



MARVEL Assembly Sequence

EC# 1754

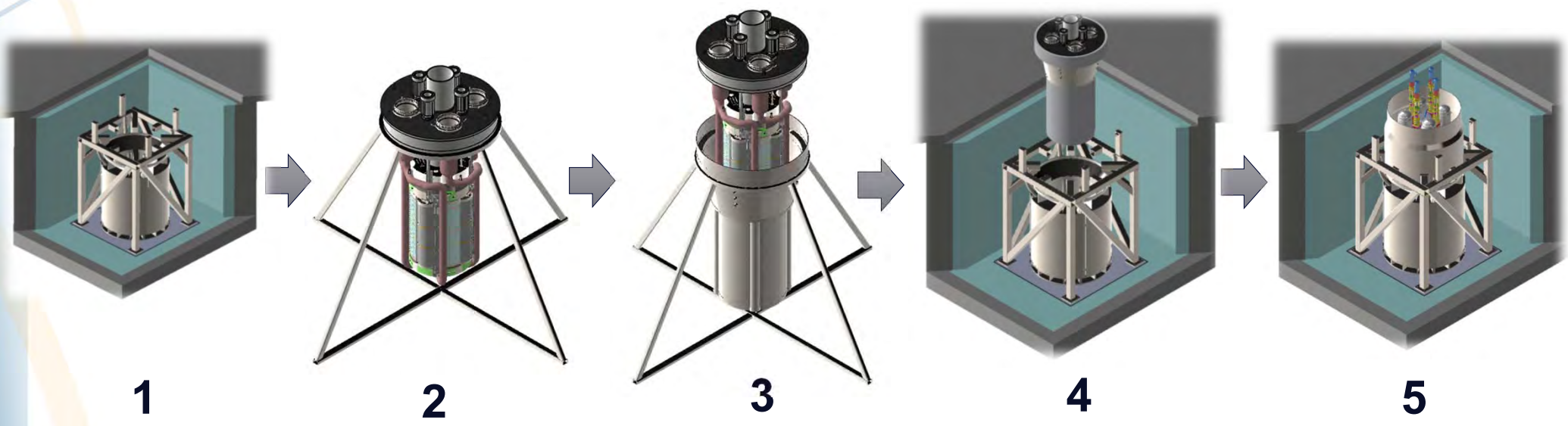
Tarrin Funderburg, Walsh Engineering Services

