



MOX Fresh Fuel Package Handling Demonstration

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July 2008

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
for the United States Department of Energy's National Nuclear Security Administration
under contract DE-AC04-94AL85000.



MISSION REACTOR

15. TRANSPORT TO MFFF
14. REPACKAGE UNLOADED STRONGBACK INTO MFFF & 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 MFFF
11. UPENDING FRAME
Lower MFFF/Skid onto Frame
Secure
Remove Impact limiter & lid
Upend Using Crane
10. STAGING TABLE
Dock SGT to Table
Pull MFFF onto Table
Lift MFFF from Table

MFFF

1. UNLOAD MFFF/SKID FROM SGT OR RETRIEVE FROM WAREHOUSE
(Using Air Pallet)
2. INSERTION/EXTRACTION STATION
Dock MFFF 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 MFFF to Station
Insert Strongback in MFFF
5. CLOSE & LEAK TEST MFFF
6. INSTALL IMPACT LIMITER
7. TRANSPORT TO LOADING DOCK
8. LOAD ONTO SGT
9. TRANSPORT TO REACTOR



At the MOX Fuel Fabrication Facility

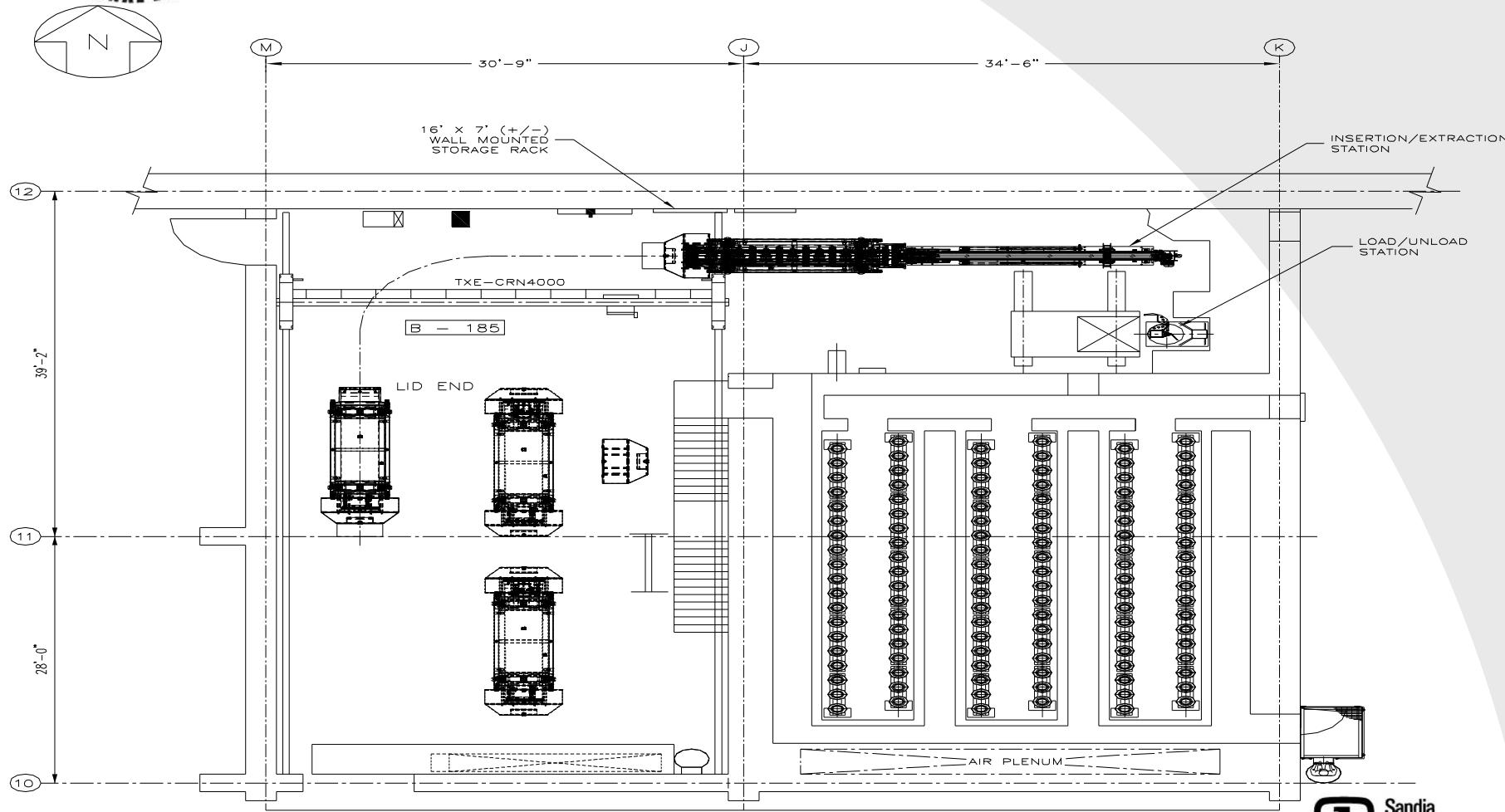


Purpose of the Demonstration

- 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



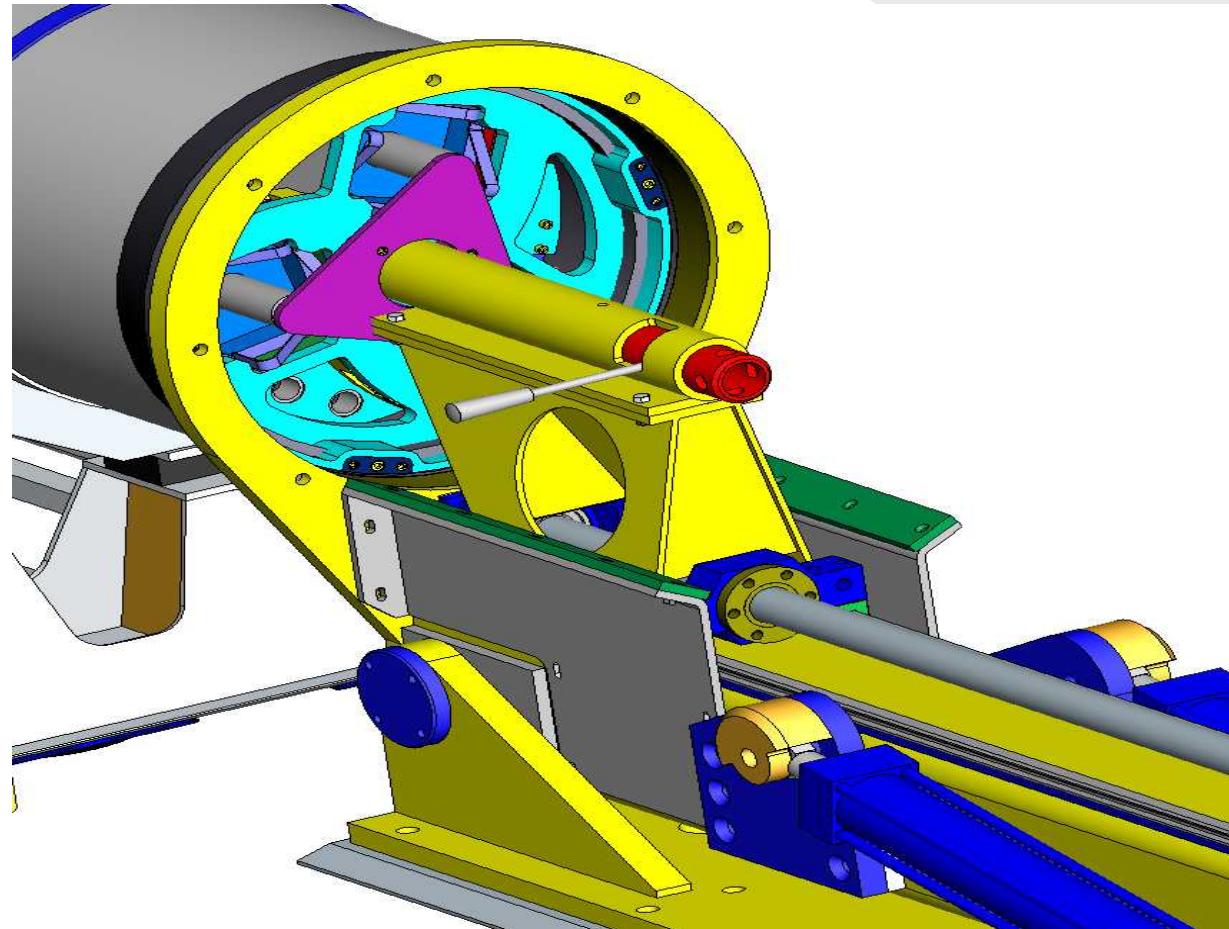


Moving MFFP with an air pallet



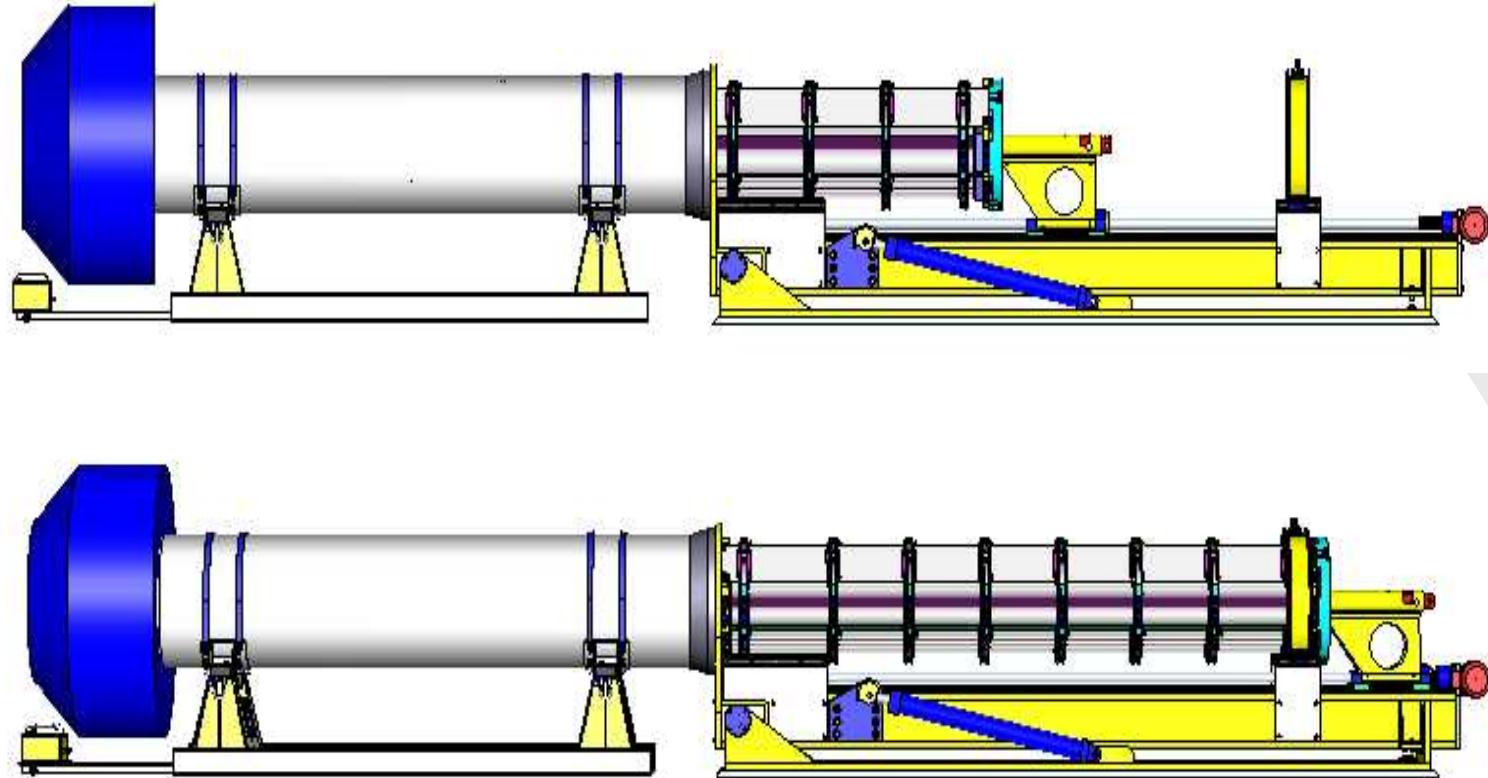


Extract Strong-back from MFFP





Extraction of Strong-back from MFFP



