



SAND2008-4339P

MOX Fresh Fuel Package Handling Demonstration

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
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MISSION REACTOR

15. TRANSPORT TO MFFP
14. REPACKAGE UNLOADED STRONGBACK INTO MFFP & ON SGT BY REVERSING LAST FEW STEPS
13. LOAD/UNLOAD STATION
Receive Loaded Strongback
Unload Fuel Bundles
12. WALL RACK
Set Upending Frame in Rack
Pull Strongback from MFFP
11. UPENDING FRAME
Lower MFFP/Skid onto Frame
Secure
Remove Impact limiter & lid
Upend Using Crane
10. STAGING TABLE
Dock SGT to Table
Pull MFFP onto Table
Lift MFFP from Table

MFFP

1. UNLOAD MFFP/SKID FROM SGT OR RETRIEVE FROM WAREHOUSE
(Using Air Pallet)
2. INSERTION/EXTRACTION STATION
Dock MFFP to Station
Extract Empty Strongback
Rotate to Vertical
Remove Strongback
3. LOAD/UNLOAD STATION
Receive Empty Strongback
Load Fuel Bundles
4. INSERTION/EXTRACTION STATION
Receive Strongback
Rotate to horizontal
Dock MFFP to Station
Insert Strongback in MFFP
5. CLOSE & LEAK TEST MFFP
6. INSTALL IMPACT LIMITER
7. TRANSPORT TO LOADING DOCK
8. LOAD ONTO SGT
9. TRANSPORT TO REACTOR



At the MOX Fuel Fabrication Facility

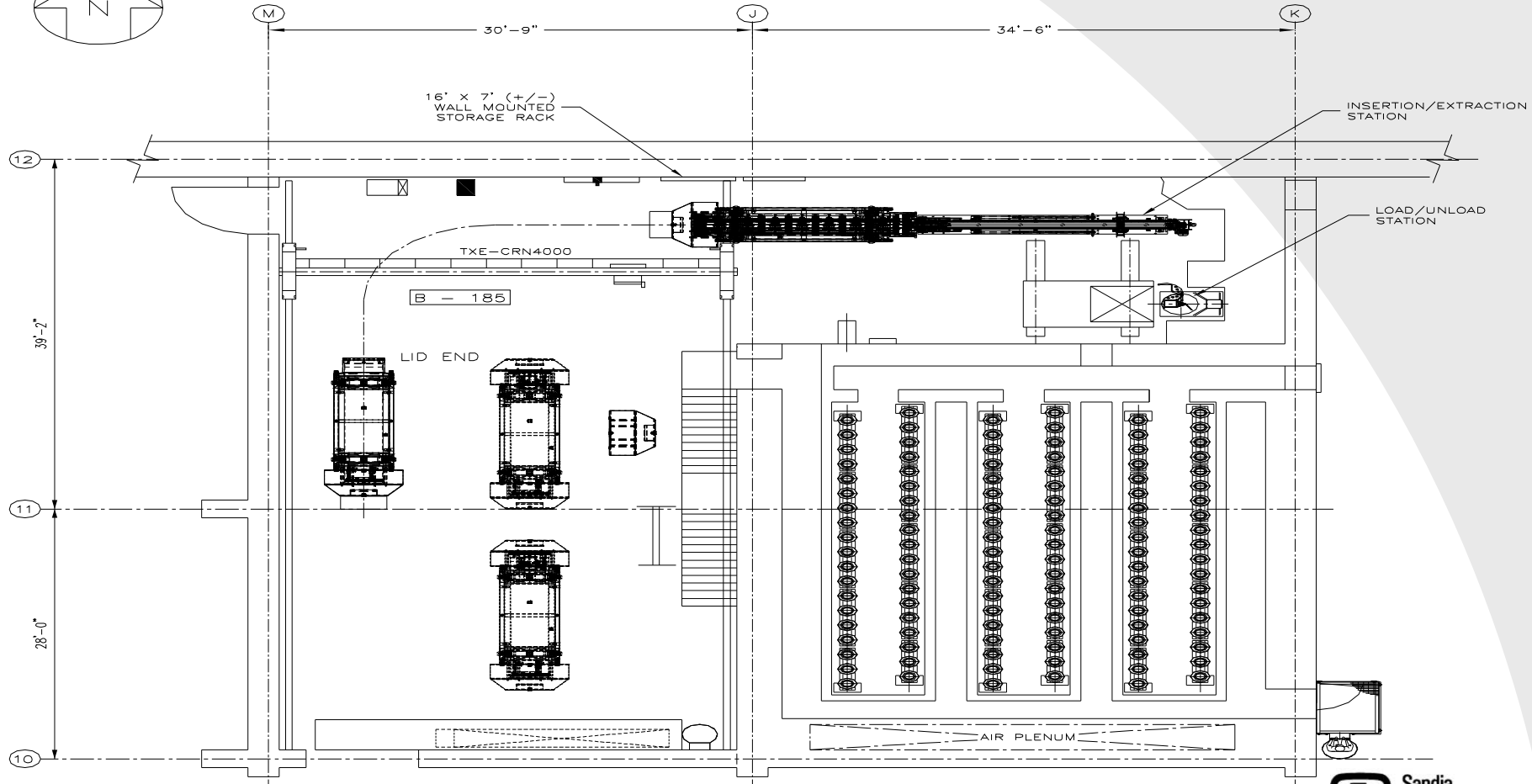


Purpose of the Demonstration

- **The MOX Fresh Fuel Package will be used to transport fuel from the MOX Fuel Fabrication Facility (MFFF) to the Mission Reactor(s).**
- **The nature of the MOX fuel requires that it currently be transported in a Safeguards Transporter (SGT)**
- **Both sites need to know how to load and unload the fuel from the package.**
- **We demonstrated all of the required steps at each facility.**



