ANSYS Mechanical Getting Started

Module 03 Student Reference Guide: Modeling Approach

Release 2023 R1

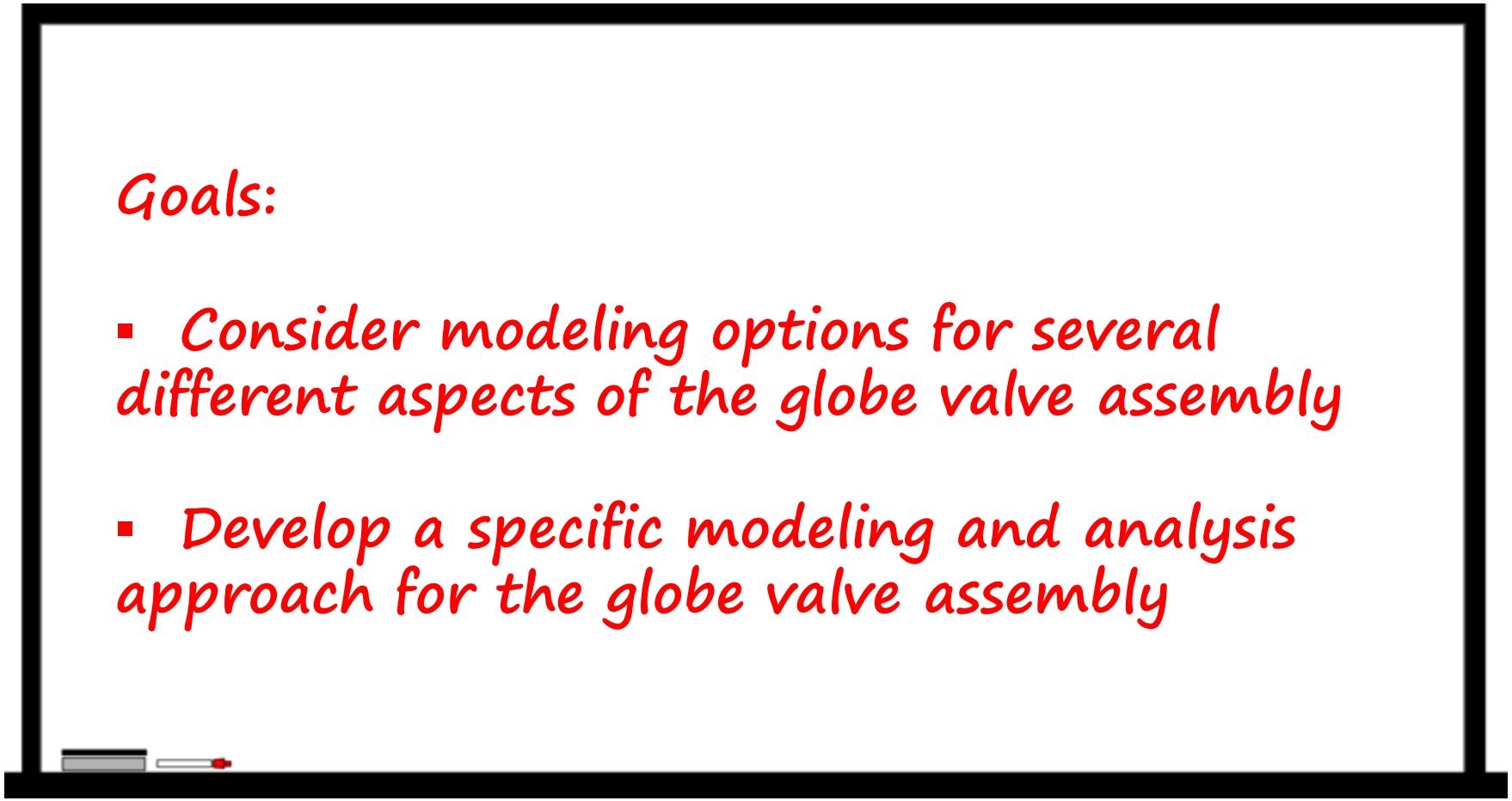
Please note:

- These training materials were developed and tested in Ansys Release 2023 R1. Although they are expected to behave similarly in later releases, this has not been tested and is not guaranteed.
- The screen images included with these training materials may vary from the visual appearance of a local software session.