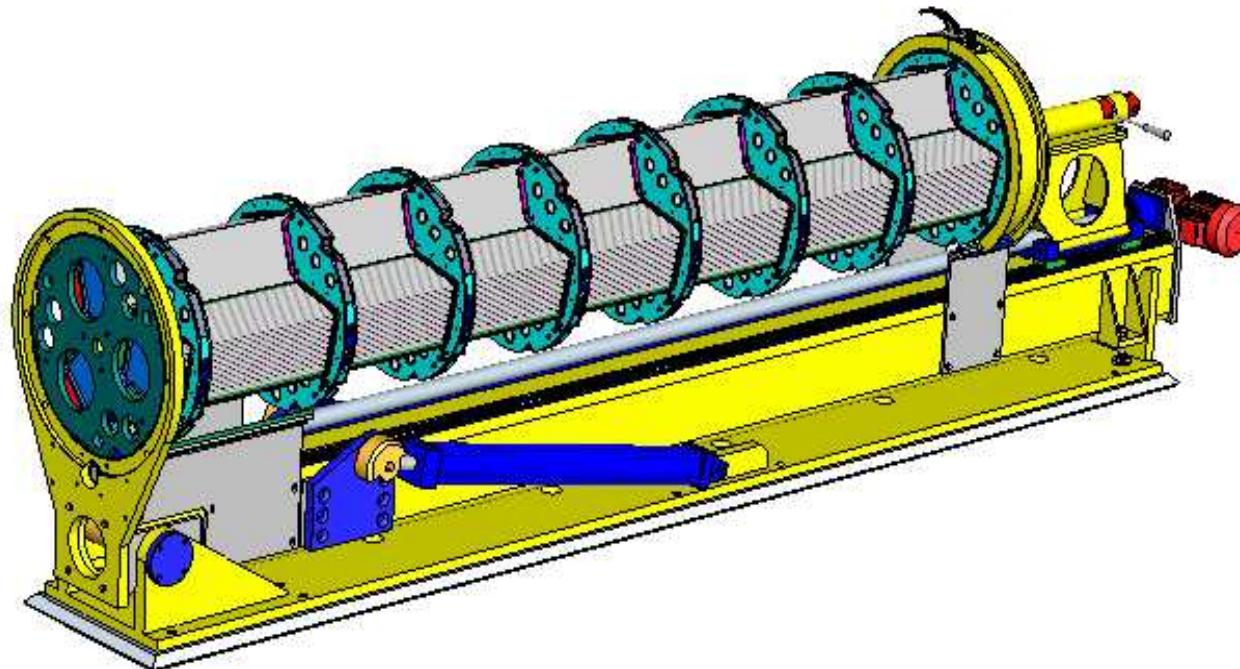


Strong-back extraction





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





Raising Insertion/Extraction Station and Strong-back to Vertical



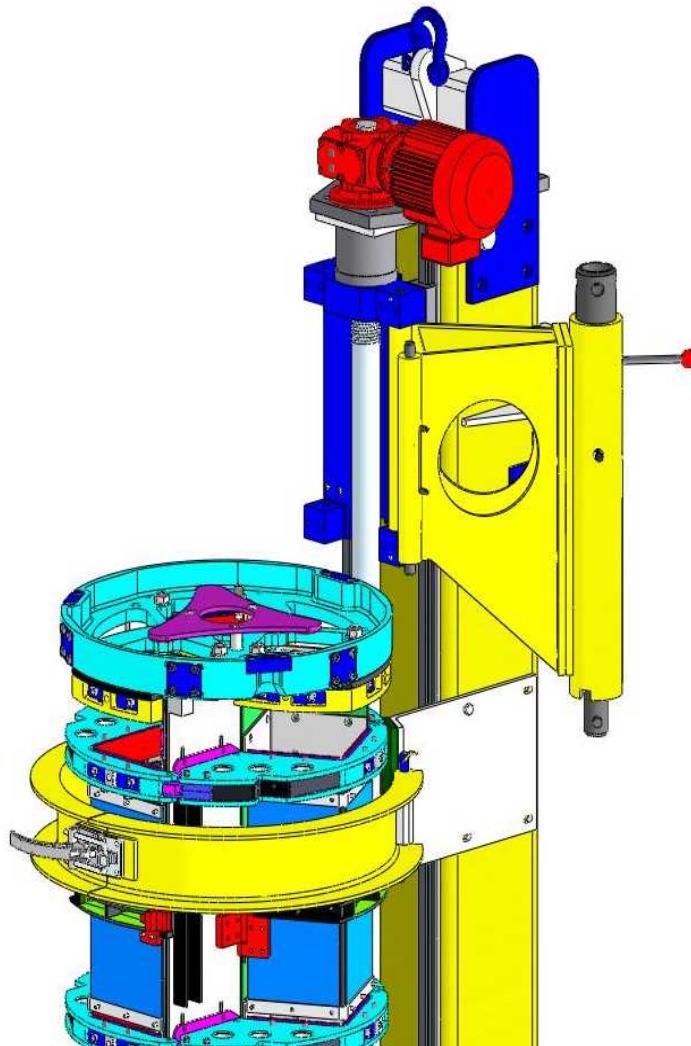


Up-ending the Insertion/Extraction Station





Remove Strong-Back from Insertion/Extraction Station





Attaching the Crane to the Strong-back



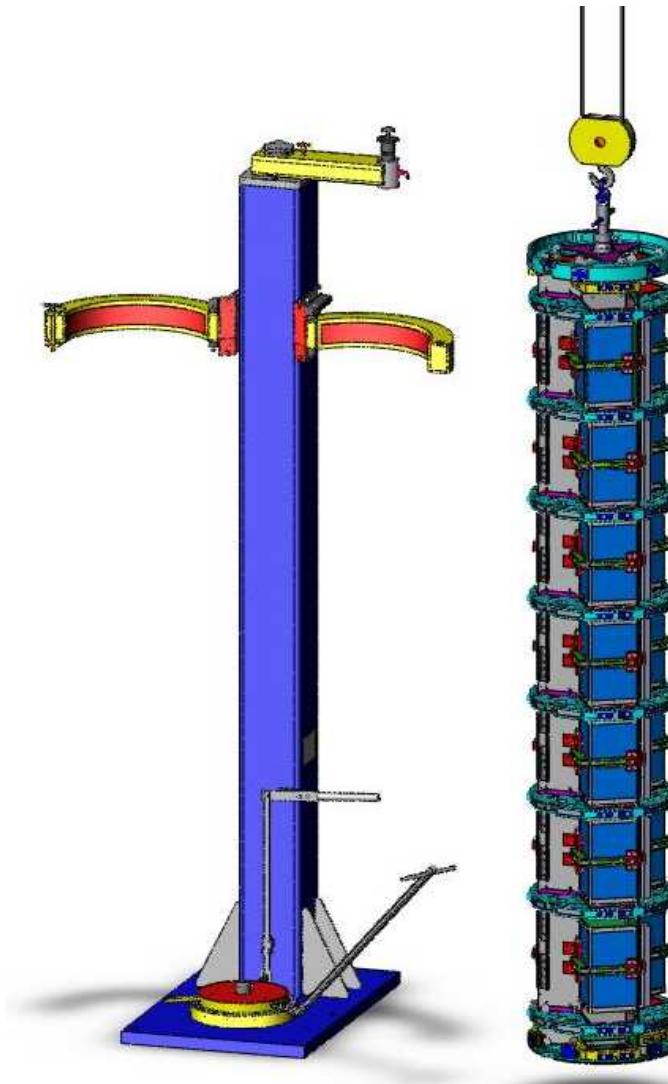


Removal of the Strong-back