Bringing the MFFP into the MFFF and mating with the insertion/extraction station



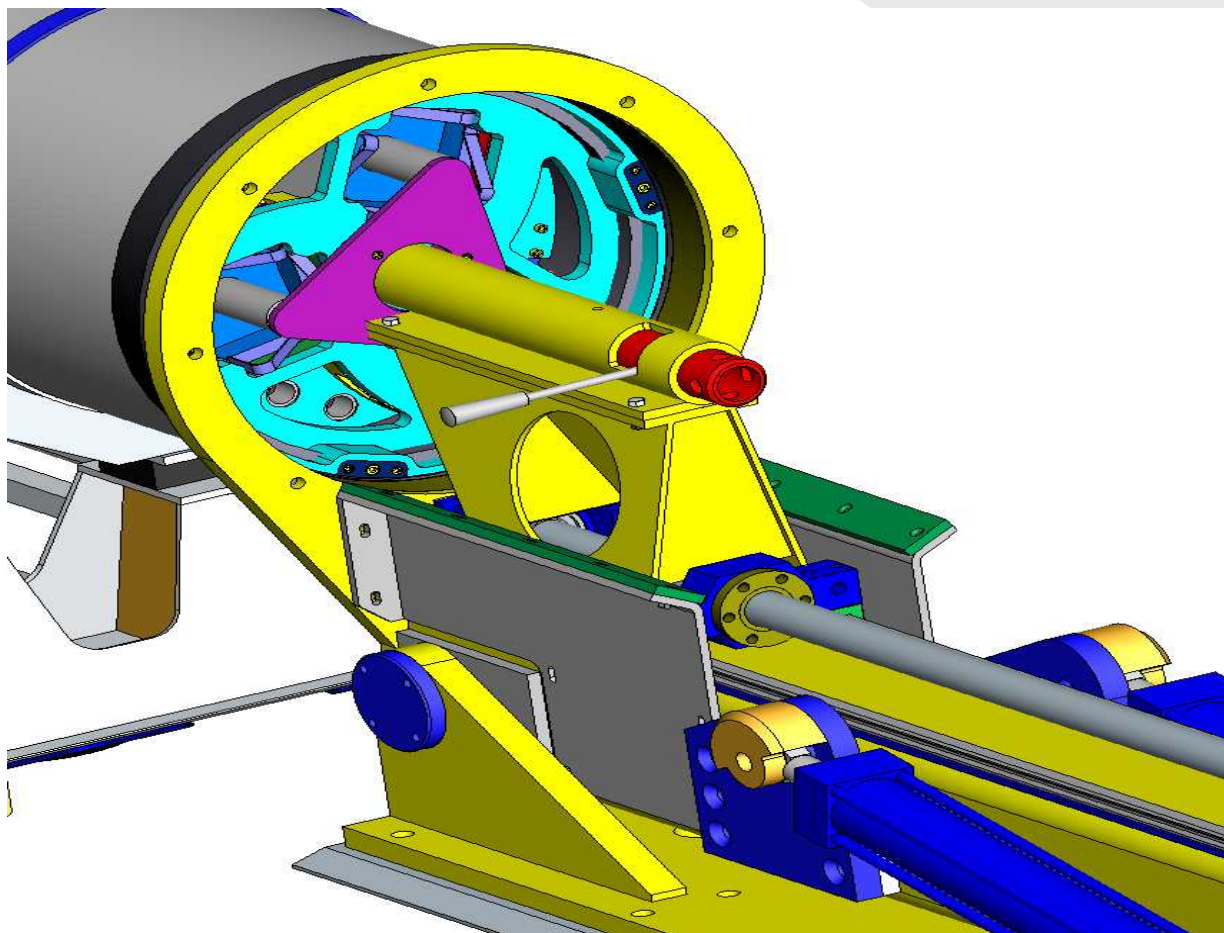


Moving MFFP with an air pallet



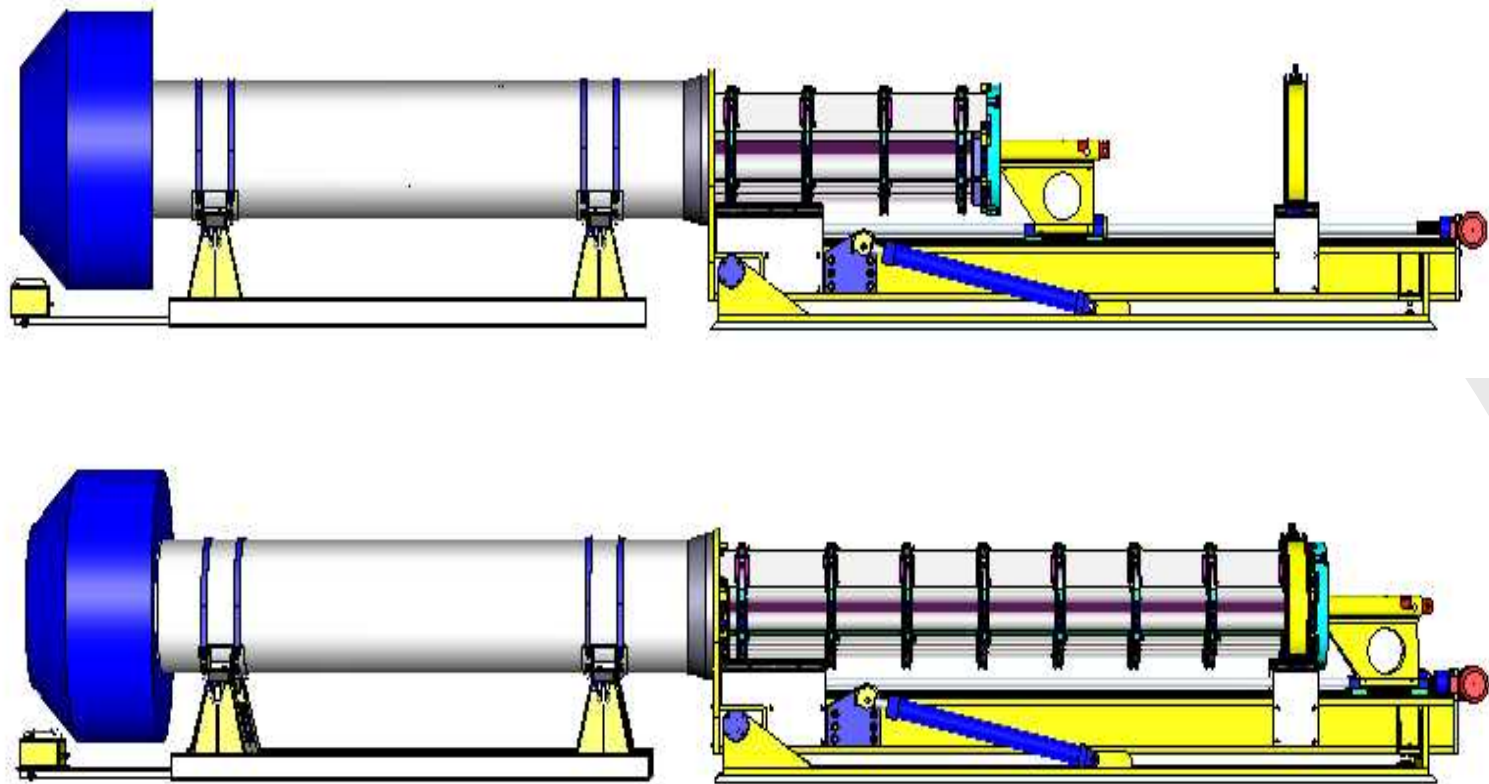


Extract Strong-back from MFFP





