Extend2[4]	W6x20	Fixed - Fixed	59.31 inches	0.5	29.655 inches
Cut-List-Item16	Trim/Extend2[5]	W6x20	Fixed - Fixed	59.31 inches	0.5	29.655 inches
Cut-List-Item16	Trim/Extend2[6]	W6x20	Fixed - Fixed	59.31 inches	0.5	29.655 inches
Cut-List-Item16	Trim/Extend2[7]	W6x20	Fixed - Fixed	59.31 inches	0.5	29.655 inches
Cut-List-Item16	Trim/Extend2[8]	W6x20	Fixed - Fixed	59.31 inches	0.5	29.655 inches
Cut-List-Item18	Trim/Extend12	L4x4x0.375	Fixed - Fixed	59.005 inches	0.5	29.5025 inches

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Example Applications – Wind Loading API 4F Specs

8.3.1.1 Onshore Wind

The design reference wind velocity, V_{ref}, for the operating, erection and transportation environments shall be as specified by purchaser.

For non-operating design environments on land in the U.S., V_{ref} for expected storm conditions is to be obtained from the ASCE/SEI 7-05 wind speed map. For other onshore locations, V_{ref} shall be taken from a source such as a recognized standards agency or a governmental meteorological agency. The wind velocity chosen shall be a 3-second gust wind, in knots (1 knot = 1.15 mph), measured at 10 m (33 ft) in open terrain with an associated return period of 50 years.

For the unexpected wind condition where pipe setback might be racked in the drilling structure, V_{ref} shall be taken as no less than 75% of the expected storm V_{ref}.

For each wind environment, the maximum rated design wind velocity, V_{des}, for various SSLs is then determined by multiplying the design reference wind velocity, V_{ref}, by an onshore multiplier $\alpha_{onshore}$ as listed in Table 8.1, but not less than as specified in Table 8.3.

$$V_{des} = V_{ref} \times \alpha_{onshore}$$

The direction of the wind in all cases may be from any azimuth. The methodology for determining the local wind velocity to be used in the design is discussed in 8.3.1.3.

8.3.1.3 Local Wind Velocity

The maximum rated design wind velocity, V_{des}, calculated using Tables 8.1 and 8.2 is to be scaled by the appropriate elevation factor β to obtain the velocity to be used to estimate wind forces per 8.3.3.

$$V_z = V_{des} \times \beta$$

where

β is $\sqrt{0.85}$ for heights up to 4.6 m (15 ft);

β is $\sqrt{(2.01 \times (z/900)^{0.211}}$ for heights > 4.6 m (15 ft) with z = height above ground level or mean sea level (ft);

β is tabulated in Table 8.4.

8.3.3 Member-by-Member Method

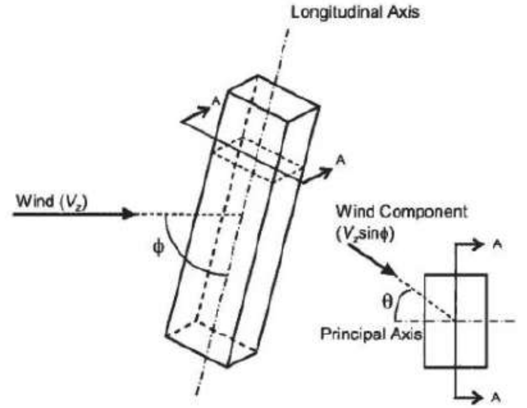
The total wind force on the structure shall be estimated by taking the vector sum of wind forces acting on individual members and appurtenances. The wind directions must be determined and considered which result in stresses having the highest magnitude for each component part of the structure. Wind forces for the various design wind speeds shall be calculated in accordance with the following equations and tables:

$$F_m = 0.00338 \times K_i \times V_z^2 \times C_s \times A$$

$$F_t = G_f \times K_{sh} \times \Sigma F_m$$

8.3.3.2 Member Angle of Inclination

The angle of inclination, ϕ, is defined as the angle in degrees between the *longitudinal* axis of a member and the wind directi



The member orientation angle, θ, is defined as the angle in degrees between the wind component acting perpendicular to the longitudinal axis and the principal axis of the member, with the principal axis normal to the longitudinal axis. The angle θ lies in a plane normal to the longitudinal axis, and is used to select a shape coefficient per 8.3.3.4. For wind walls, K_i equals 1.0.