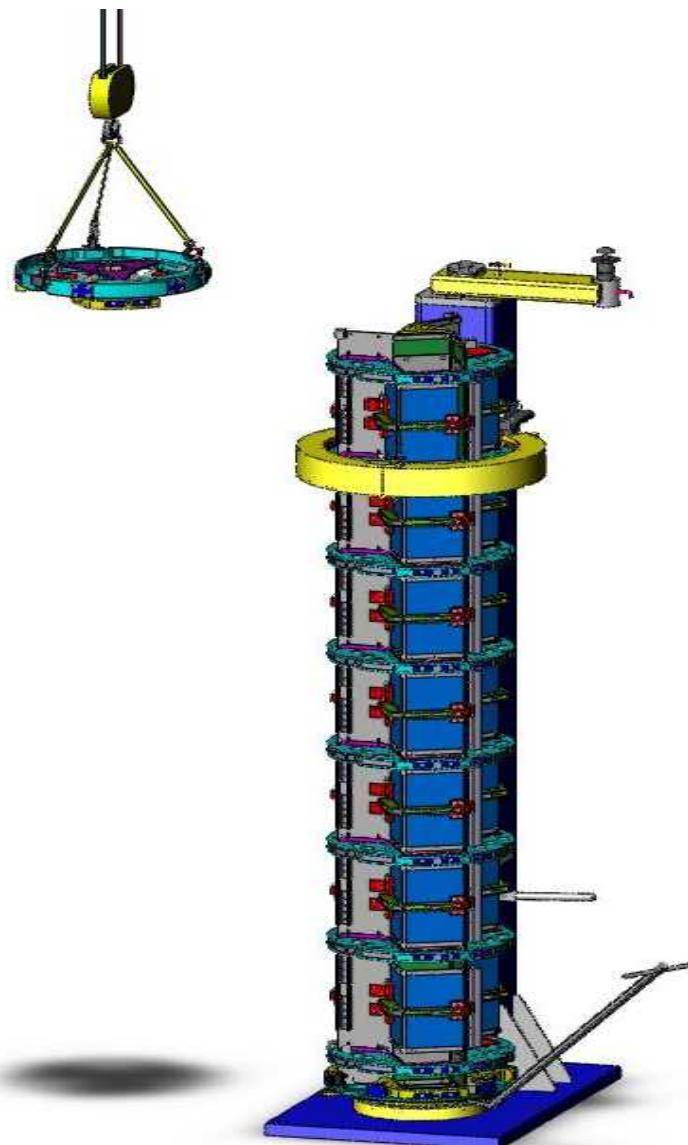


Transport the Strongback to the Load / Unload Station



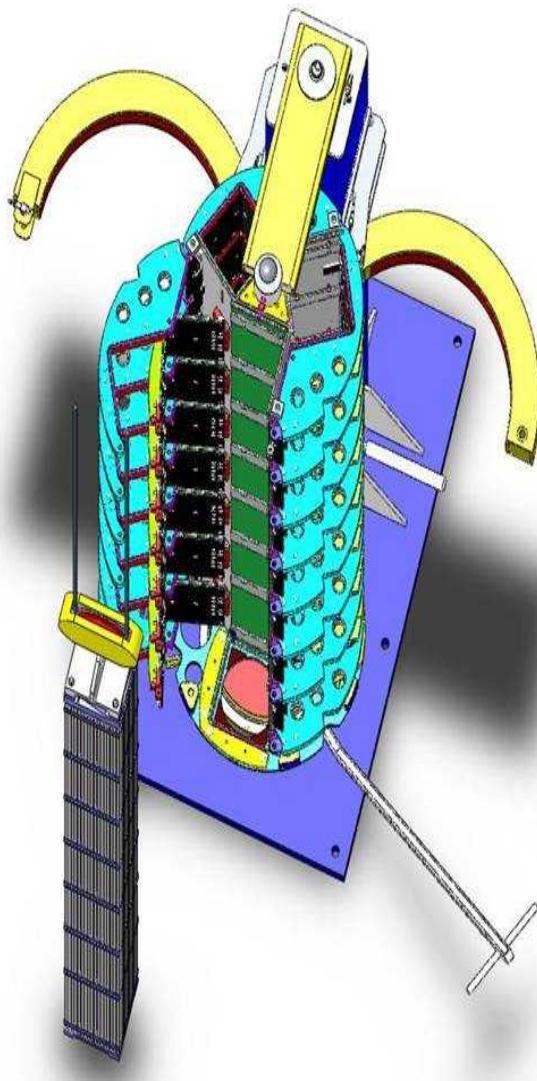


Strong-back in Load/Unload Station, Top Plate Removed





Loading of Fuel Assemblies into Strong-back



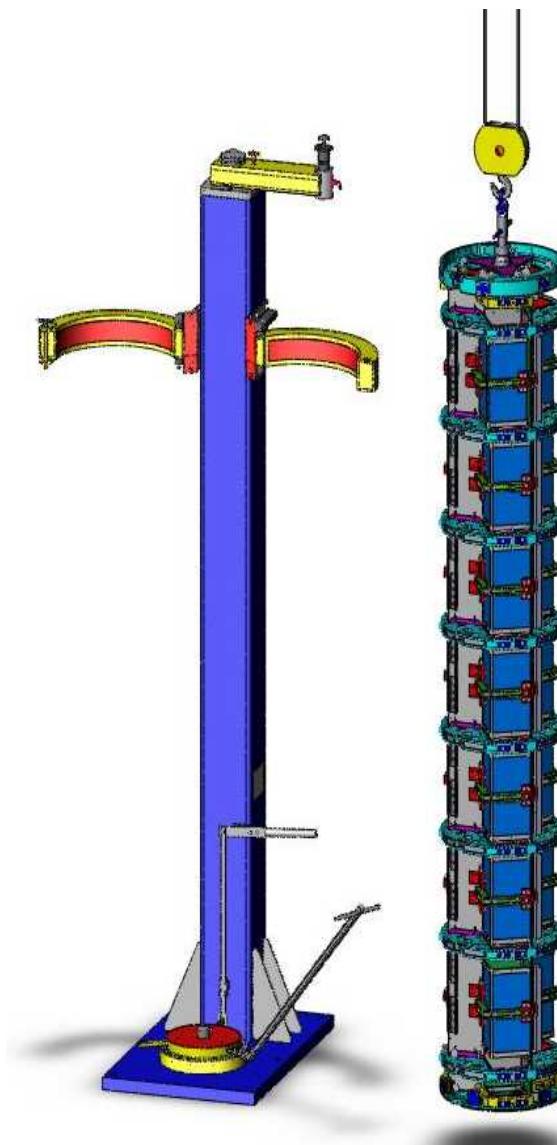


Loading a Dummy Fuel Assembly





Transport the Strong-back from the Load / Unload Station



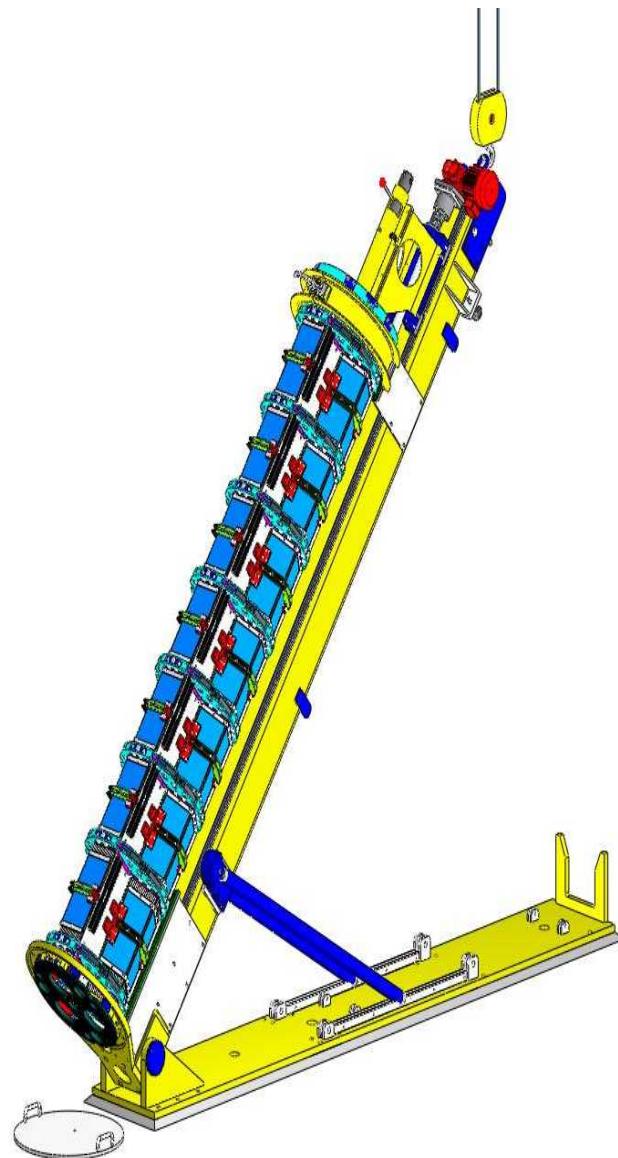