Extraction of Strong-back from MFFP



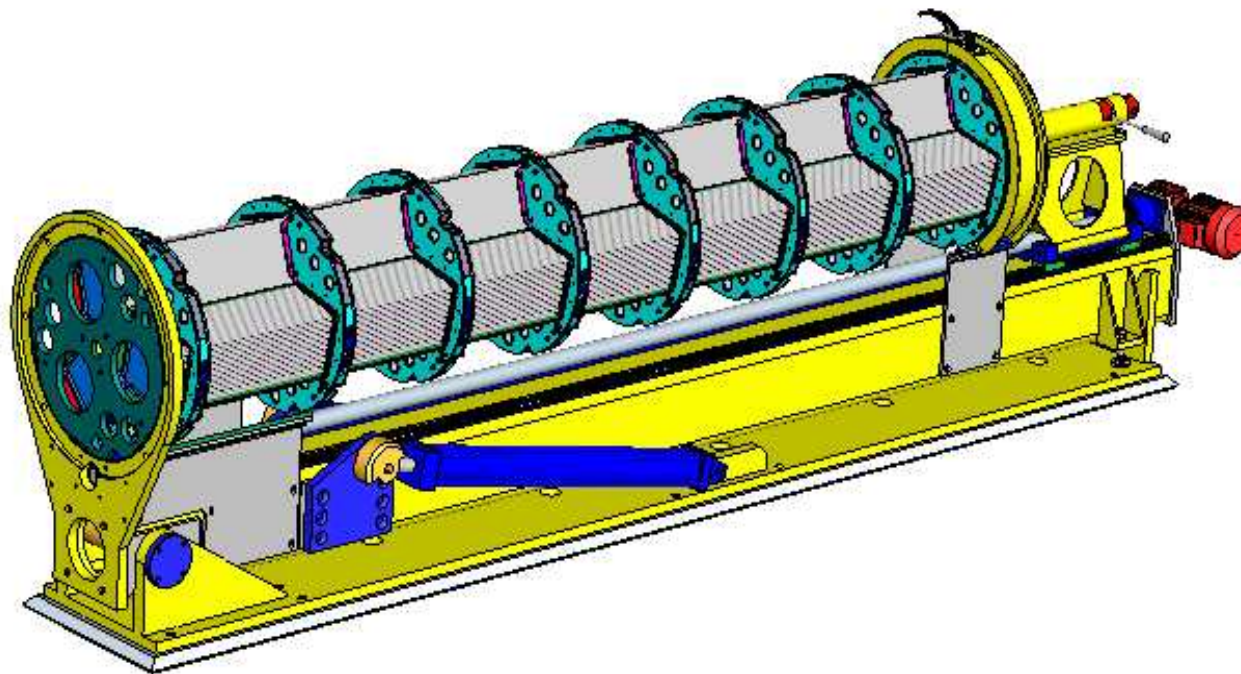


Strong-back extraction



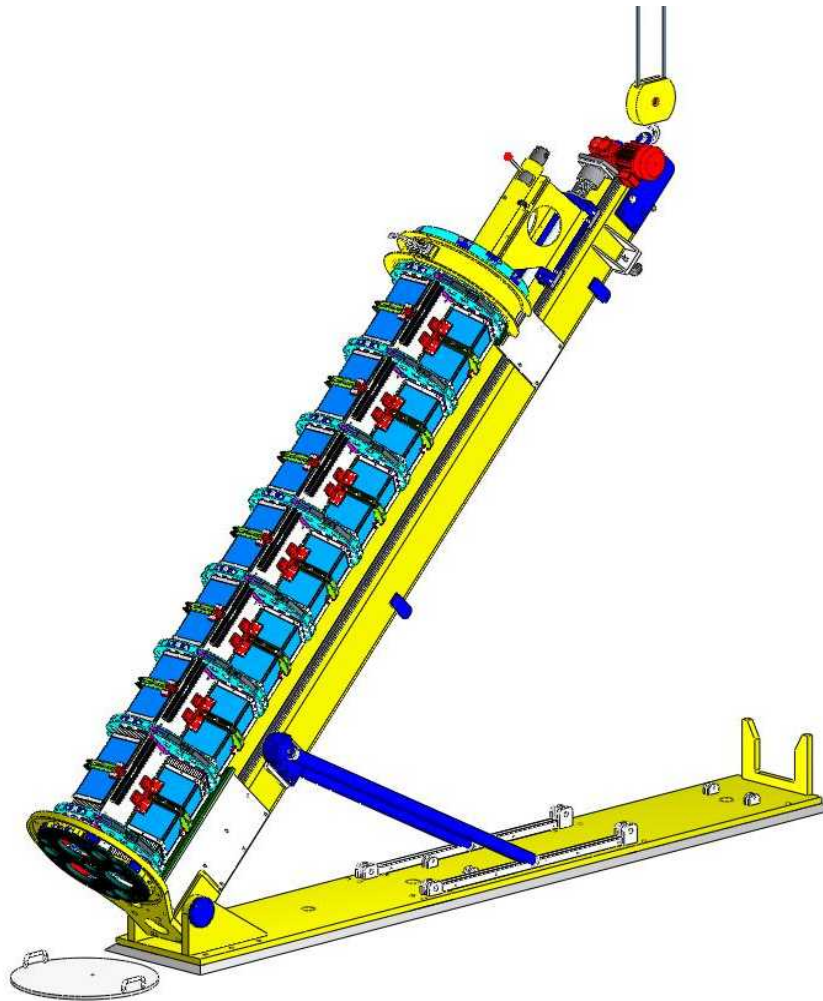


Strong-back Removed from MFFP and MFFP Body Disconnected from Insertion/Extraction Station