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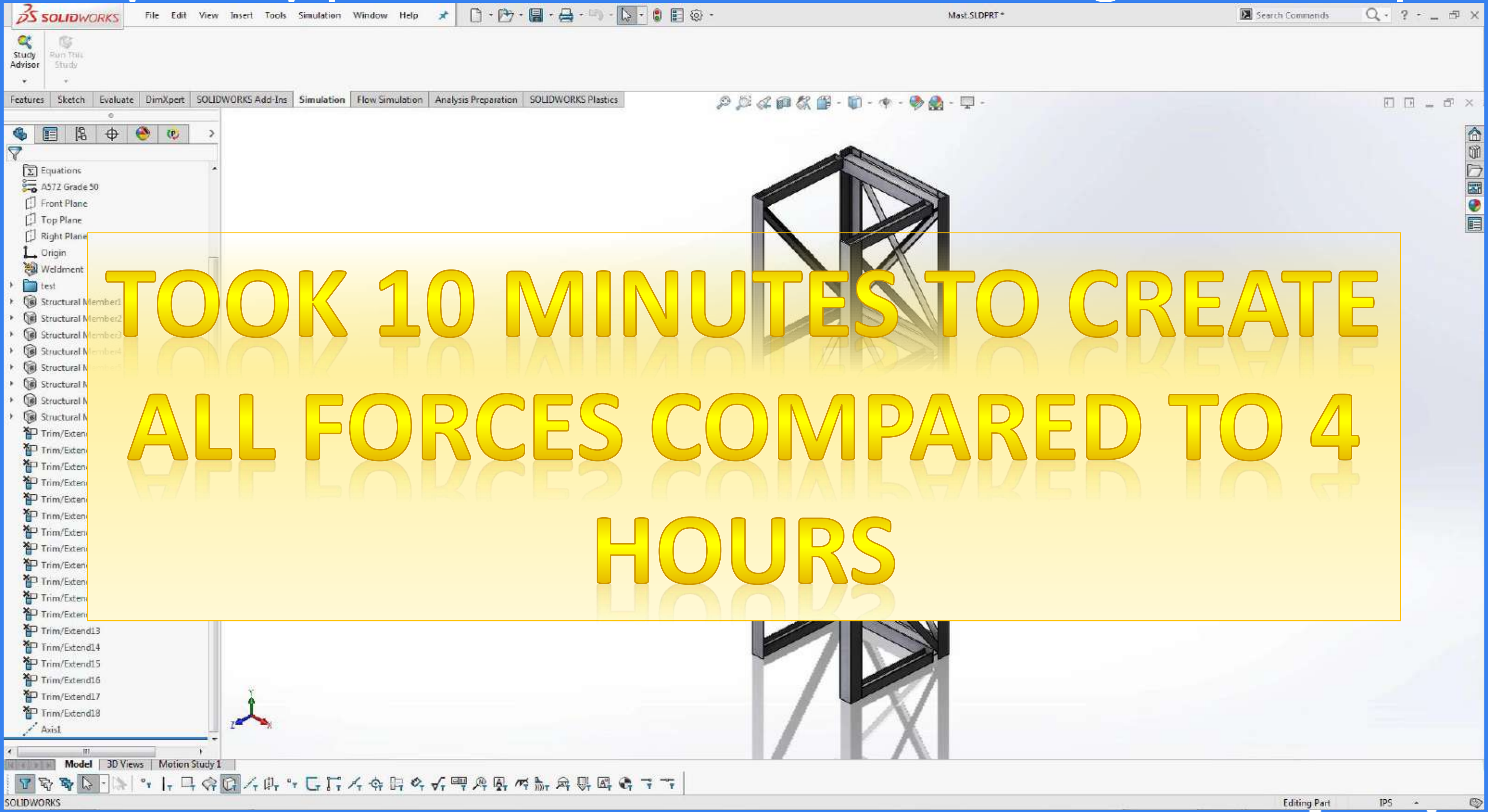
Example Applications – Wind Loading API 4F Specs