Transporting the Loaded Strong-back





Raising Insertion/Extraction Station and Strong-back to Vertical



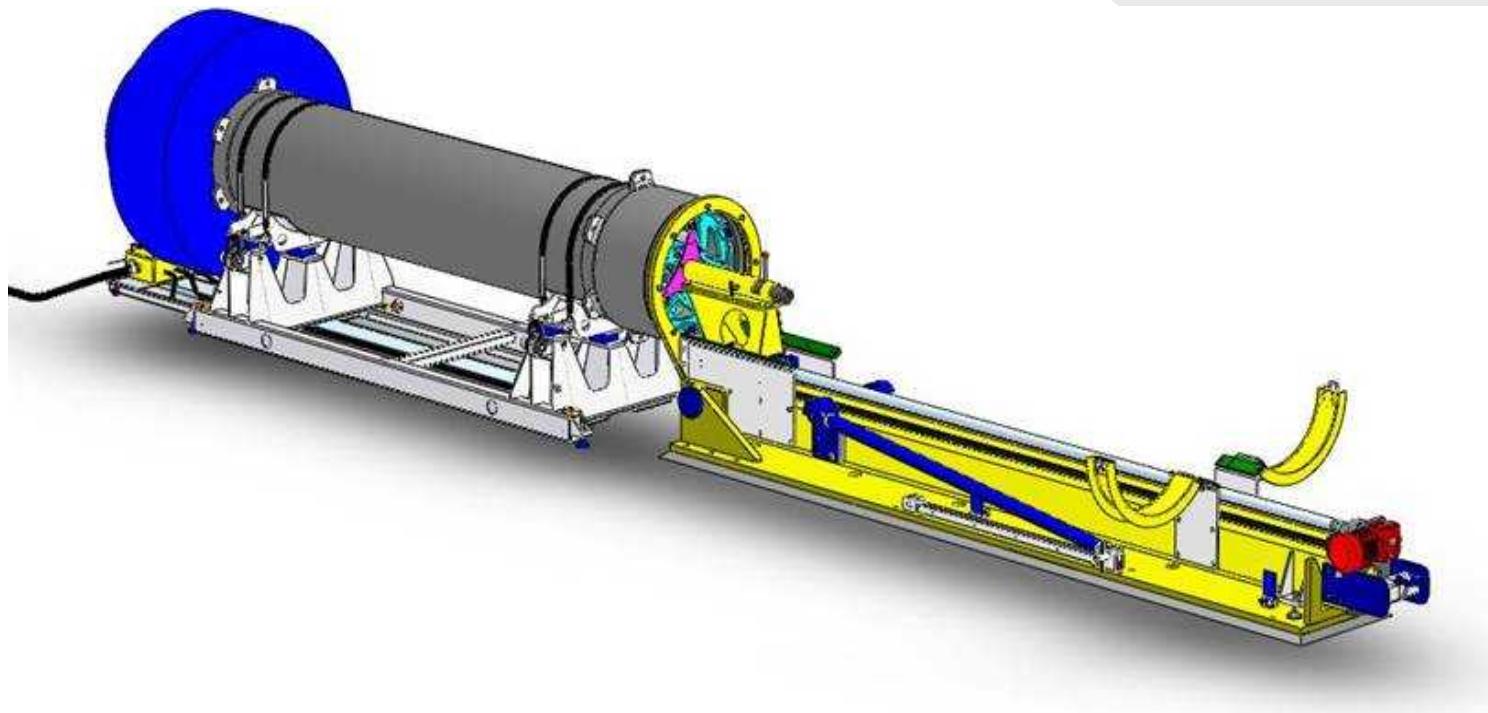


Down-ending the Insertion/Extraction Station



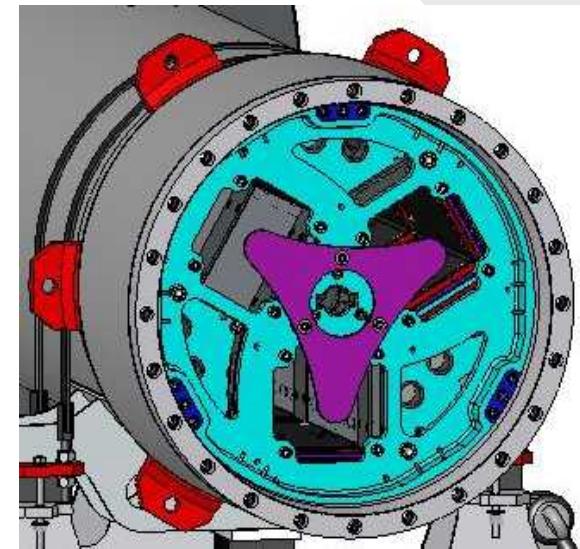
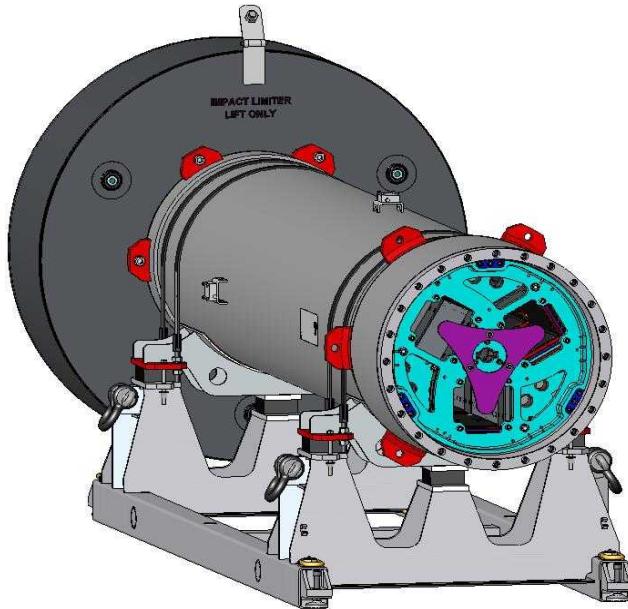


Loading of the Strong-back into the MFFP



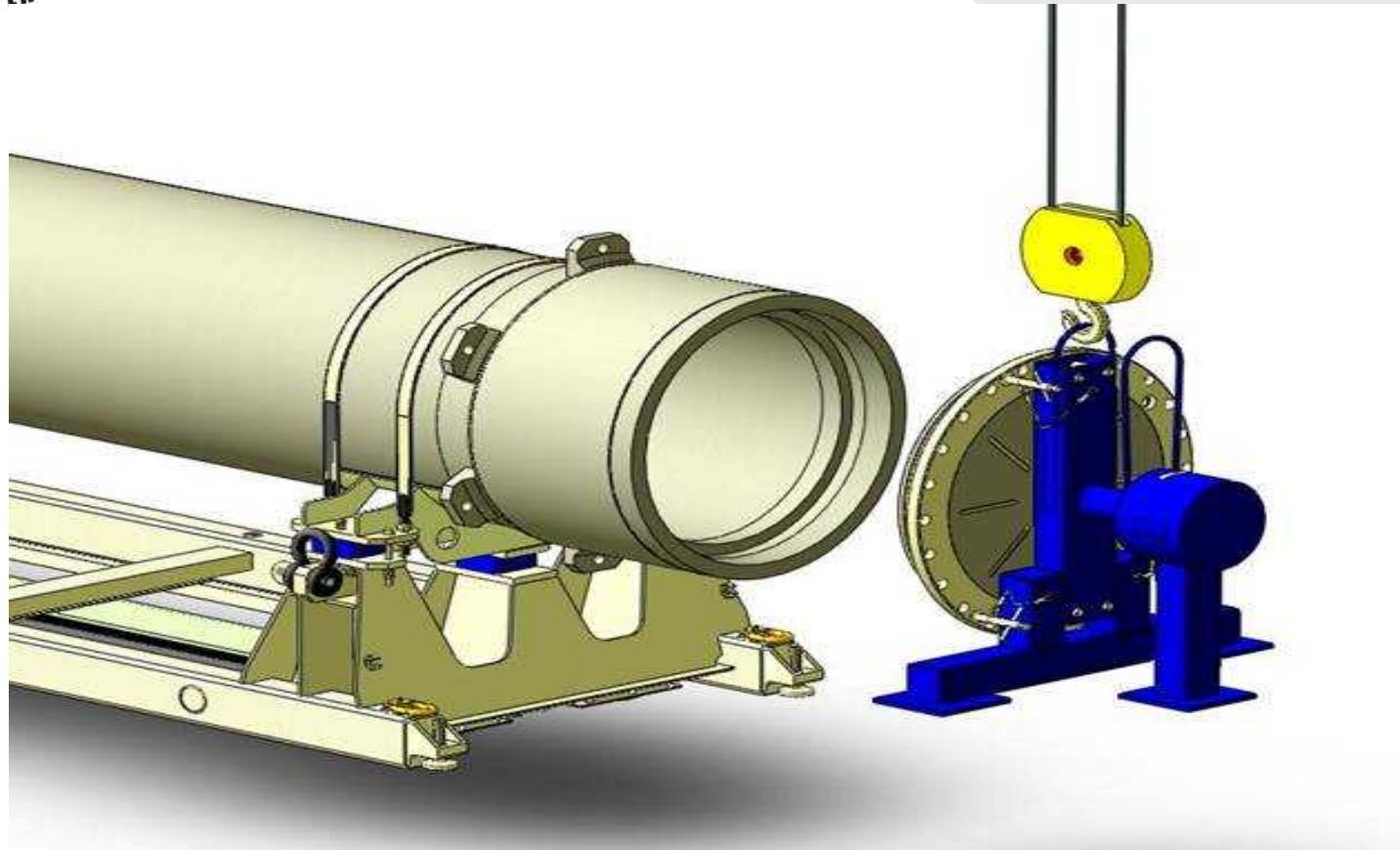


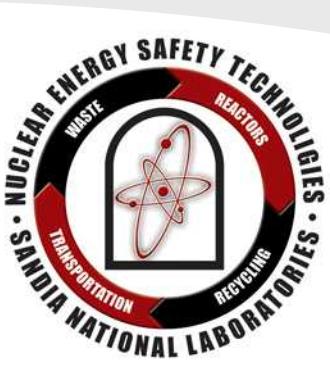
MFFP with Correctly Oriented Strong-back