Raising Insertion/Extraction Station and Strong-back to Vertical



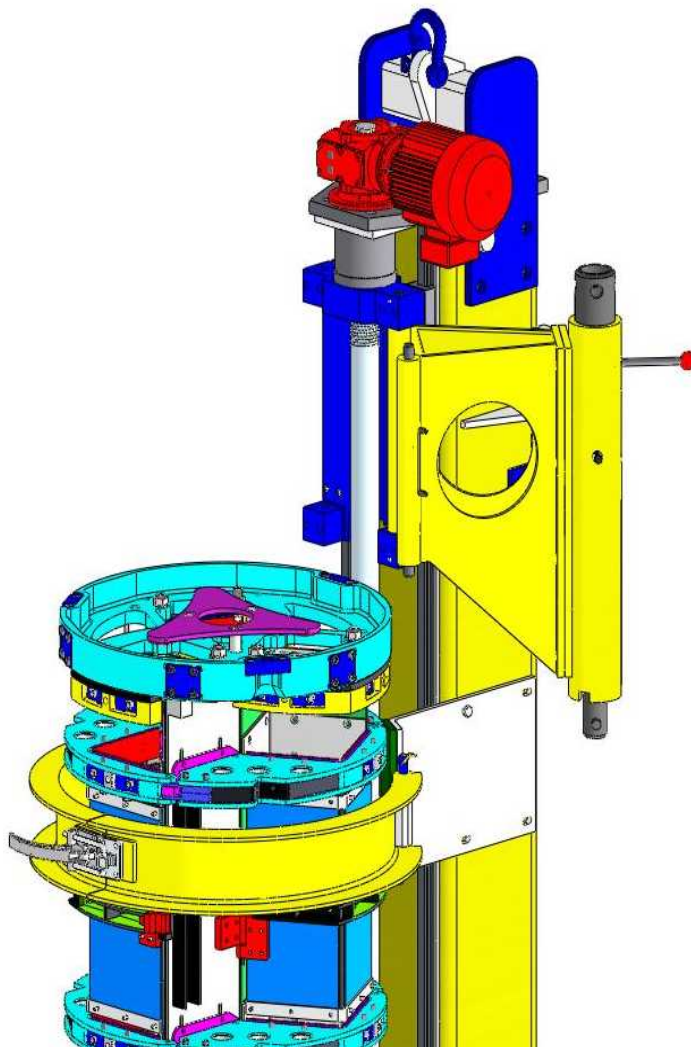


Up-ending the Insertion/Extraction Station





Remove Strong-Back from Insertion/Extraction Station





Attaching the Crane to the Strong-back



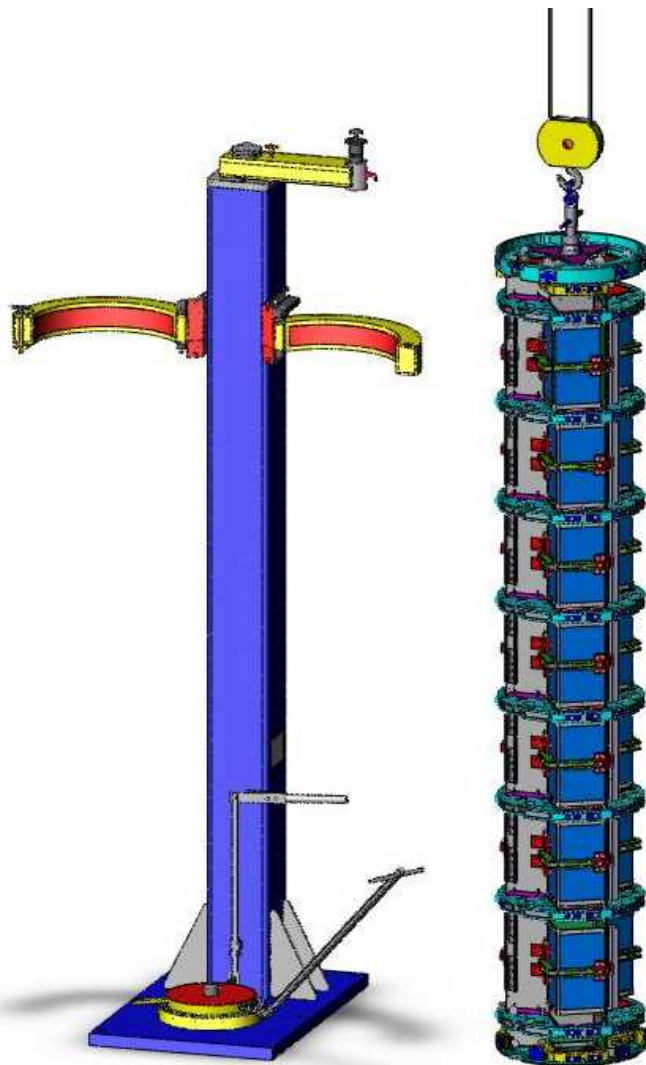


Removal of the Strong-back



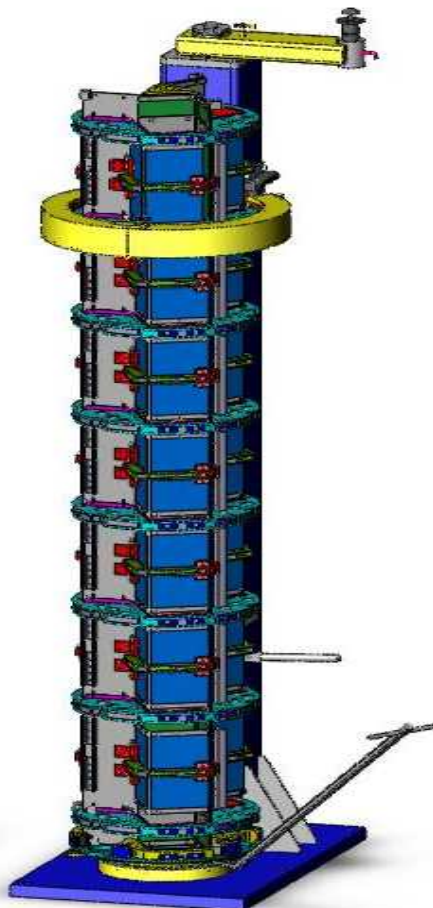


Transport the Strongback to the Load / Unload Station



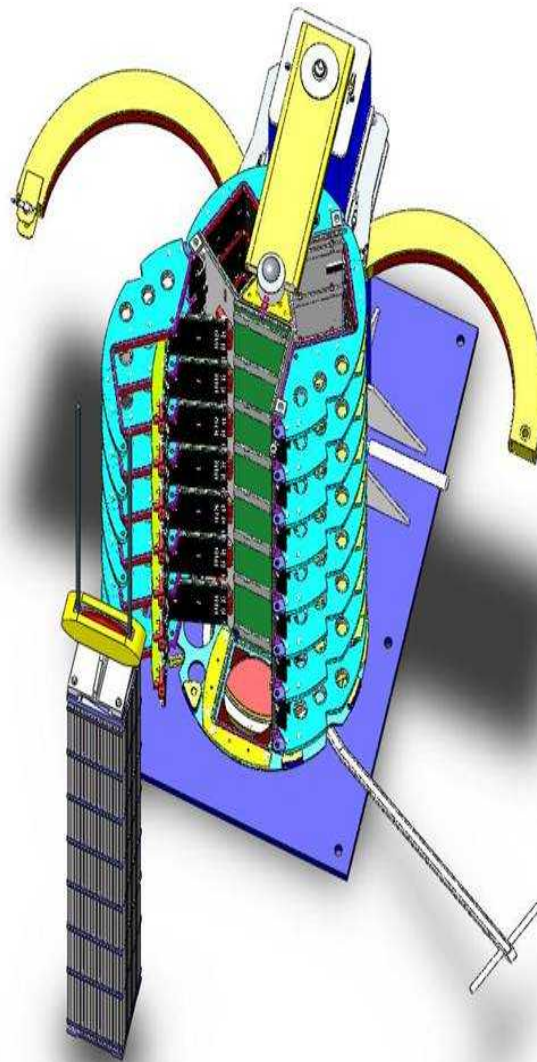


Strong-back in Load/Unload Station, Top Plate Removed