TOOK 10 MINUTES TO CREATE ALL FORCES COMPARED TO 4 HOURS

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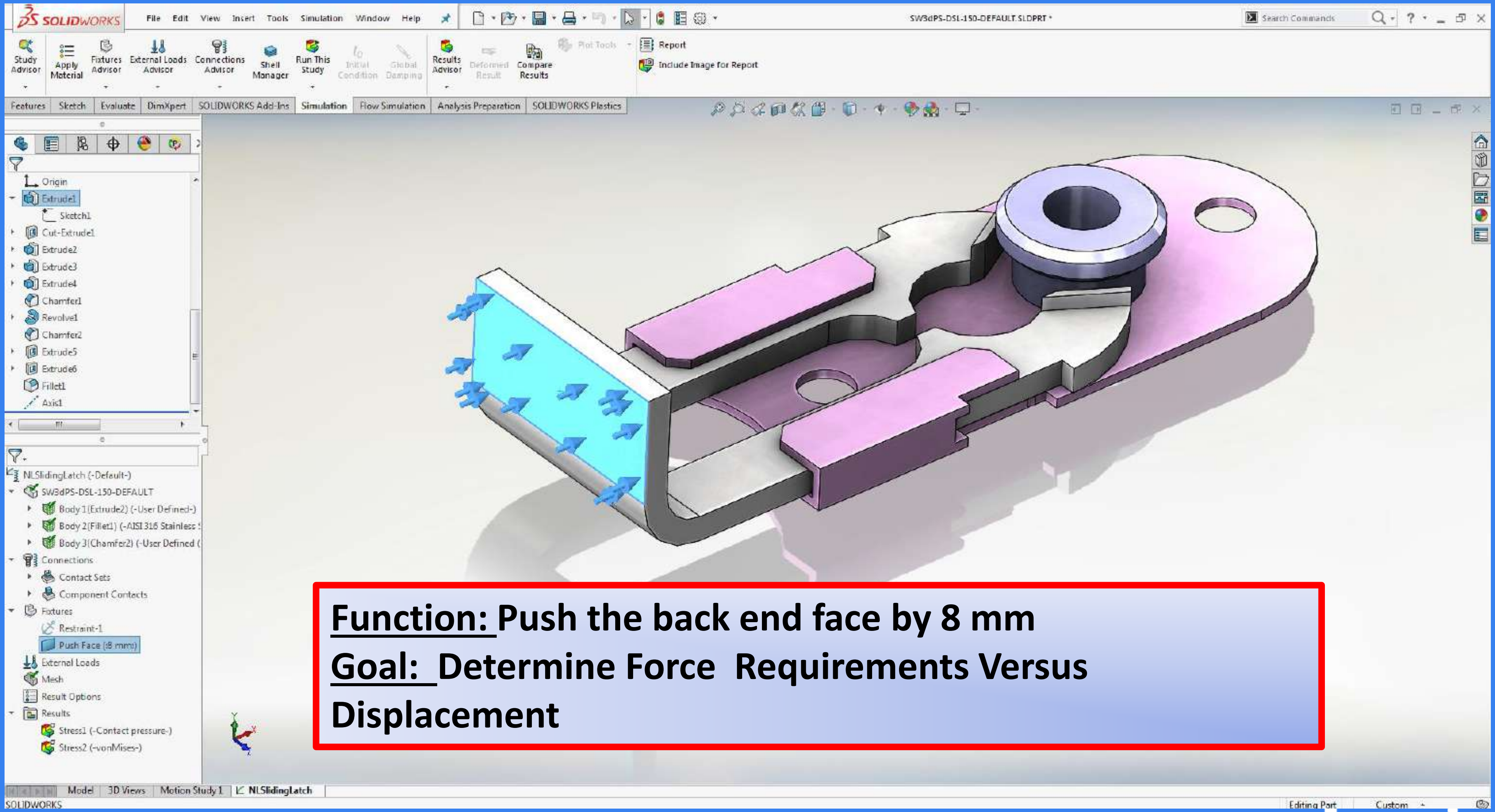
Example Applications– Snap Fit Mechanism