Module 03: Learning Objectives

- Upon successful completion of this module, the student should have a general understanding of the preliminary decisions that will lead to the proper analysis approach, including the following:
  - What components should be included in the model and why?
  - How should those components be characterized from a geometry standpoint and from a material standpoint?
  - How should the interfaces between the components be modeled?
  - How should the operating environment be characterized?
  - How should the design and the analysis model be validated?

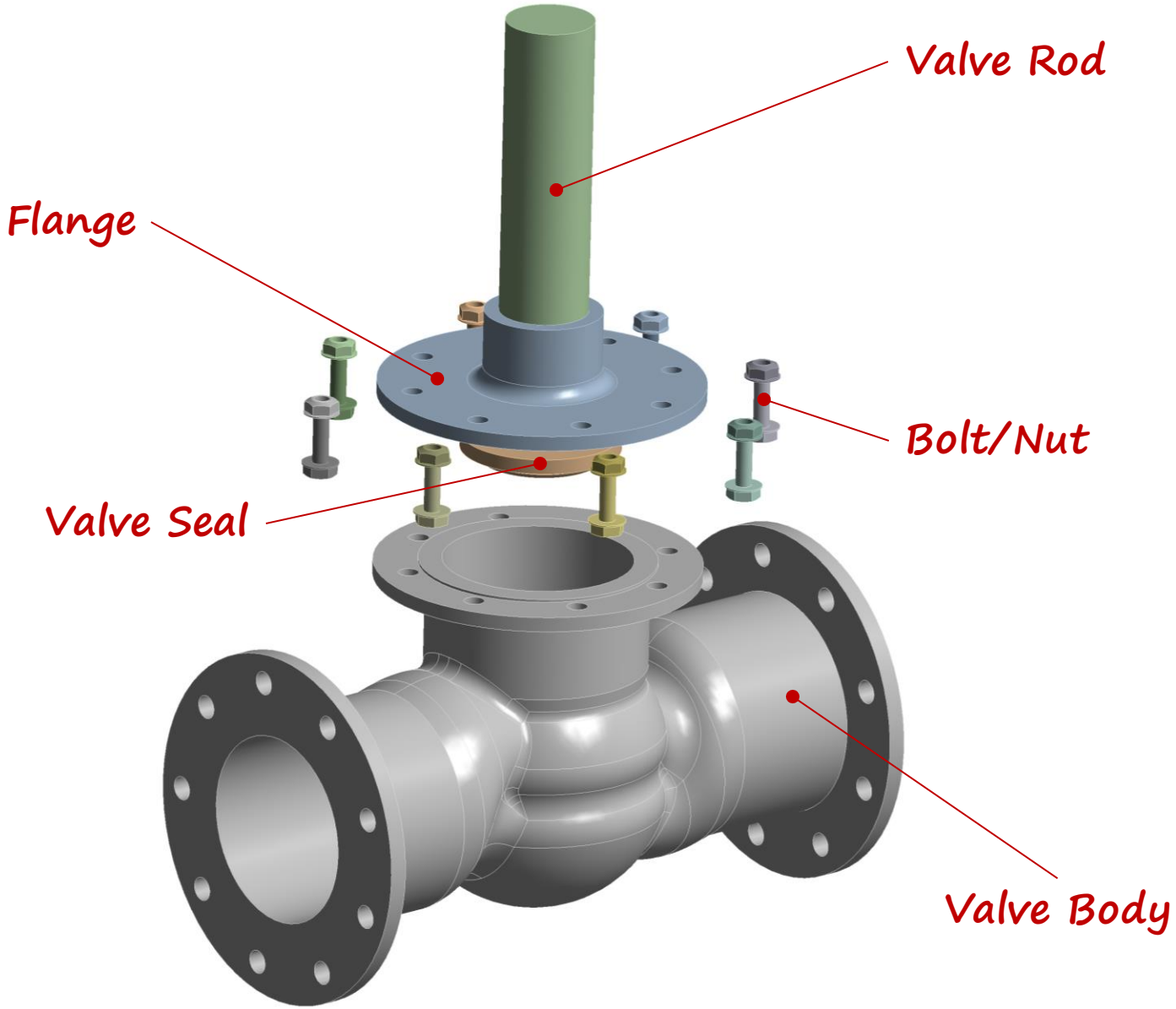
Module 03: Graphics



Module 03: Points to Consider

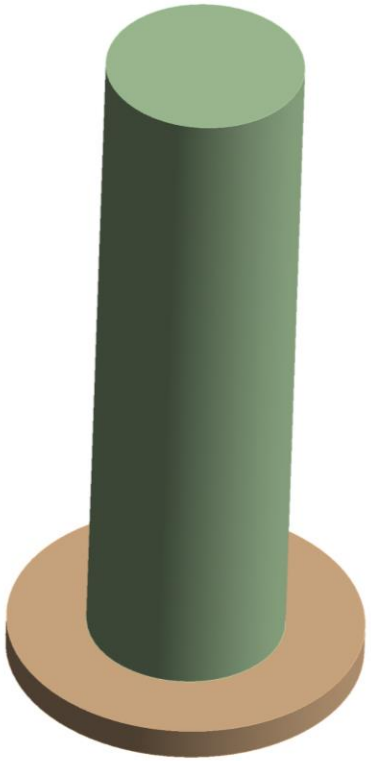
- Specific discussion points may include:
  - Review of the assembly components and their purpose (in the design and in the model)
  - What parts do I model and how I might represent them (solids, surfaces, lines; material properties)
  - Important interfaces in the model (loads are transferred through the various interfaces among the assembly components)
  - Loads and boundary conditions necessary to adequately characterize the external environment
  - Postprocessing techniques and results quantities that will help validate my model and the design

Module 03: Reference Material



Module 03: Points to Consider

- Point #1: What components should I model and why?
  - Valve body, required per the stated objective
  - **Valve rod**
  - **Valve seal**
  - Flange
  - Nuts/Bolts



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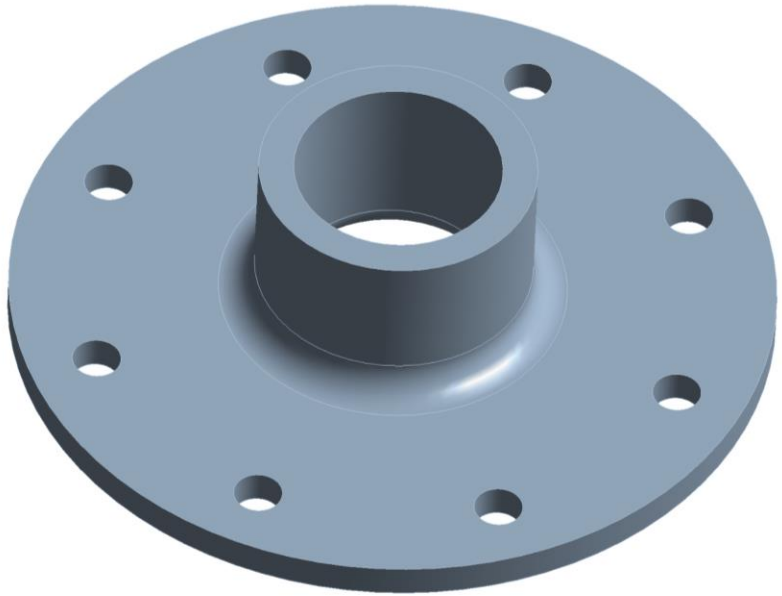