Loading of Fuel Assemblies into Strong-back



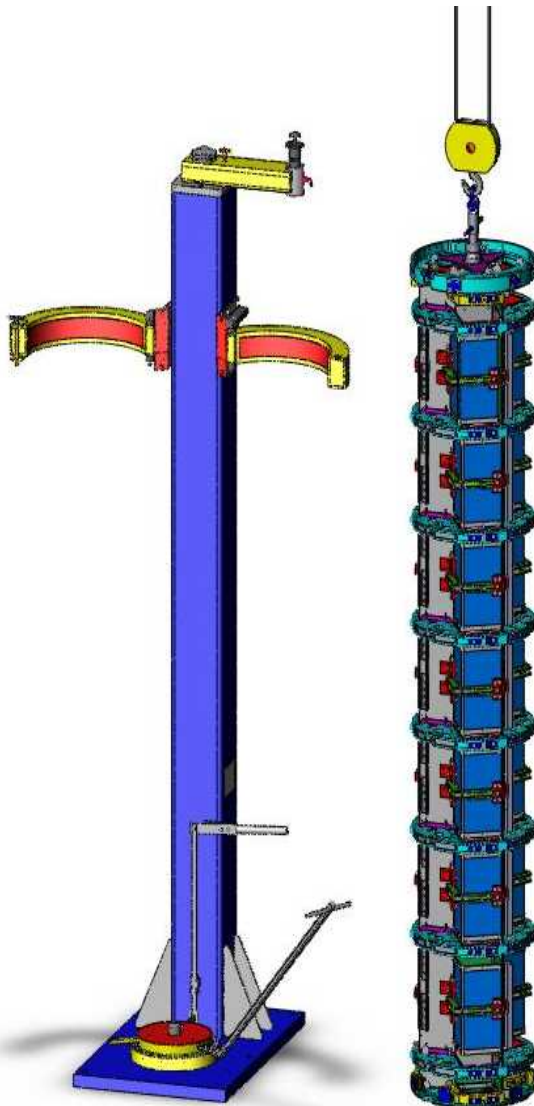


Loading a Dummy Fuel Assembly





Transport the Strong-back from the Load / Unload Station



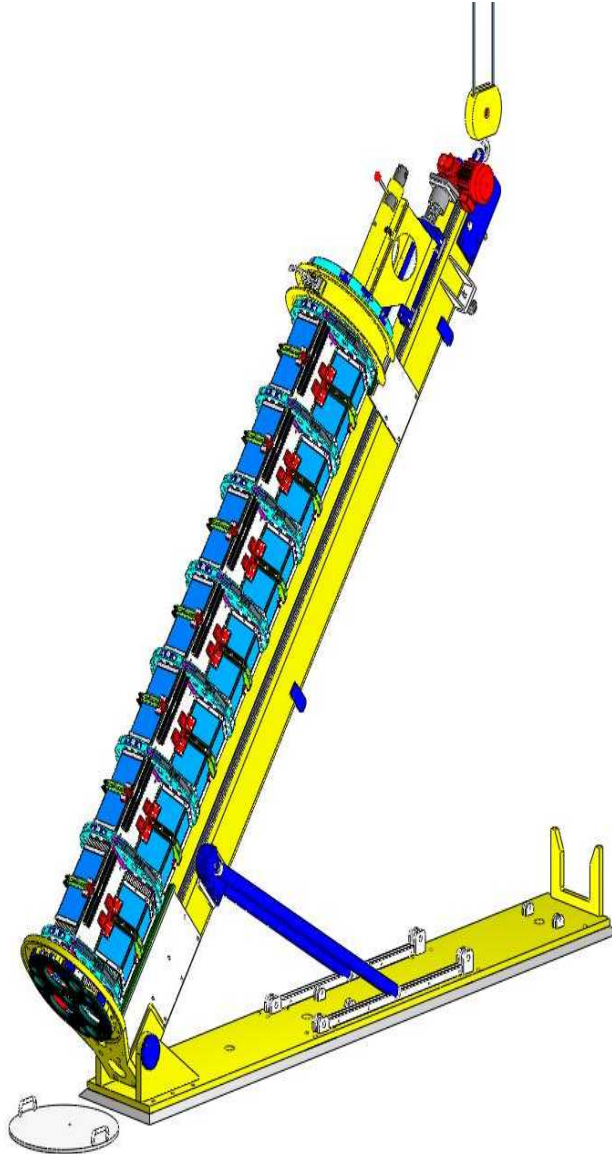


Transporting the Loaded Strong-back





Raising Insertion/Extraction Station and Strong-back to Vertical



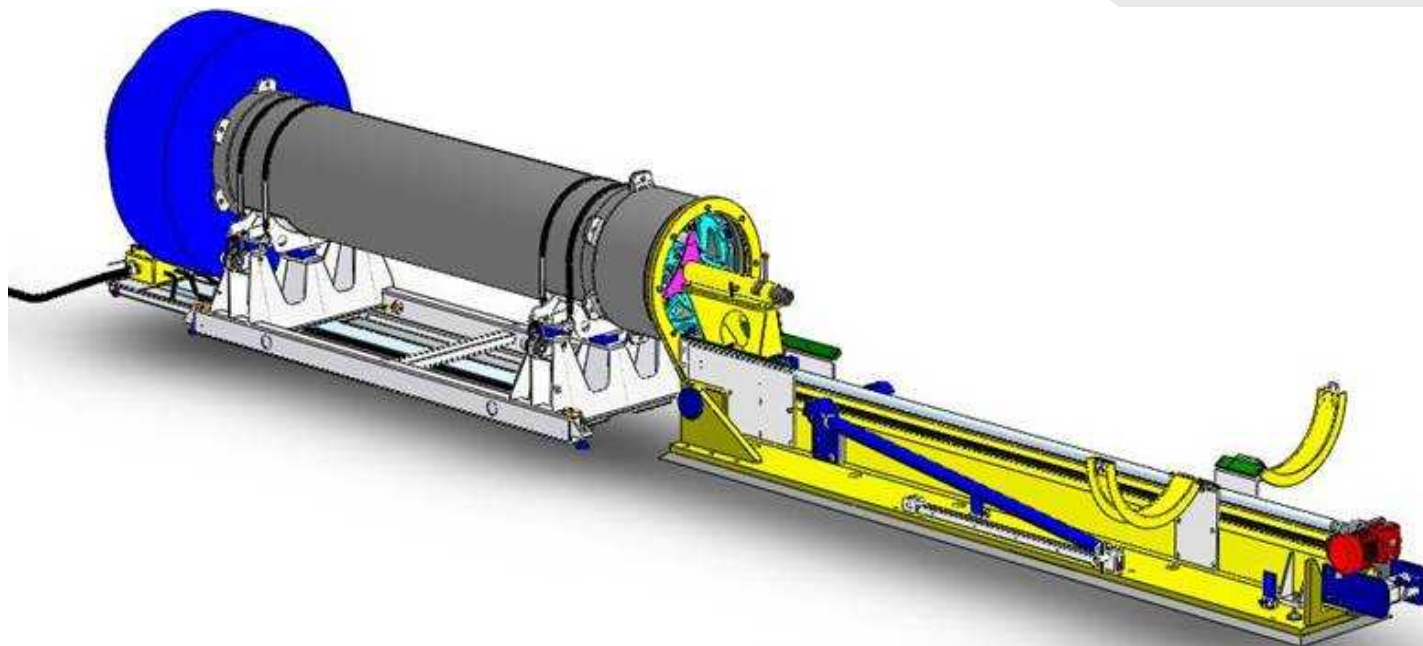


Down-ending the Insertion/Extraction Station



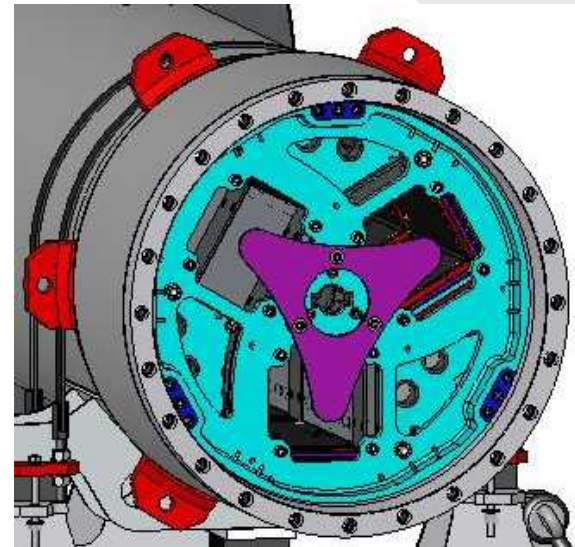
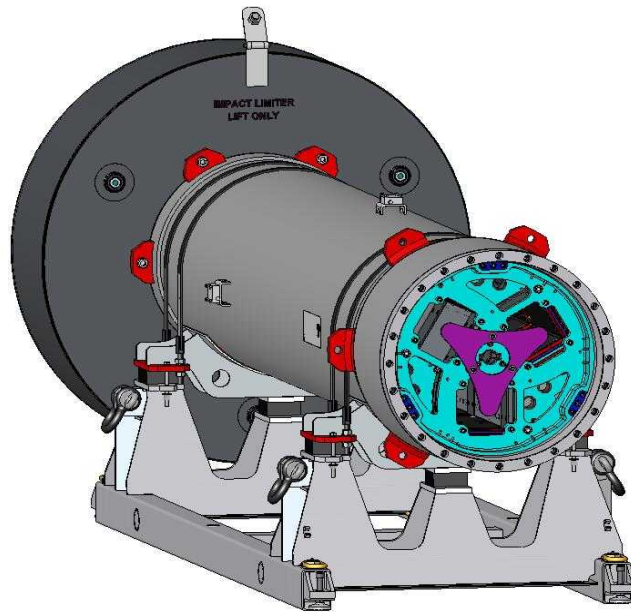