<u>Function:</u> Push the back end face by 8 mm

<u>Goal:</u> Determine Force Requirements Versus Displacement

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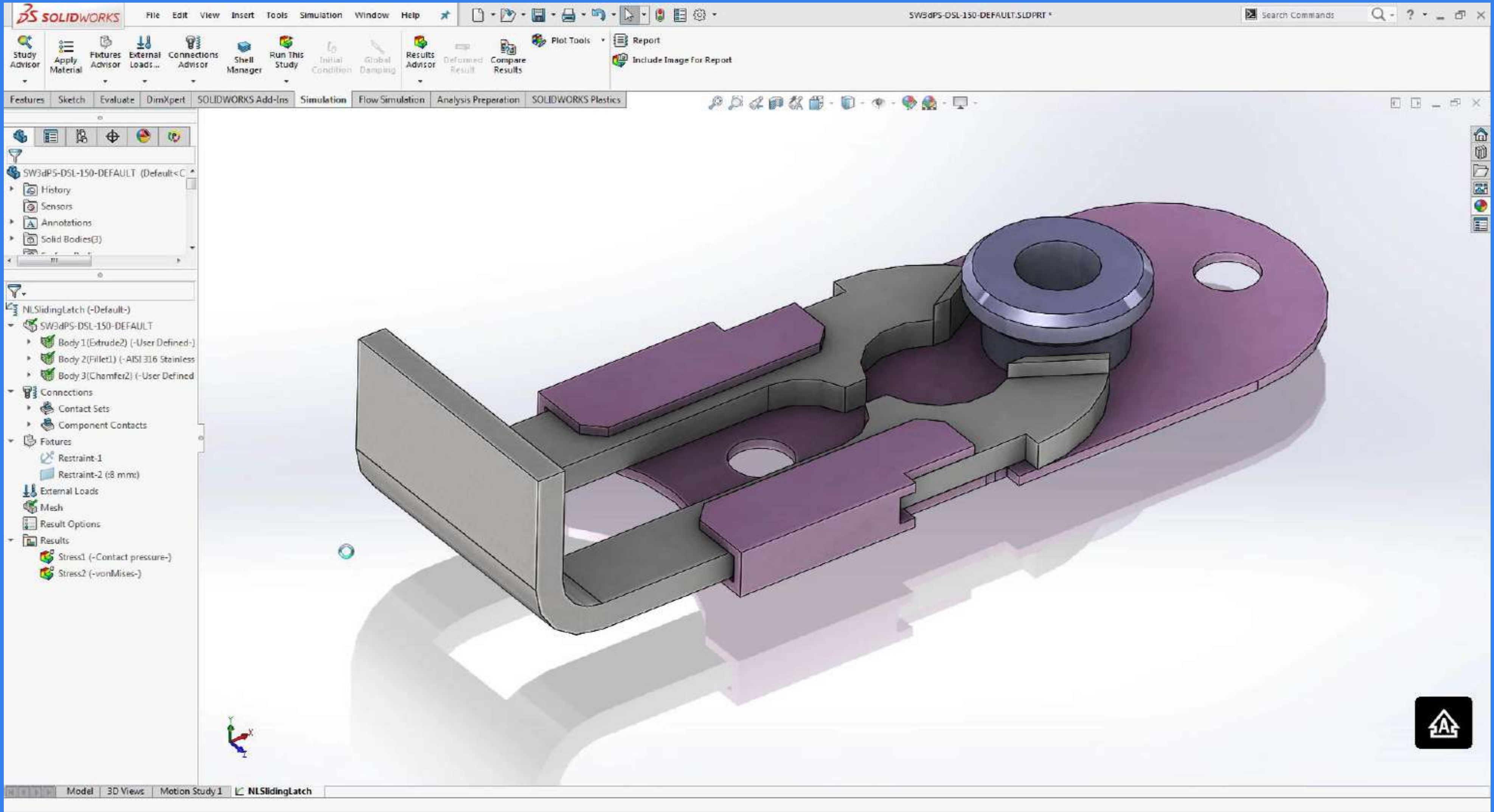
Example Applications– Snap Fit Mechanism



