

Purpose

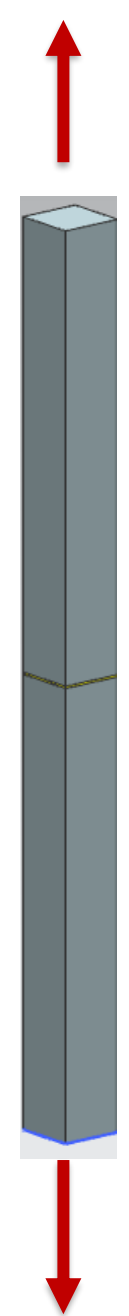
To replace welding processes on customer specific interfaces to the exterior of an MRI magnet with a proposed alternative joining method. Our goal is to reduce time and labor hours and improve manufacturing assembly flow with delayed differentiation to create a standard, or “vanilla”, magnet.

Past Work

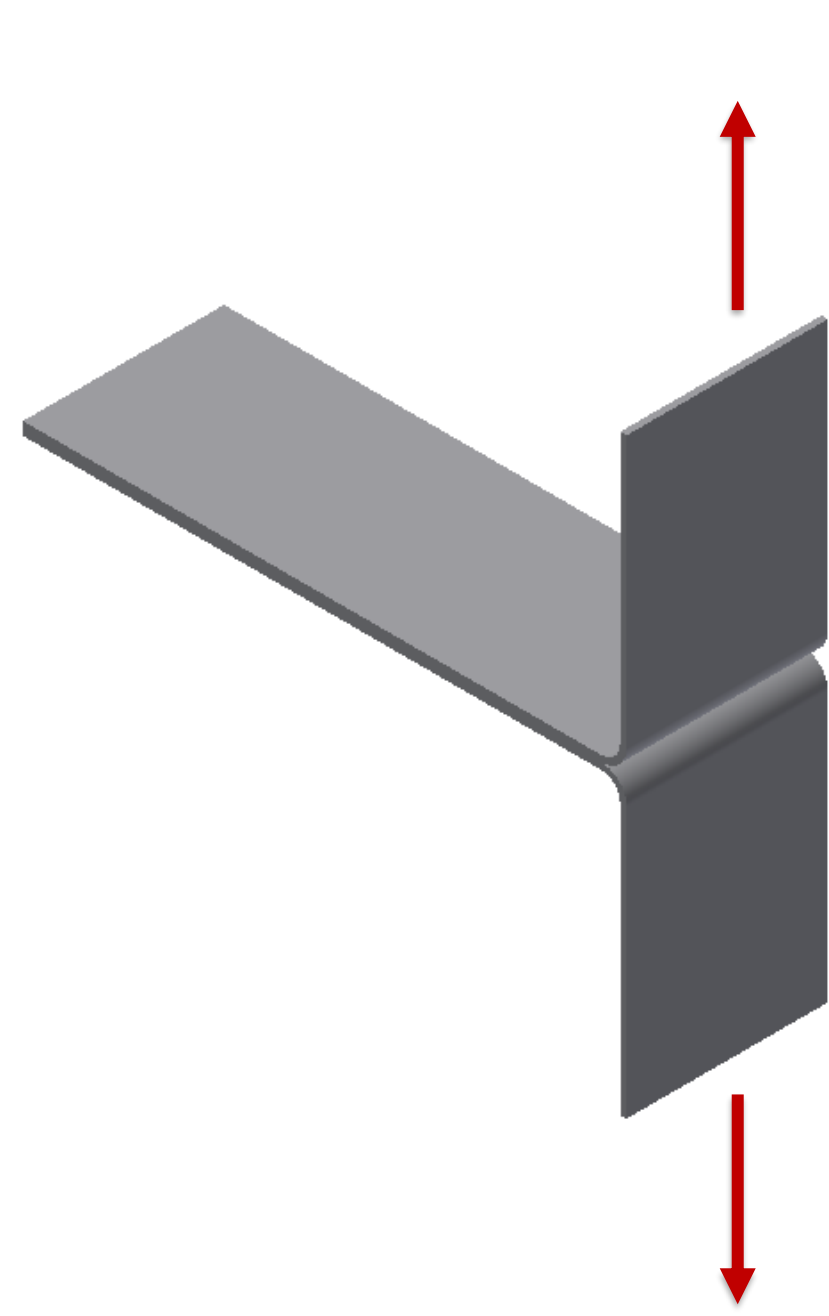
Philips Healthcare in Latham NY has performed preliminary research on potential adhesives, loading analysis, and implementation.