Loading of the Strong-back into the MFFP



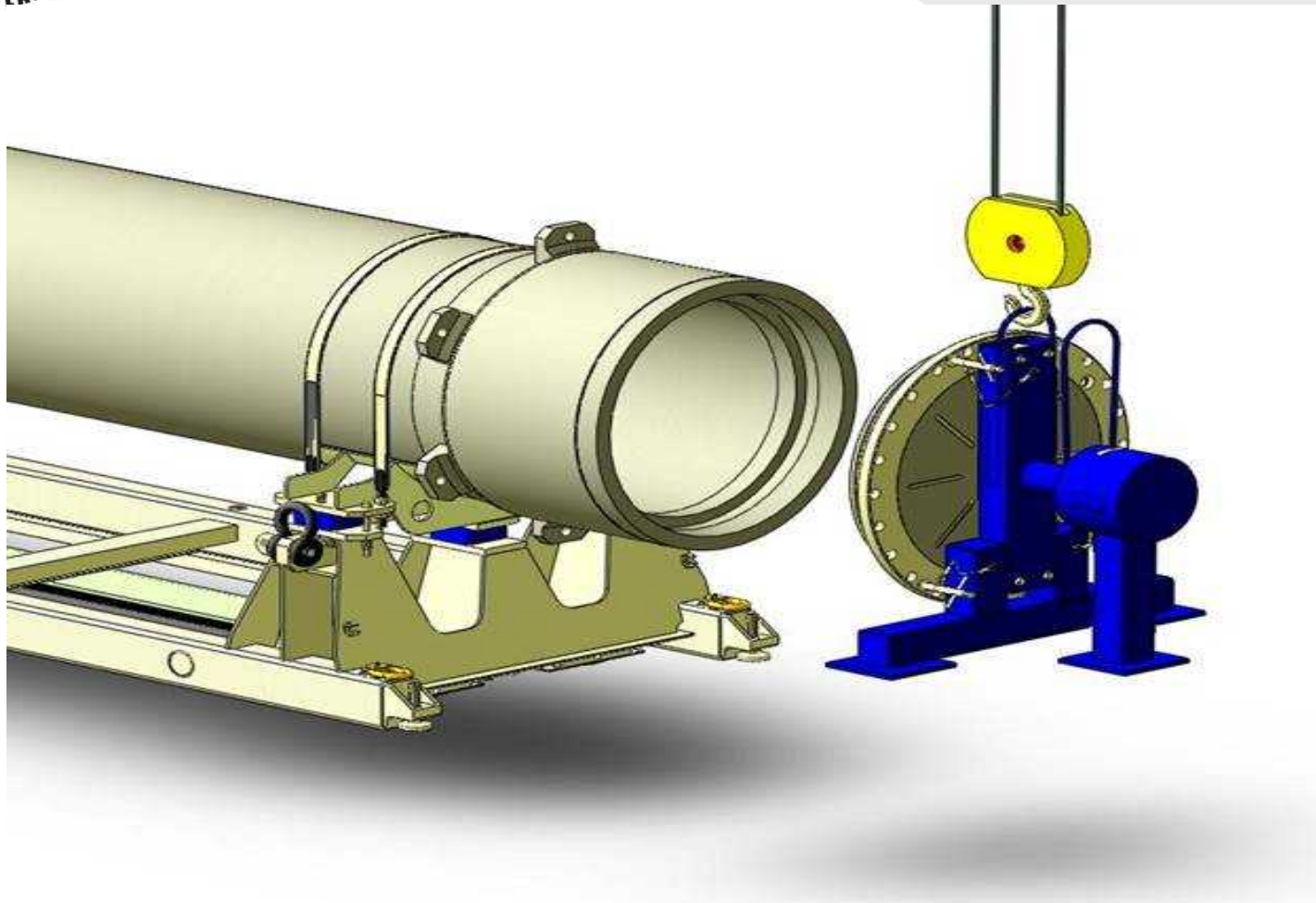


MFFP with Correctly Oriented Strong-back





Attachment of the Closure Lid



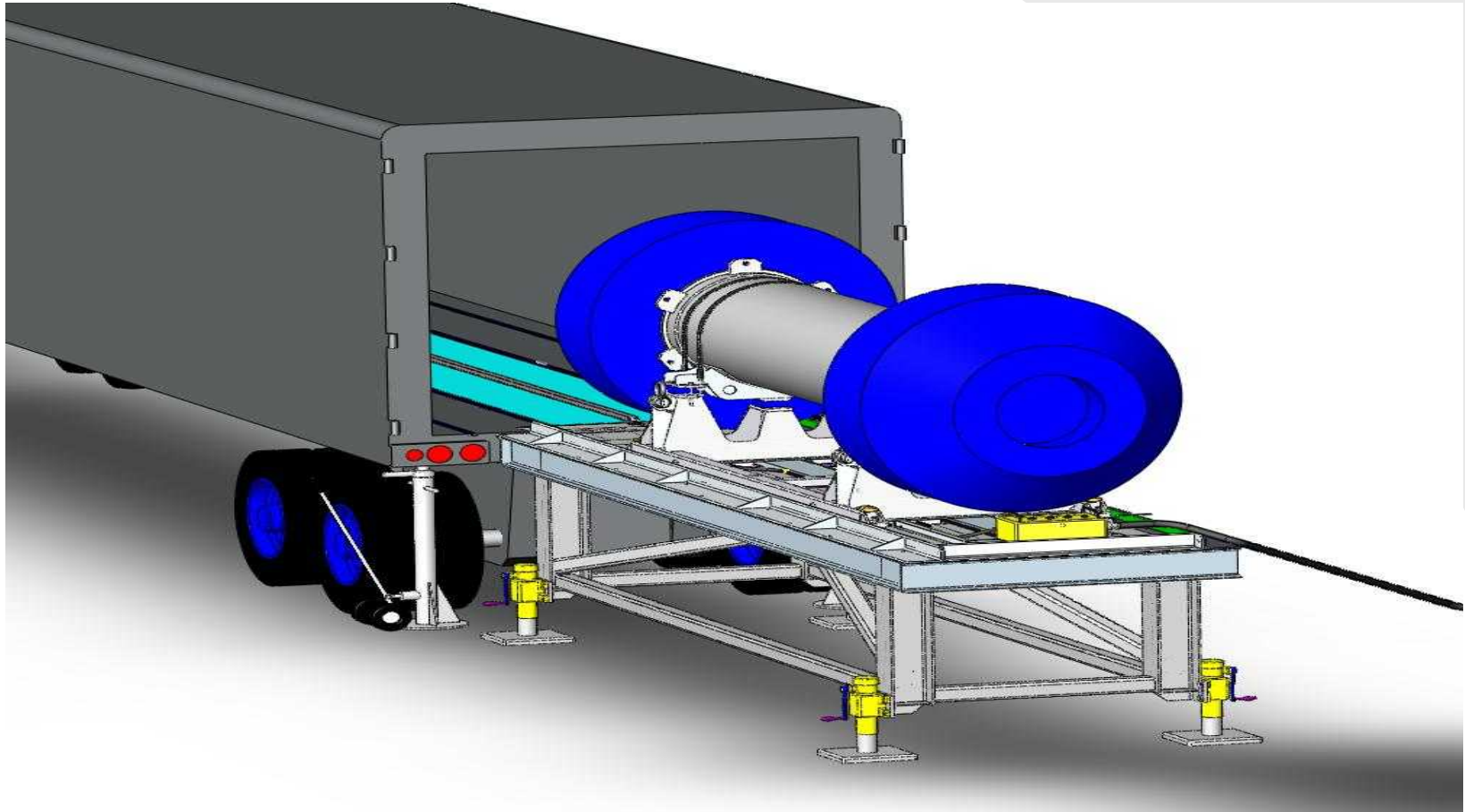


Last Steps at the MFFF

- **Install closure end impact limiter**
- **Load MFFP into the SGT**
- **Transport to the mission reactor**