Collaborators: INL (NS&T, TREAT), Munro & Associates

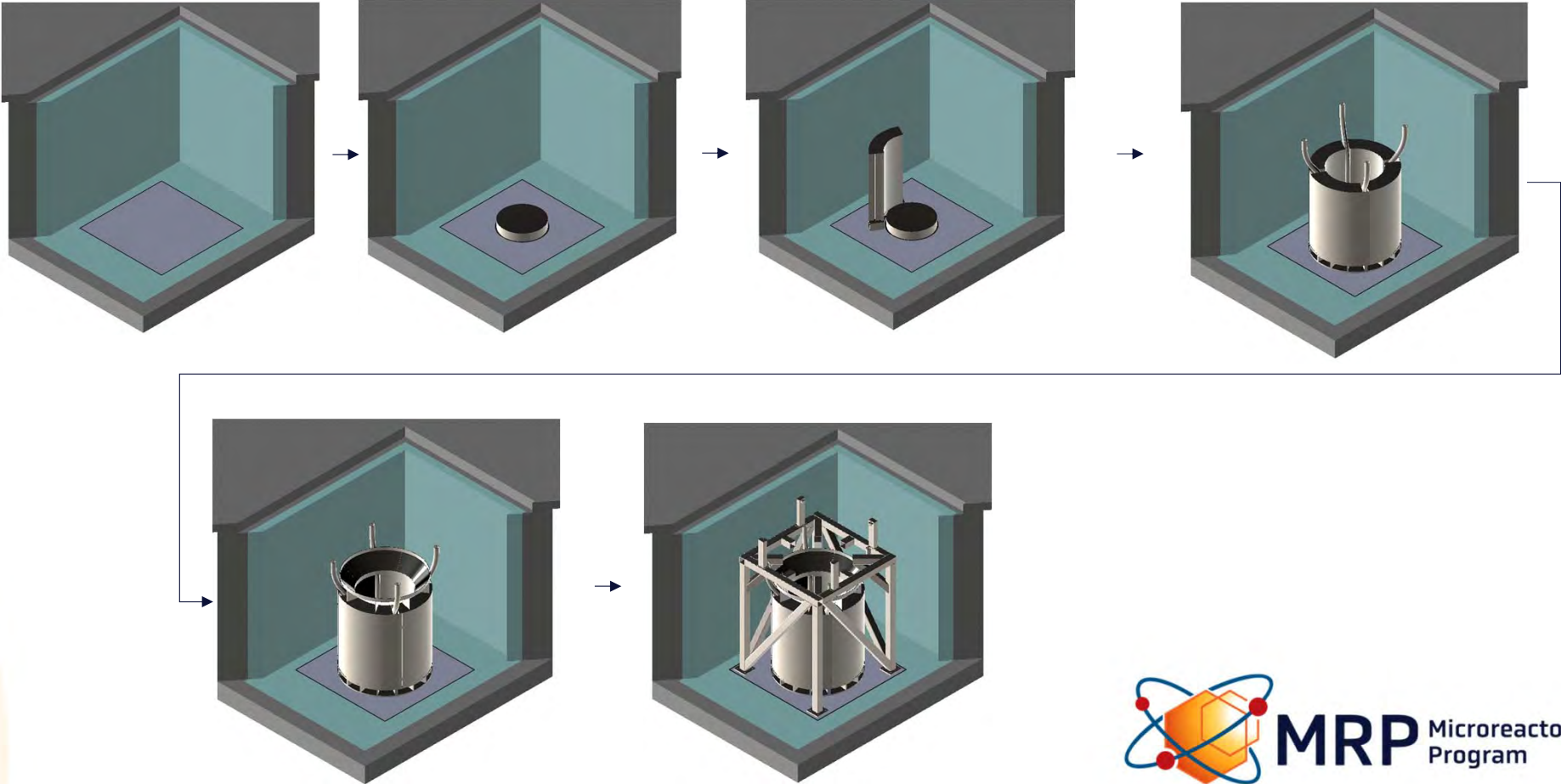
March 9, 2023



Assembly Overview



Bottom Shield and Support Frame



Temporary Frame

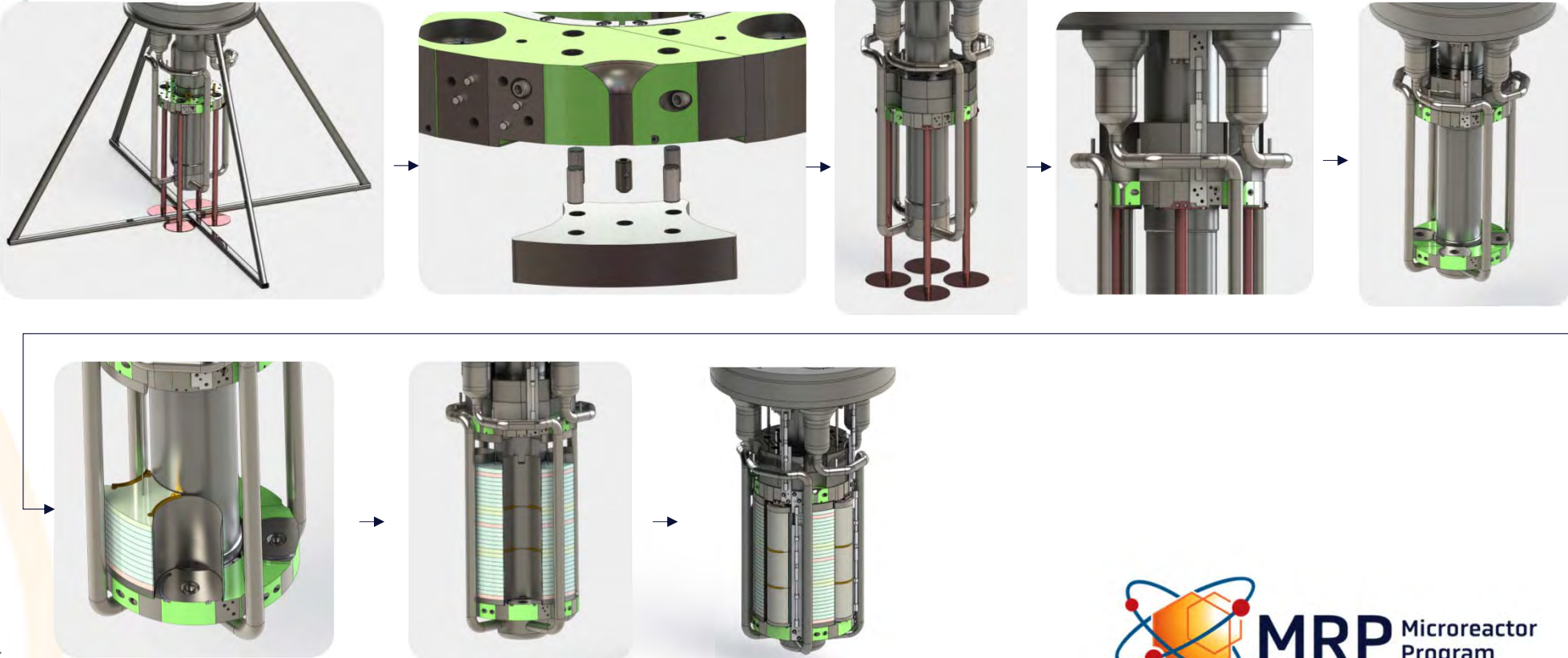
Required Equipment: Overhead crane and lifting straps. Two temporary frames, one for reactor internals and one for guard vessel