Module 03: Points to Consider

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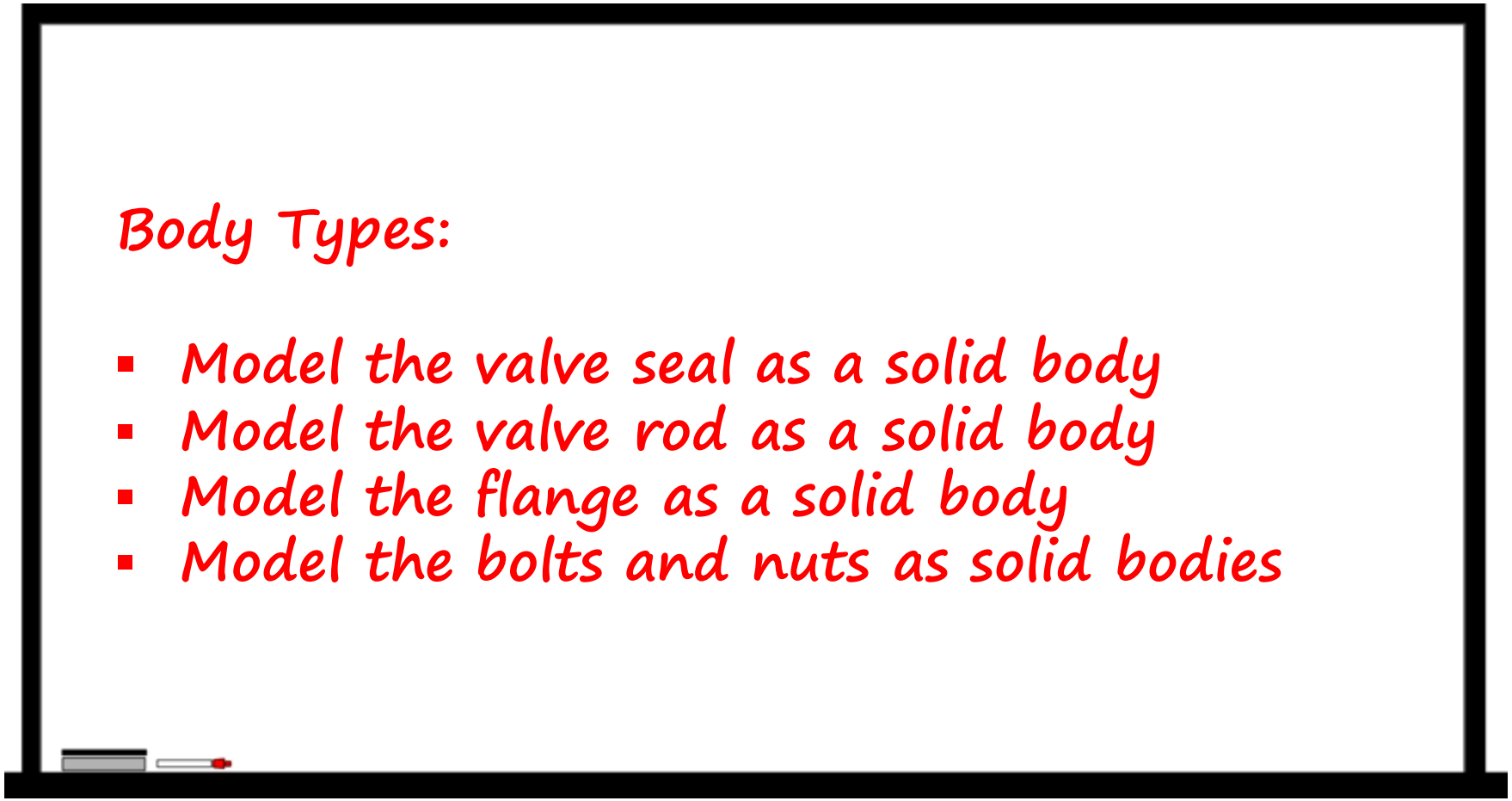
Module 03: Graphics