Attachment of the Closure Lid



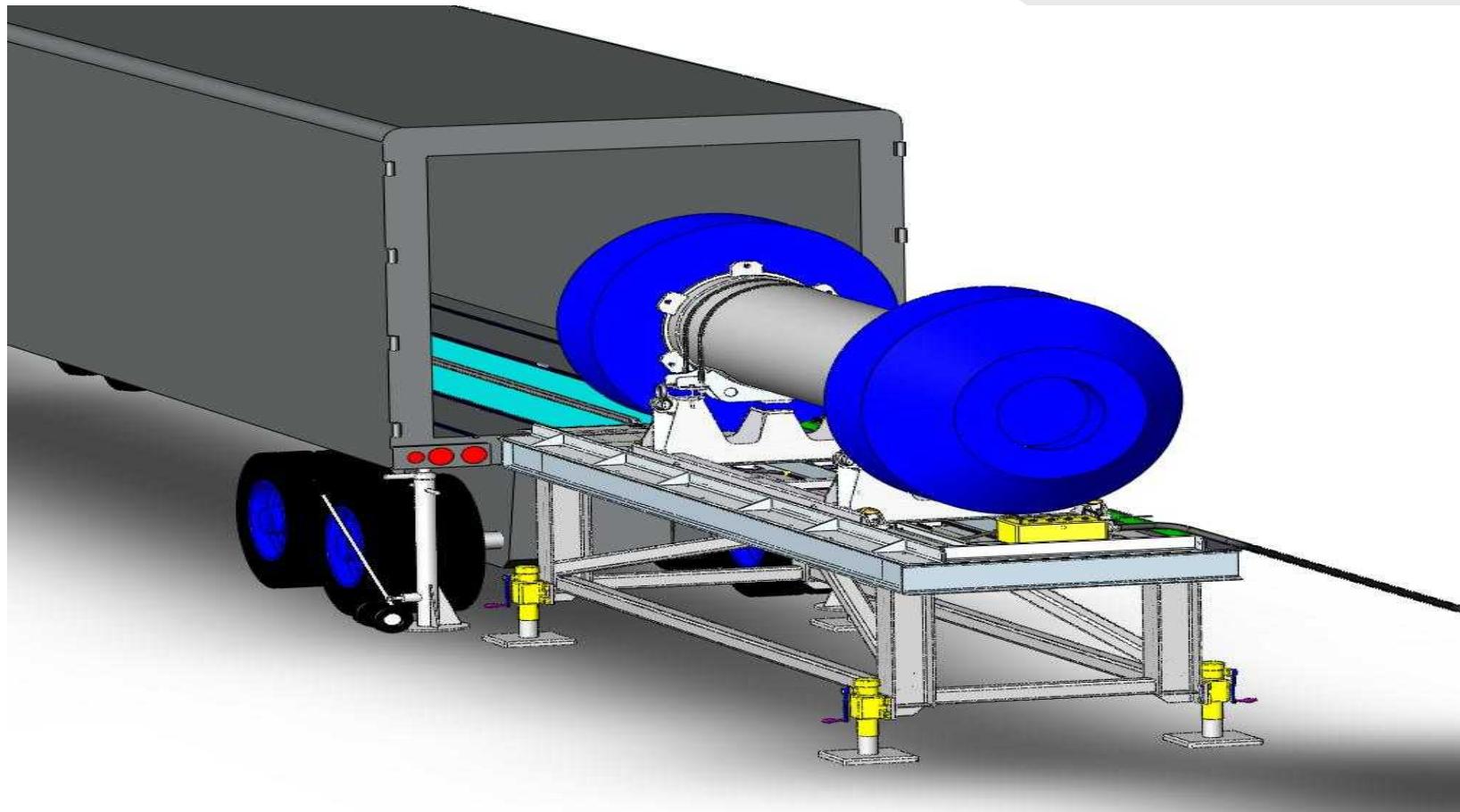


Last Steps at the MFFF

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



Unload MFFP/Skid from SGT using Air Pallet



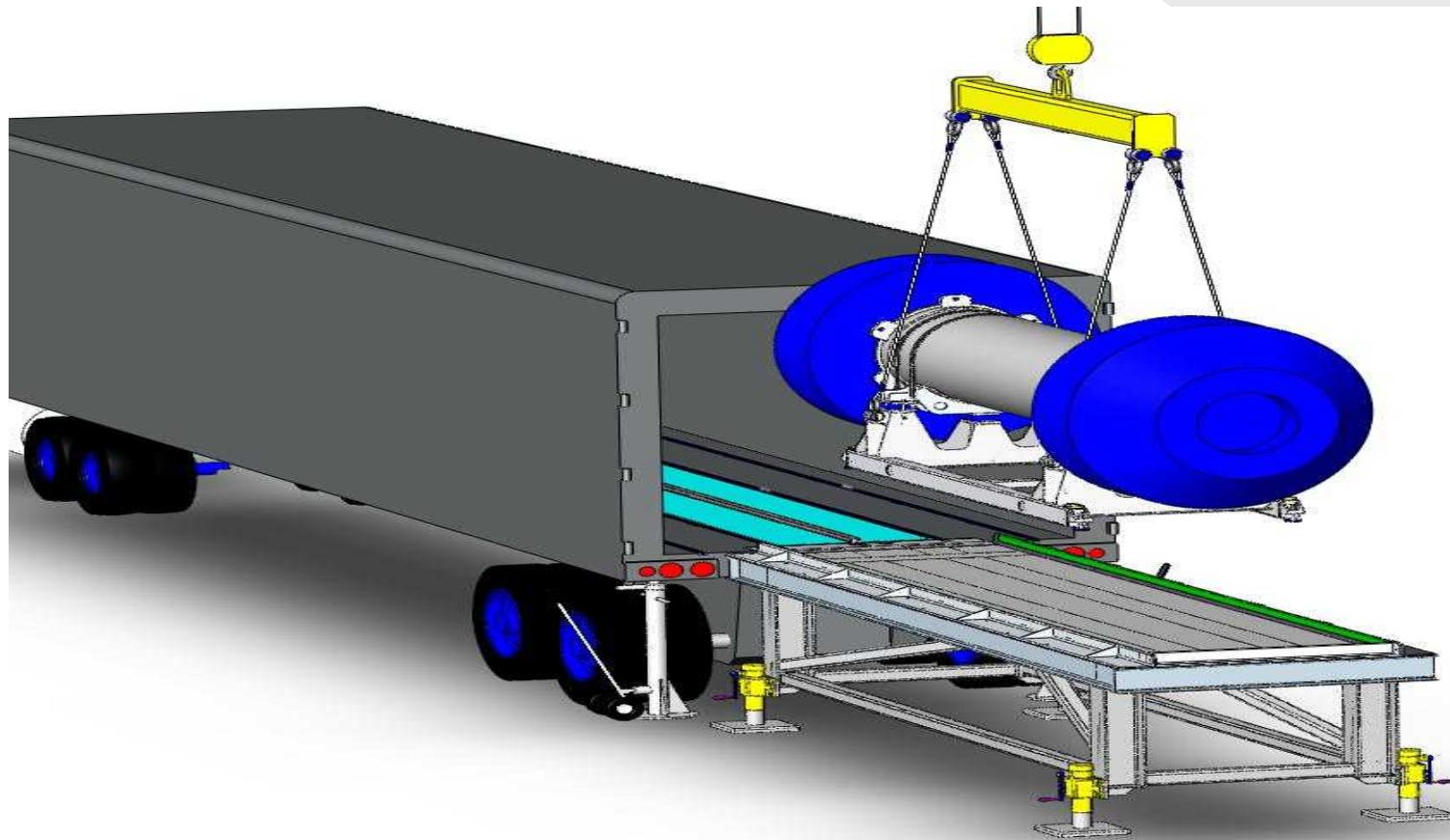


Moving the MFFP from the SGT to the Staging Table





MFFP/Skid Lifted from Staging Table