Frame Details:

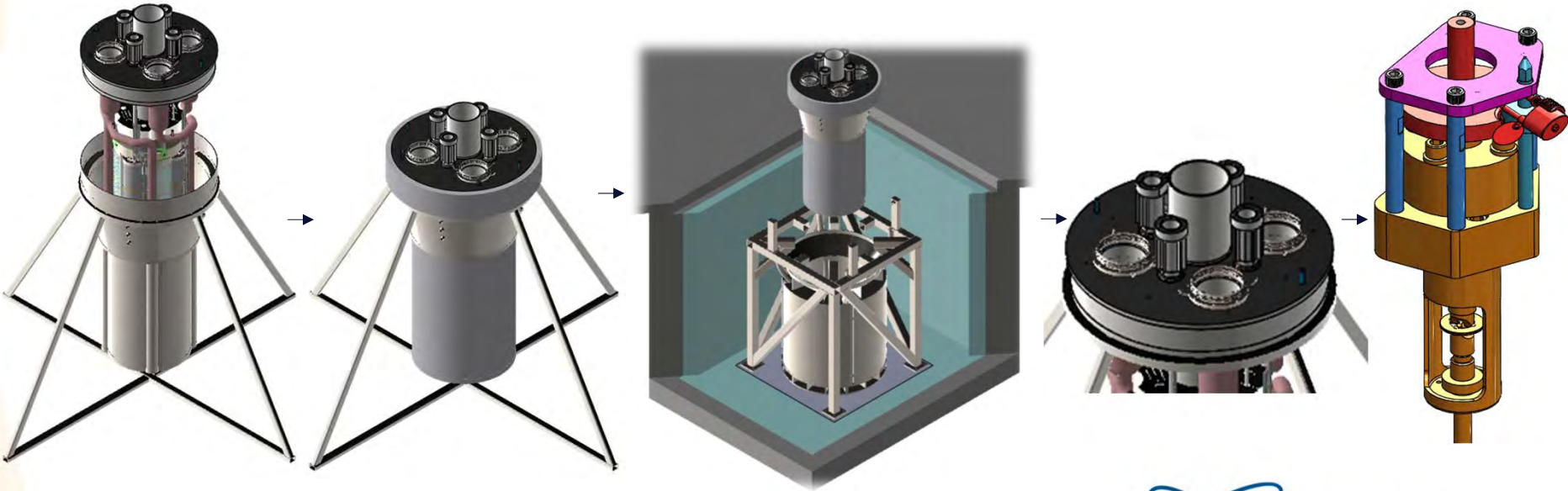
- Footprint \approx 6 ft (radius)
- Weight \approx 535 lbs
- Tube type: $3 \times 2 \times .25$ HSS, type 304/304L SST



Reactor Internal Assembly



Guard Vessel



NUCLEAR FUEL LOADING

Estimated time: 14 Days
Estimated weight: 650 lbs



MRP Microreactor
Program

FCS Preliminary Steps

- Place control drums in “least reactivity” configuration.
- Beryllium plates require special handling, supervision, and PPE.
- The only access to the core barrel is from the top. Removing unwanted or misplaced items can be very difficult.
- Up to 6 fuel pins will be on the TREAT floor at a time.

FCS “SHELL”

Required Equipment: Crane, fixture for lowering.

Prepare: Ensure the core barrel is free of debris.

Execute: Assemble shell outside of pit.