Module 03: Points to Consider

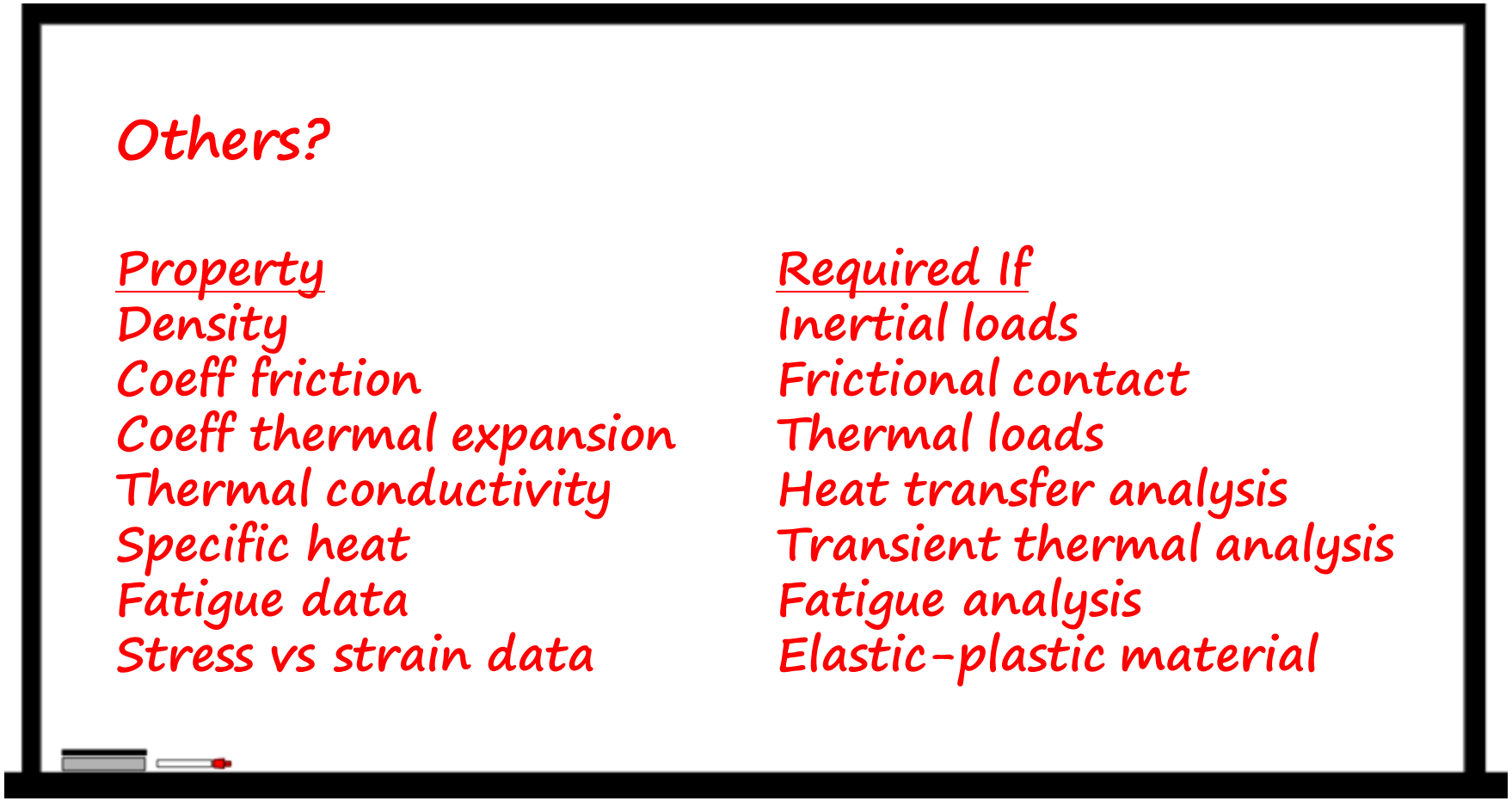
- Point #2: What material properties do I need?
  - Valve body (Type 40 Gray Cast Iron)
  - Valve rod (AISI 6150 Steel)
  - Valve seal (Type 302 Stainless Steel)
  - Flange (Type 40 Gray Cast Iron)
  - Nuts/Bolts (AISI 6150 Steel)

Module 03: Graphics

Module 03: Points to Consider

- Point #3: How do I treat the interfaces between the components and between the components and the rest of the world?
  - In the real world, what happens at the interface between components?
  - What are some ways to represent the interfaces in FEA?
  - If we choose not to model a component in detail, how and/or when do we account for its presence?

Module 03: Graphics



Module 03: Points to Consider

Point #4: What do I know about the operating environment and what simplifying assumptions will/must I make?

- How will the pressure be modeled?
- What effect will the preload in the bolts have?
- Based on what we know about the mating flanges at the inlet and outlet, how will we model that condition?
- Are there any oblique loadings on the valve rod?