Test Specimens

Tensile



Peel



Shear



Interface Part Criticalities

21 Interfaces separated into three risk categories:

Tier 1: Most critical; Failure will cause danger of death or injury (Factor of Safety = 4)

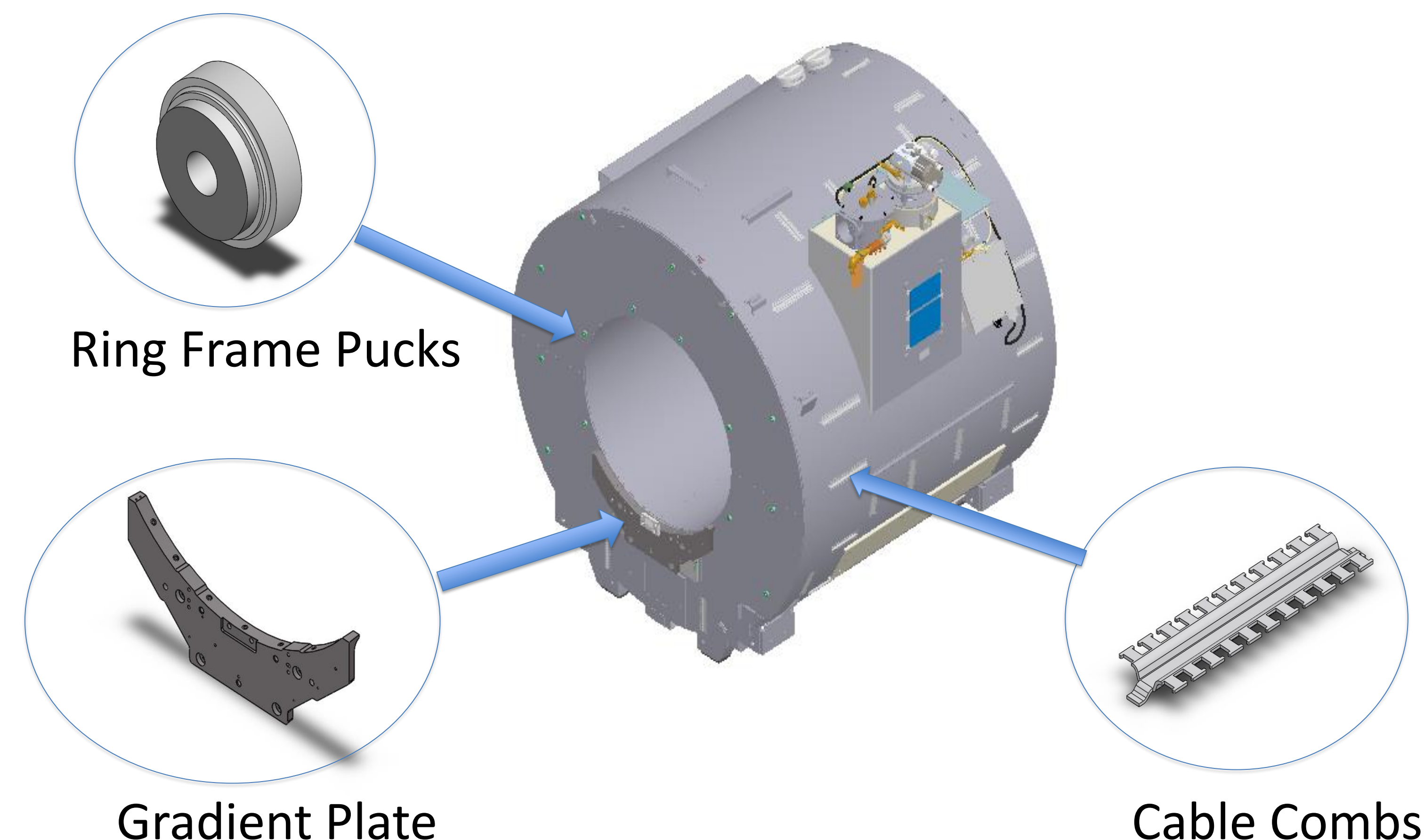
Tier 2: Failure will harmfully affect the performance of the system (Factor of Safety = 3)

Tier 3: Least critical; Failure will cause minor inconveniences (Factor of Safety = 2.5)

Technical Approach and Plan

- Identify interface placement accuracy and requirements of joining methods for each grouping of interfaces
- Research and down-select to the top 4 methods
- Tests and simulations performed on selecting joining methods to determine strength
- Final Pugh Matrix for final joining method recommendations

Isometric View of MRI Magnet



Technical Analysis and Recommendation

- Tier 1 Recommendation:
 - Tested joining methods did not meet requirements
- Tier 2 Recommendation:
 - Loctite H8000 for parts in shear and combined shear/tensile loading
 - 3M DP8810ns for parts in tensile only
- Tier 3 Recommendation:
 - Loctite H8000 for all parts
- No requirements were met during peel testing
- Loctite H8000 and Loctite E-05MR specimens retained at least 60% strength after being subject to high humidity environment

Semester Objectives/Requirements

- Summarize and identify all location requirements and joint strength requirements of joining methods for selected interface
- Research and survey joining methods and create a list of properties
 - Examples of properties include:
 - Odor
 - Humidity Resistance
 - User Safety
 - Ease of Application
 - Cure Temperature
- Down-select through use of Pugh matrix
- Make test specimens that simulate interface geometries (see below)
- Physically test 4 joining methods for critical properties.
- Analyze results and determine best joining method for each interface.

Testing Results

Tensile Strength Results for Interface Parts