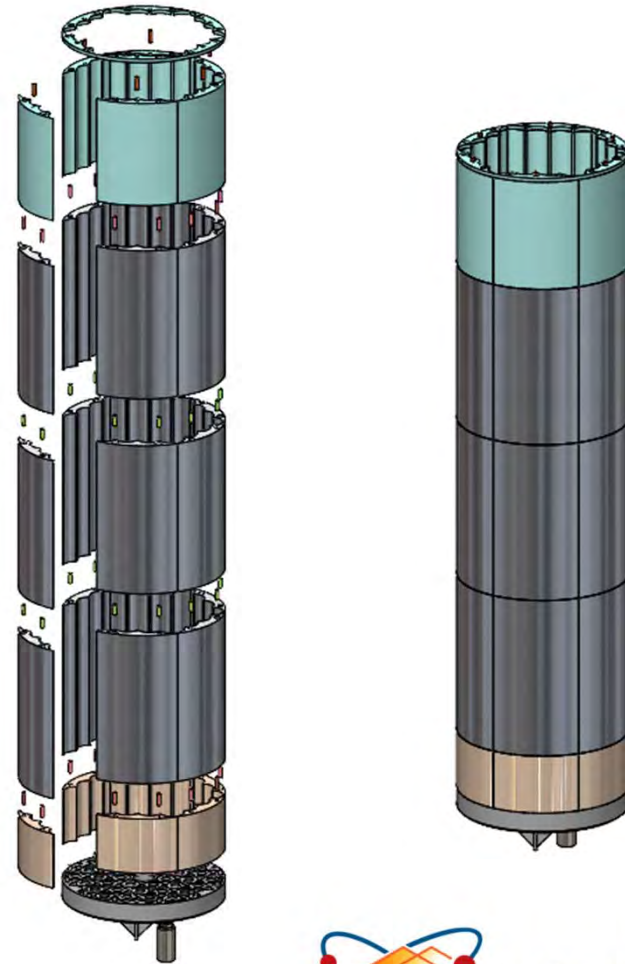
1. Place first steel spacers on lower grid plate.
2. Place pins and beryllium reflectors in sequence on spacers
3. Place upper spacers on reflectors
4. Place vertical tie-plate on upper spacers
5. Attach neutron source to lower grid plate
6. Lower assembly into core barrel

Load Details:

- Total weight: 120 lbs

NOTE:

- lifting feature has not yet been designed. Hole for CIA rod could be used as a lifting point. In the lower grid plate.