Module 03: Graphics

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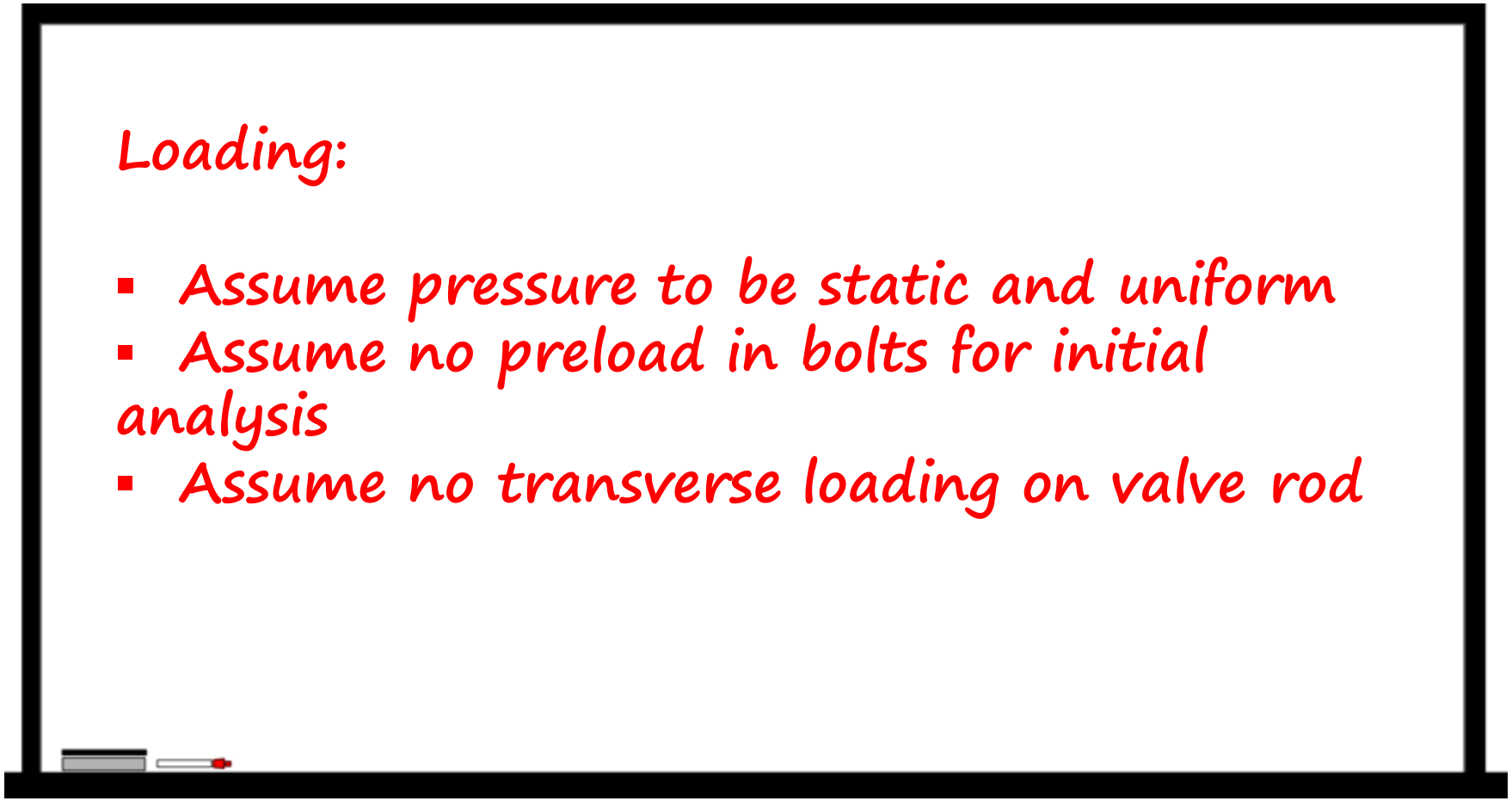
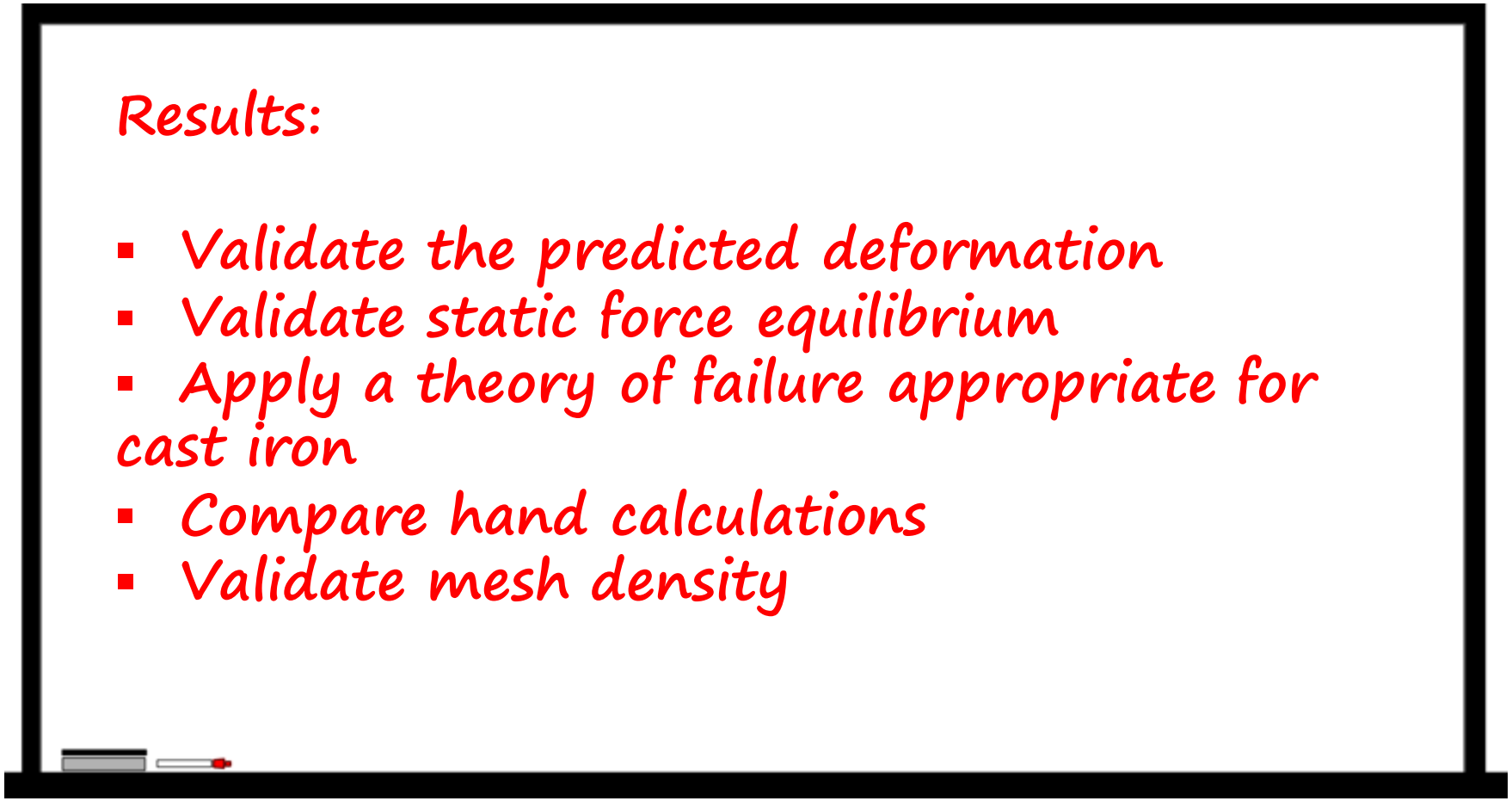


Module 03: Points to Consider

Point #5: How will I know if/when I've met the design objectives?

- What stress are we going to use to validate the design criteria?
- How will I know whether the stress value is accurate?
- How else can we validate the model in order to determine whether we should believe the answers?

Module 03: Graphics



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