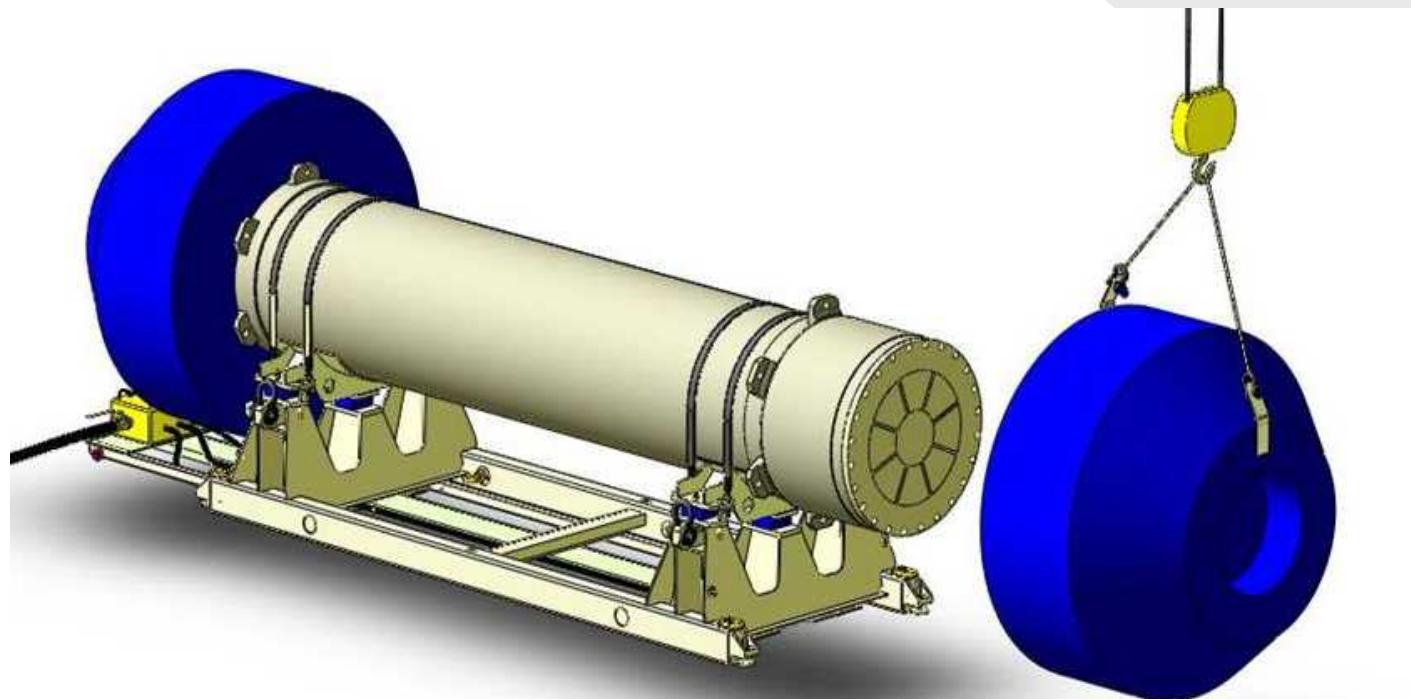


Lifting the MFFP/Skid off the Staging Table



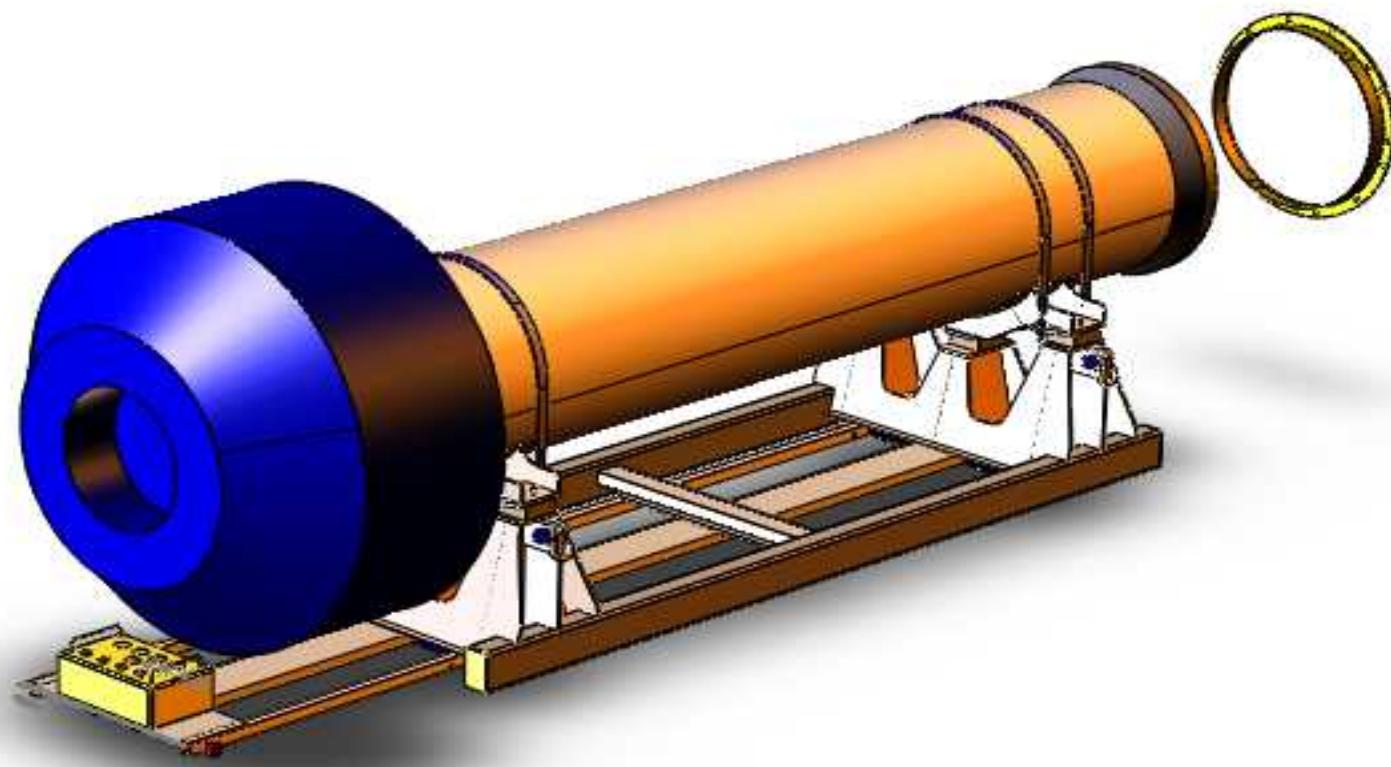


Removing the Impact Limiter





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 MFFF is done with a crane in the vertical position.
- The MFFF 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