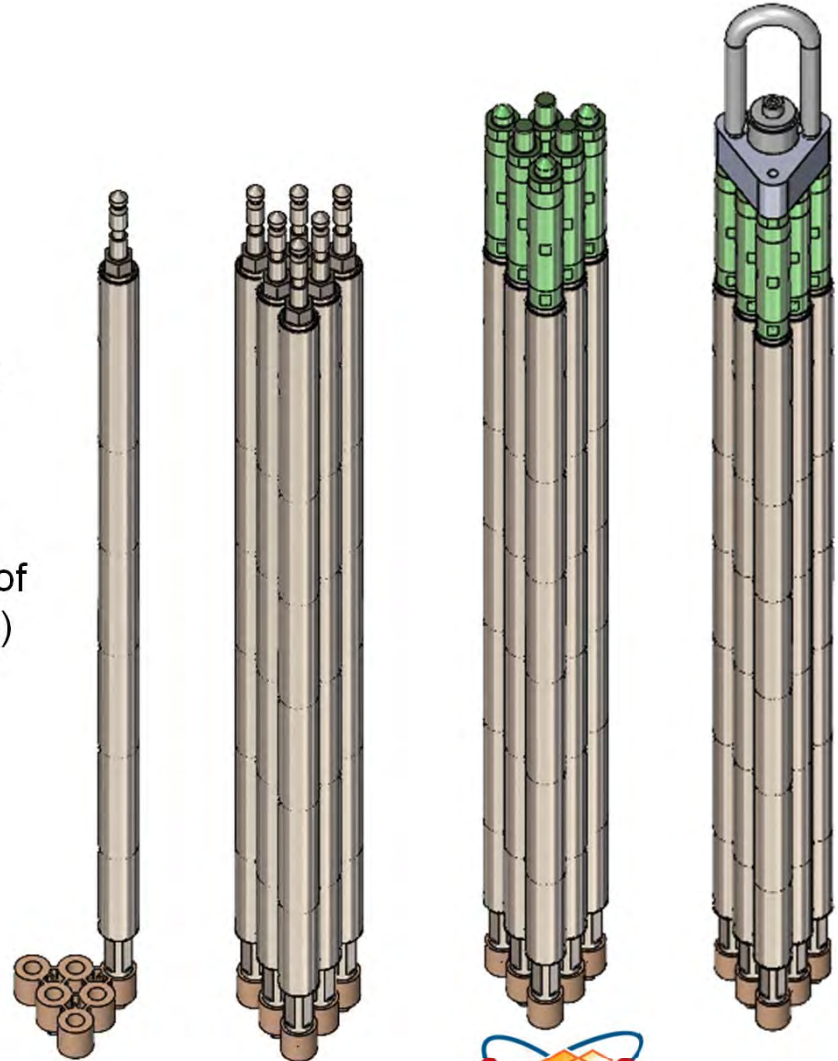


Fuel Pin Assembly

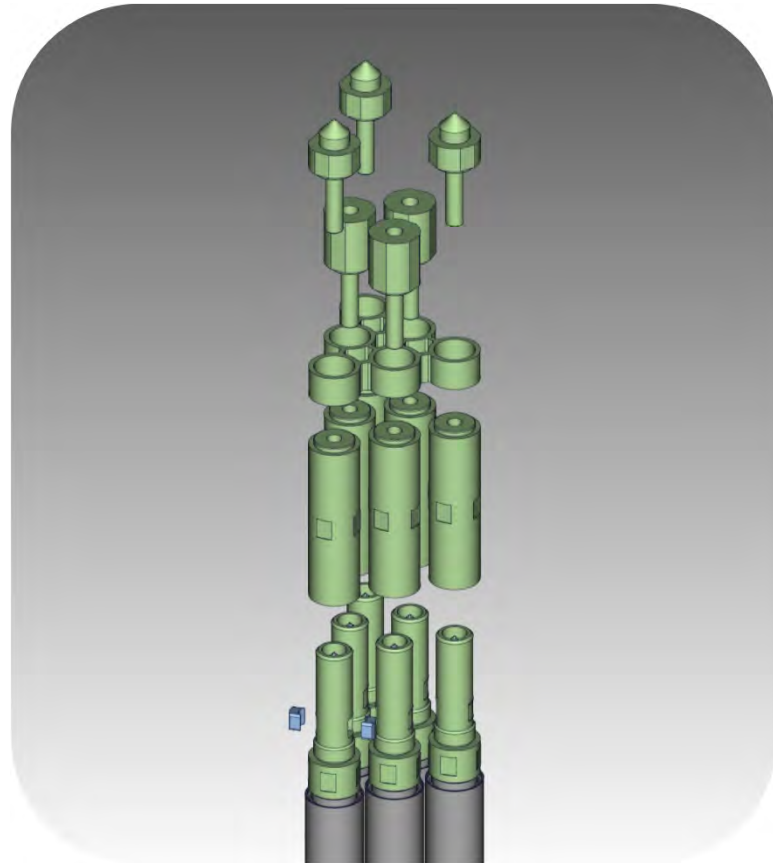
Required Equipment: Basic tools. Overhead crane. Extended reach (5ft) 3/8 hex head tooling

Execute:

1. Screw 6 fuel pins into lower alignment plate
2. Assemble upper alignment system on group of 6 pins (see next slide for assembly animation)
3. Thread lifting feature onto group of 6
4. Lower into FCS “Shell” inside core barrel
5. Remove lifting feature
6. Repeat steps 1 through 5 for the rest of the pins