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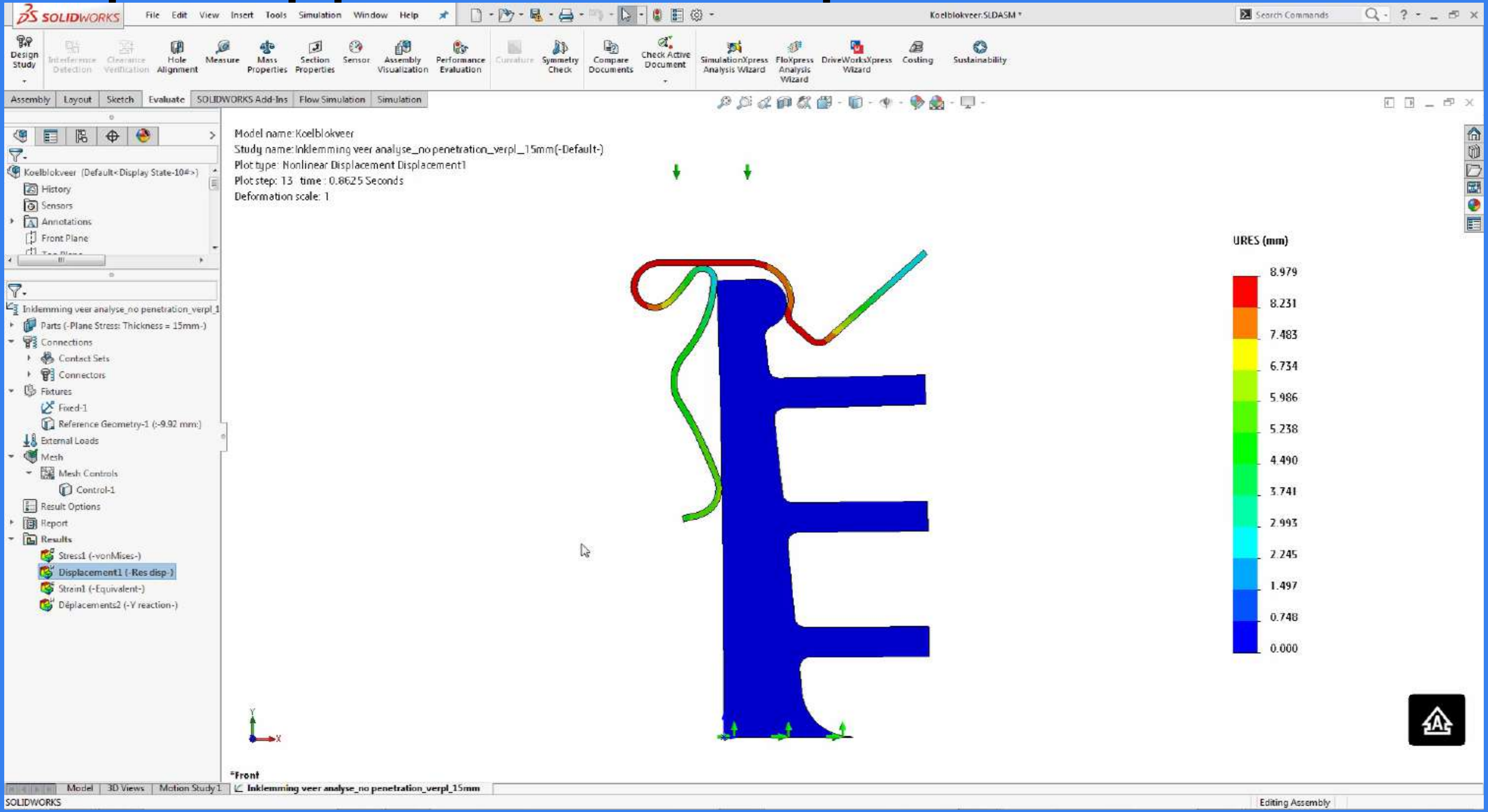
Example Applications– Clip Insert



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Questions?

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