Unload MFFP/Skid from SGT using Air Pallet



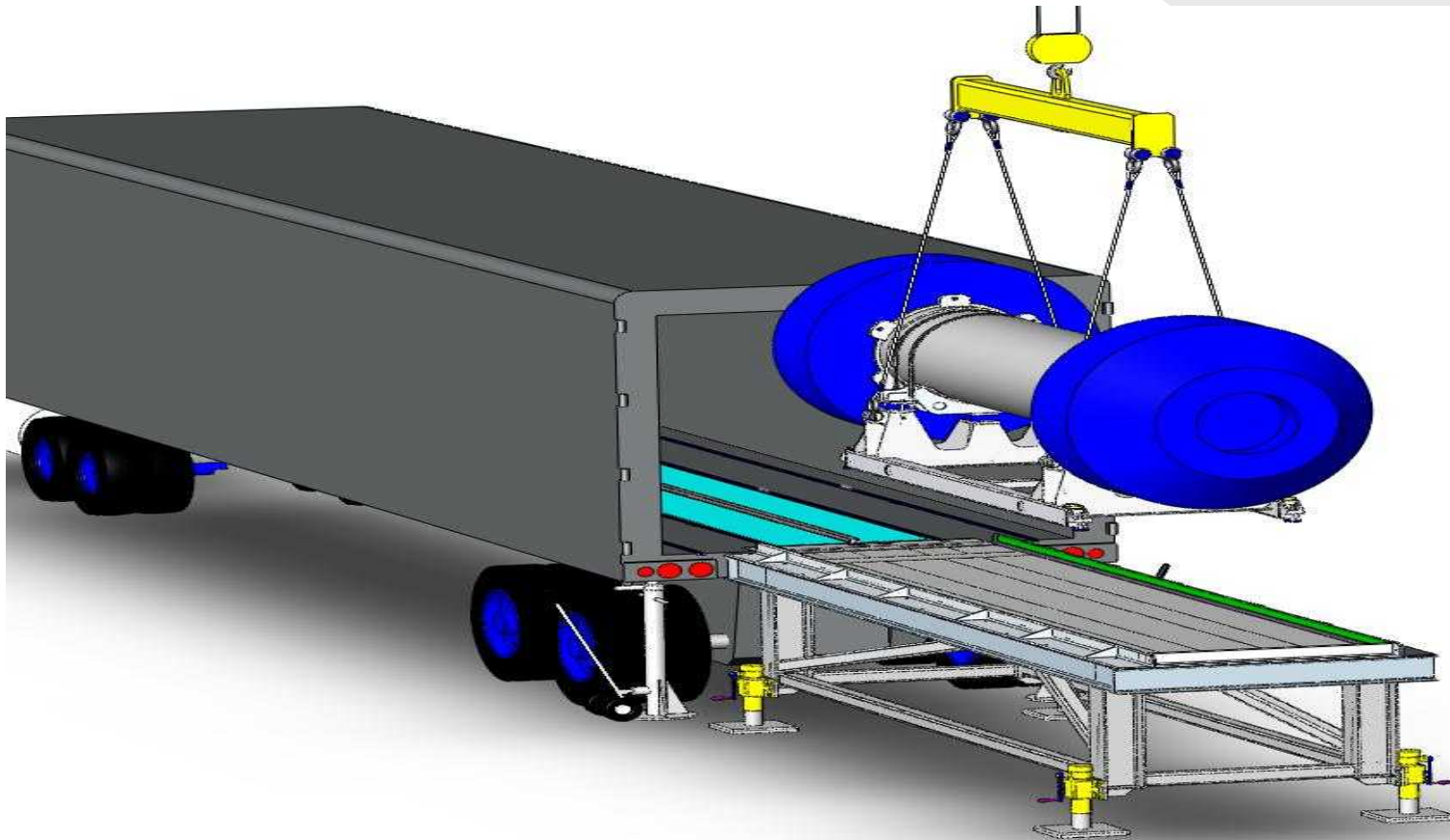


Moving the MFFP from the SGT to the Staging Table





MFFP/Skid Lifted from Staging Table



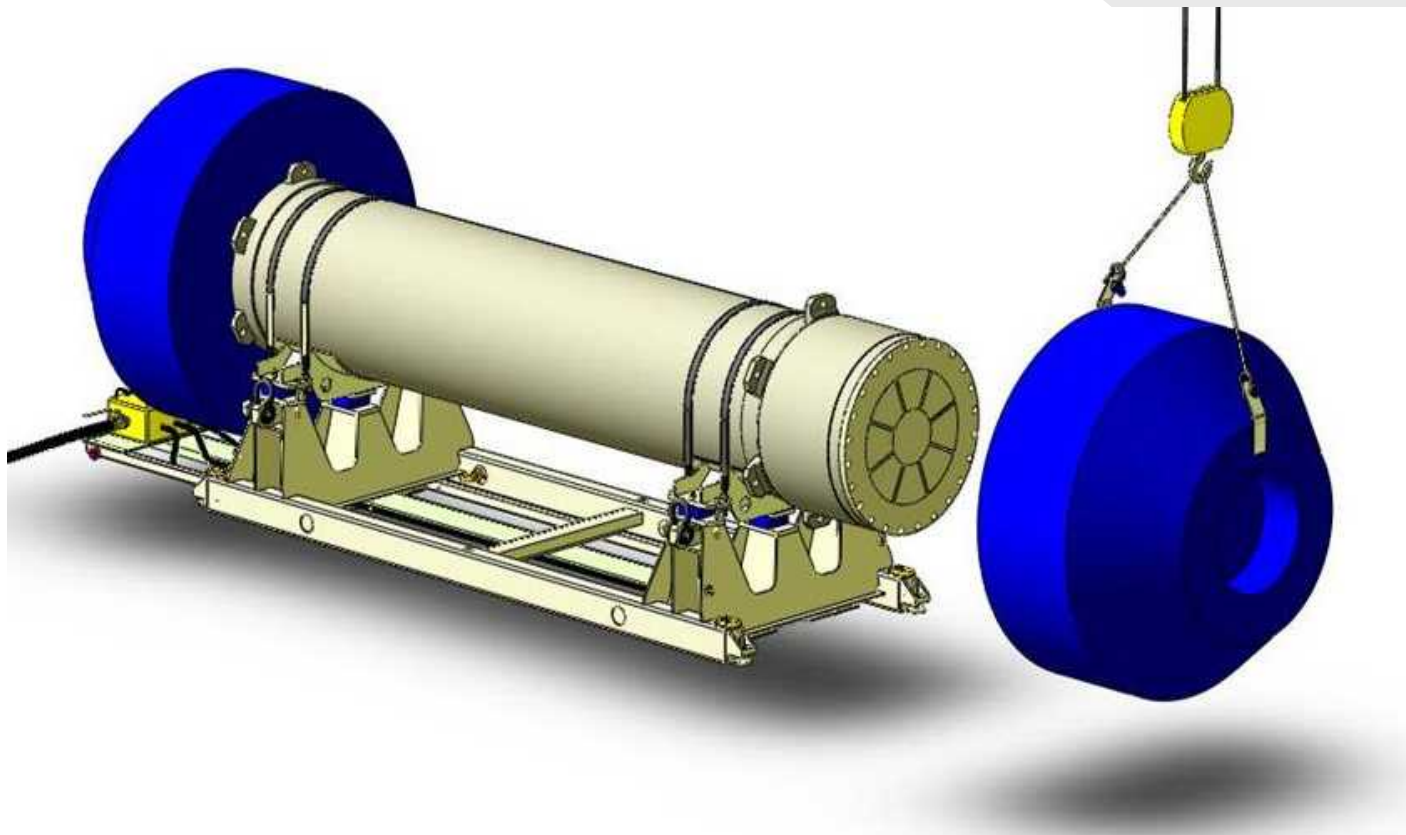


Lifting the MFFP/Skid off the Staging Table



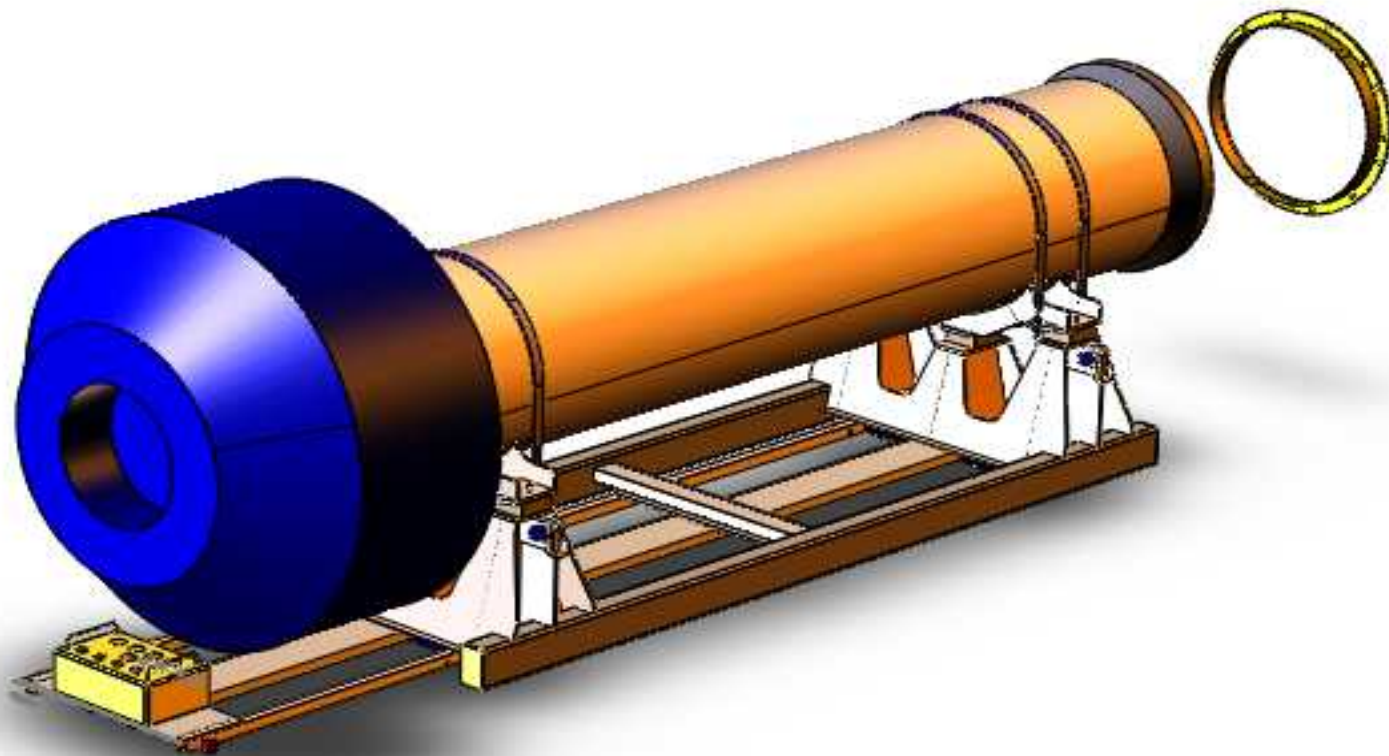


Removing the Impact Limiter





MFFP Cask with Sealing Surface Protector after Lid Removed





Up-Ending the Loaded MFFP





Loading and Unloading at the Mission Reactor

- At the mission reactor the removal of the strong-back from the MFFP is done with a crane in the vertical position.
- The MFFP is secured against tipping with a bracing frame.
- The fuel is unloaded from the strong-back by reversing the steps for loading it at the MFFF.



Lessons Learned from the Demonstration

- **Showed there is a problem with tolerances**
- **Need for chamfers or rounding of corners**
- **Need better guides for locating strong-back**
- **Replace some bolts with ball-lock pins**
- **Up-ending frame should have a feature to eliminate snap-through (we used the large wood block for this)**
- **Some locks are difficult to operate in a vertical position**
- **Operation of the air pallet (rollers, quick disconnects)**
- **Should have passive feature for up-ending and down-ending the insertion/extraction station**