ALIGNMENT SYSTEM ANIMATION

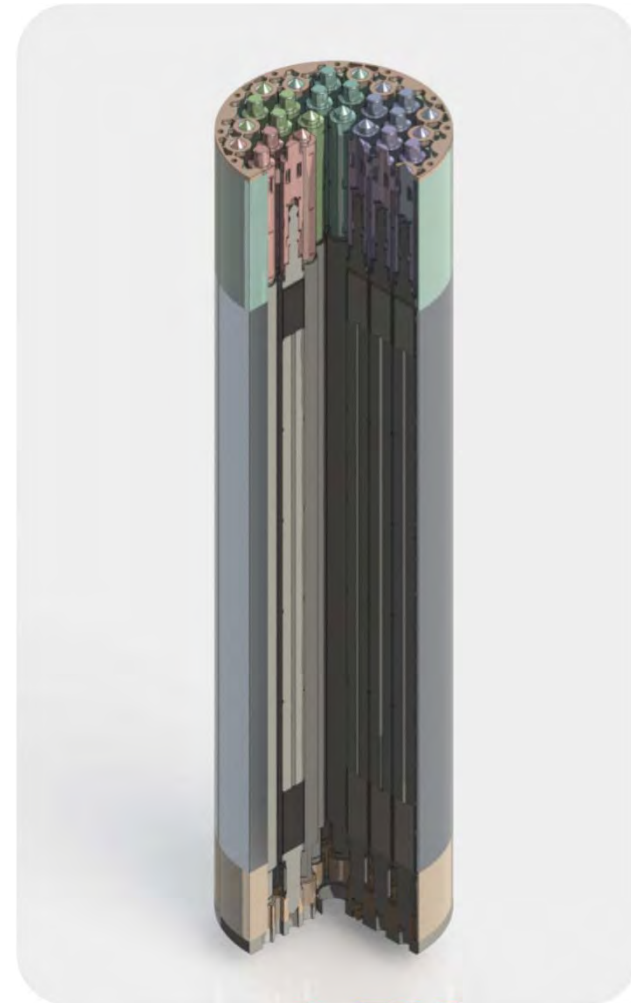


Complete FCS

Required Equipment: Basic tools, Extended reach (5ft) 3/8 hex head wrench

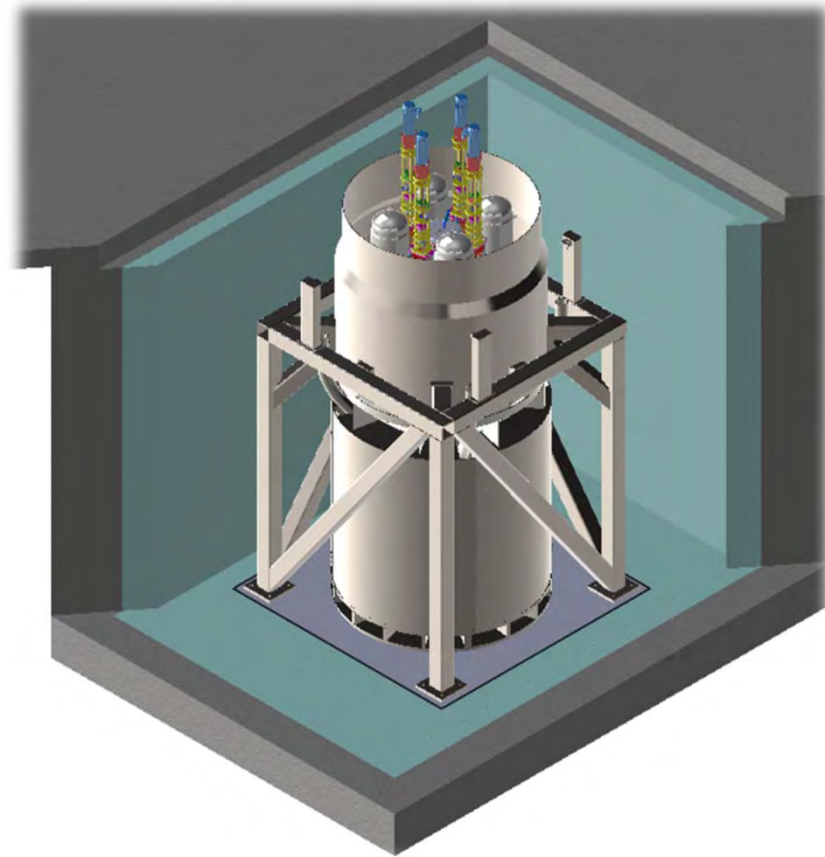
Execute:

1. Lower top grid plate onto FCS
2. Lower Belville washer onto FCS, with captured bolts
3. Tighten bolts to compress Belville washer and seal FCS

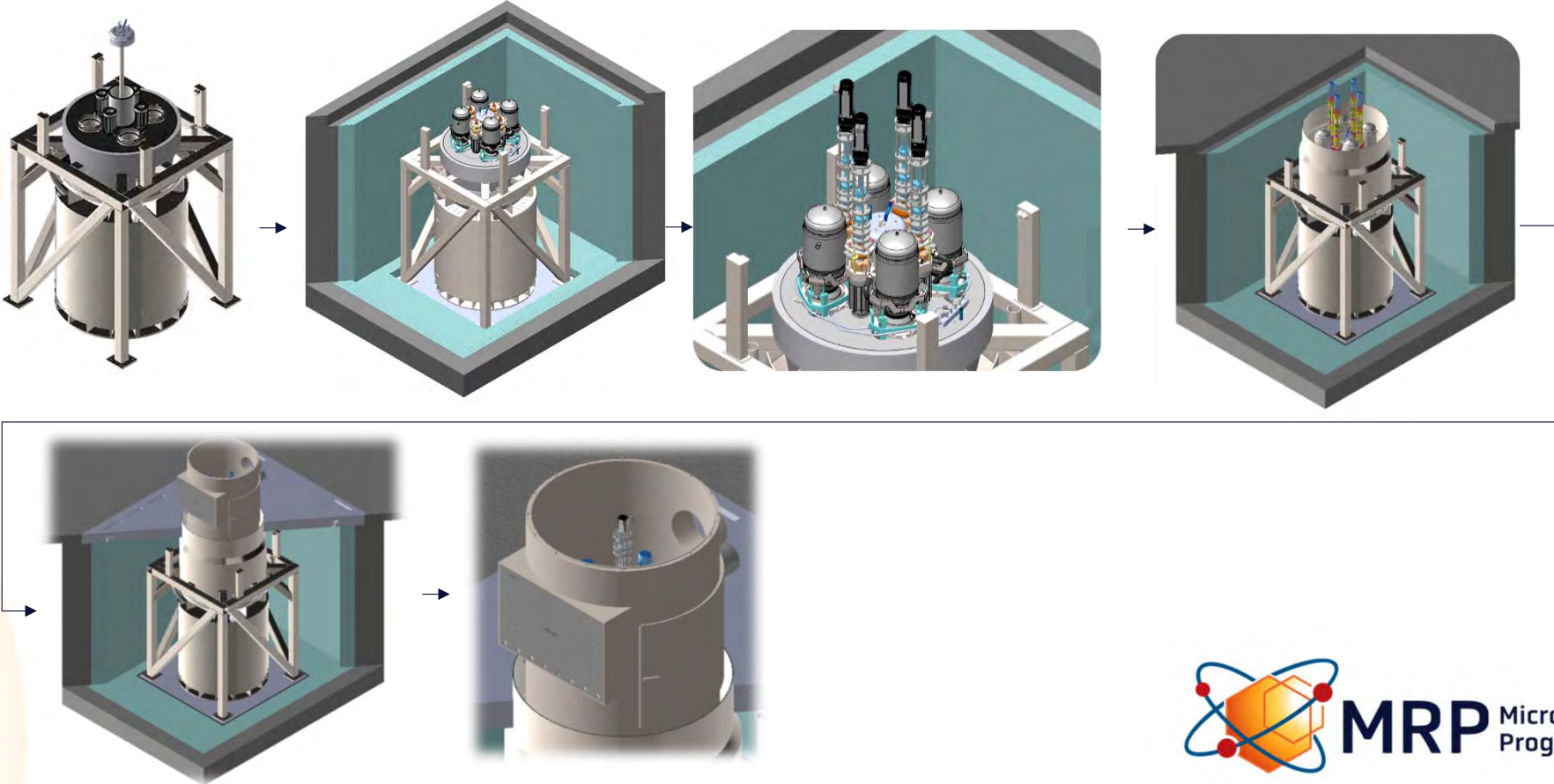


FINAL ASSEMBLY

Estimated time: 22 Days



Upper Reactor Components and Final Assembly

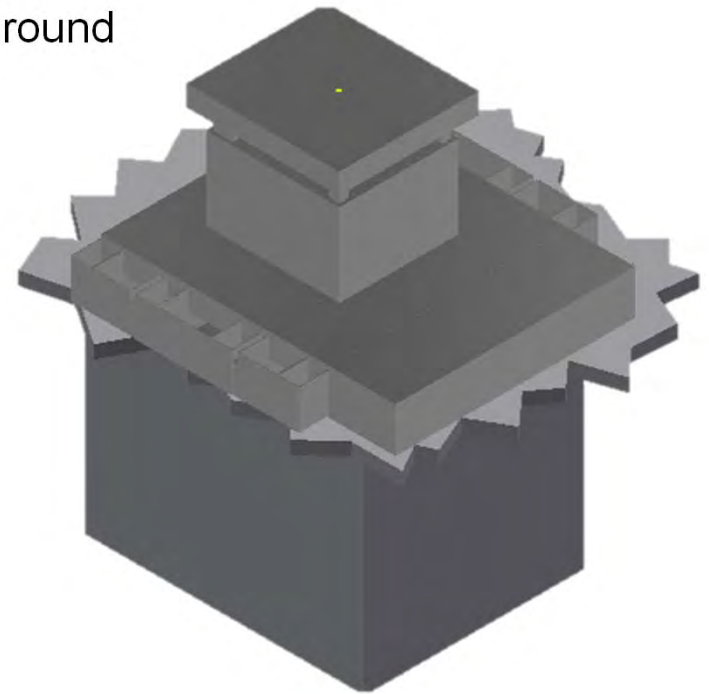


Argon Purge and NaK Fill

- Leak test PCS and GVS
- Purge PCS with argon
- Purge GVS with argon, fill to specified pressure
- Fill PCS with NaK per Creative Engineers Inc. procedure

Shielding

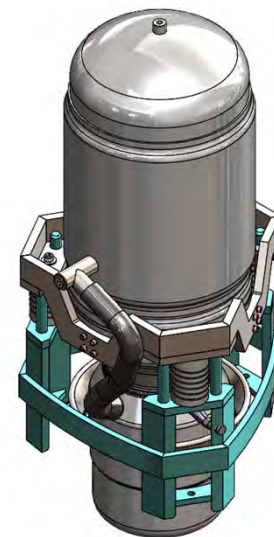
- Assemble TREXc Pit Shielding Lid and Fire Barrier around reactor



Obsolete Secondary Support Structure



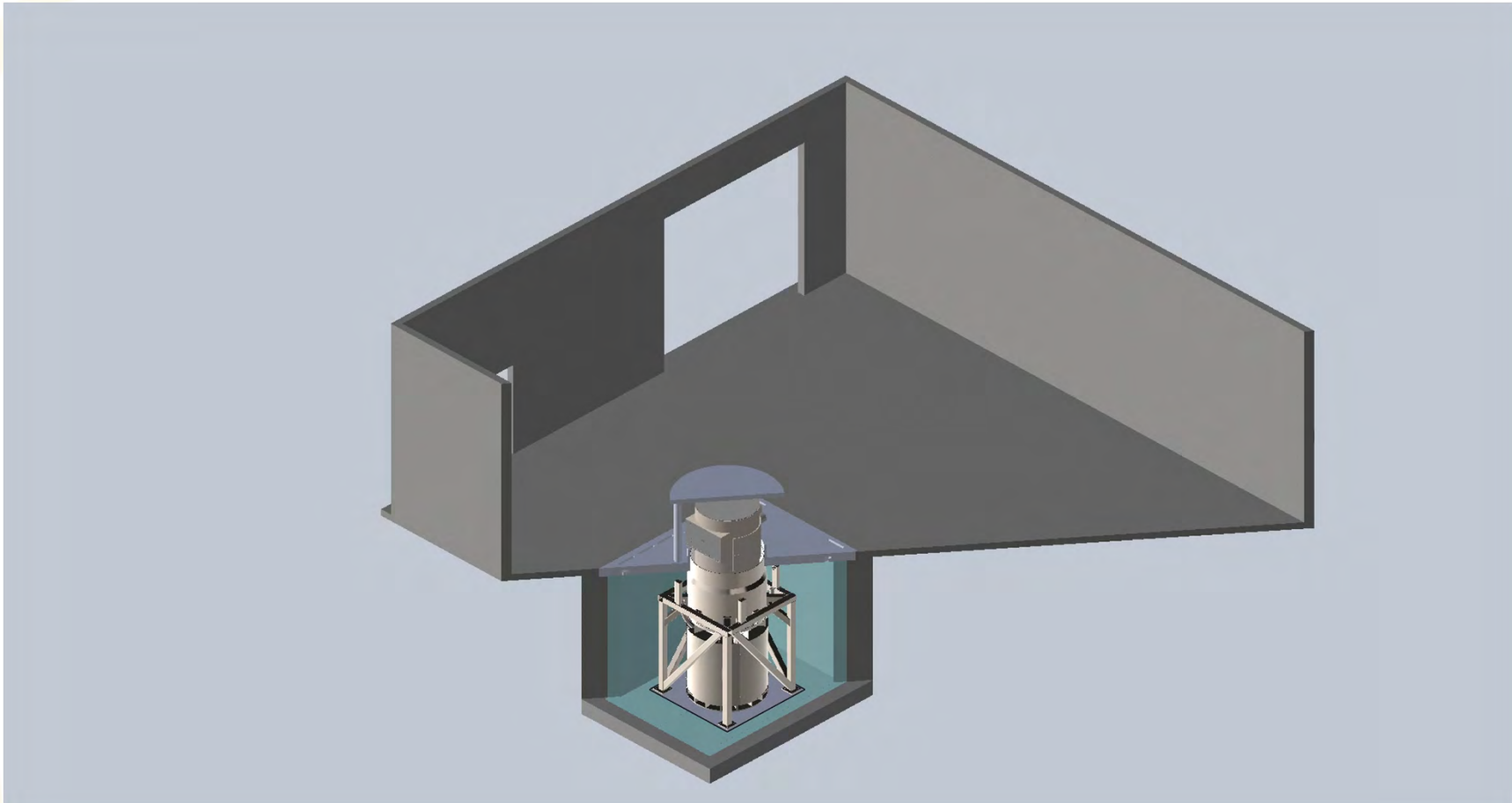
Old Design



Current Design



Assembly Sequence





MRP

Microreactor
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