

DISASSEMBLY PROCEUDRES:

Procedure title: Drawbar tension removing and upper cover removal

Procedure: page #1

- 1. Assemble tensioning units and sling spreader. See pictures (QA assembly notes log book page 46) or sketch A-1--Disassembly procedure.**
- 2. Set up hydraulic pumping unit for operational test.**
 - A. Open hydraulic bypass valve**
 - B. Close air throttle valve**
 - C. Hook up air supply**
 - D. NOTE: Assure unit hydraulic supply fitting has a protective Dummy quick connect cap temporarily installed.**
 - E. Start pumping unit by opening air supply throttle valve.**
 - F. Adjust air pressure regulator to approx. 40psi.**
 - G. Close hydraulic bypass valve slowly observing hydraulic pressure increase. Readjust air regulator pressure to where hydraulic pressure DOES NOT exceed 12,500 psi.
12,300 psi = 500,000 lbs. tension on jacks.**
- 3. Hoist hydraulic pumping unit to operating level.**
- 4. Hoist tensioning units assembly rig to center of cover.**
- 5. With one man at each end of the four tensioning units, lift up units over drawbars, lower until puller nuts touch bars. Then screw on tension nut using hand pin.**
- 6. Screw on puller nut leaving ¼” piston extension between jack and puller nut body. Assure drawbar threads are well cleaned and greased.**
- 7. Attach hydraulic hoses to jacks assuring fittings are locked.**
- 8. Start hydraulic pump unit raising pressure to 10,000 psi. At this point, try to unscrew the drawbar nuts by using hand pressure on 1” pin, while increasing hydraulic pressure to 12,000 psi.**
- 9. Record at what hydraulic pressure it takes to release the first 12 nuts.**
- 10. Unscrew nuts ½ turn or 3 holes only.**
- 11. Release pressure and transfer all tensioning units in unison to the adjacent nut and repeat 11 times until all 48 nuts are loose.**

12. Remove tensioning rig and break down components for storage, keeping tensioners and pumping unit for bottom drawbars.
13. Clean grease off of 8 draw bars thoroughly 2 each, 90 degrees apart and remove nuts to storage using identification tags or labels.
14. Wrap packing material around all other drawbars threads that are going with the cover move. Assure the rapping is secured well.
15. Install drawbar-lifting fork under the other 40 nuts and raise drawbars to remove oval pin. NOTE: leave in the pins for the 8 drawbars not being removed.
16. Remove oval pins using vacuum cup. Wrap in packing material to storage using identification tags or labels.
17. Install 10 pieces of 6x6x36" of wood spaced between ports for the cover in south west corner of cell. Cover with enough plastic to completely bag the cover when placed.
18. Inspect upper cover for interference for removal.
19. Install 6 each 6" x 6" ³/₄" plywood pads blocking for lift plate to sit on top of draw bar bolts or larger blocks on cover to clear draw bar bolts.
20. With portable strain gauge adjust lifting fixture to be level and all turn buckles sharing tension. Note: turnbuckles secured (to inner lifting eye pads).
21. Using strain gauge with 0 weight setting hoist lift fixture to center of cover, lining up datum and re-level fixture to cover assuring turn buckle sharing. Note: lifting fixture should weight approximately 5 tons.
22. Lower lifting fixture onto plywood pads lining up with holes in cover.
23. Install 1 1/8" fine thread studs into the 10 each holes in cover through fixture and secure washers and nuts to equal hand torque. Assure studs are screwed into cover fully.
24. Raise hoist, taking some strain on strain gauge. At this point, have new hook strain gauges hooked up and record load difference. Raise hoist to a number of increasing loads and record differences in load between hook gauge to cable gauge. Assure a match of less than 400 lbs.
25. Raise hoist to approximately 70,000 pounds. Cover should start to rise. Could go as much as 74,000 pounds.

26. Record cover weight before and after draw bars lift off.

Before: _____ **After:** _____
Was: 76,600 **Was: 74,300**

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27. Hoist cover up 1/2 to 3/4" checking the TF central G10 cover. Assure it doesn't stick to both sides, pry to one side only.

28. Raise cover high enough were the drawbars hit the key pins releasing them. Remove all key pins to storage before removing cover any further.

29. Move cover to southwest corner off cell. Set on 10 pieces of 6 x 6 x 36" blocking between each port and assure drawbars have clearance off floor. Remove lifting studs from cover and hoist fixture high enough to install plastic over cover to the floor leaving lift fixture stored on top.

30. Using drawbar-lifting fixture with spring assembly, remove the 8 drawbars and oval pins to storage container.

Completed by: _____ **Date:** _____
(Signature)

Notes or Changes: _____

PROCEDURE TITLE: Cylinder Removal and draw bar tension removal

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The cryostat and all TF, EF cylinder bus previously removed.

- 1. Install 5 each 1 1/8 x 8' rods through upper wedge plate spaced equally and screw through lower wedge plate until bottomed out on lower cover.**
- 2. Install nuts on the 4 rods tighten them a little more than hand tight. Step 1 and 2 will hold the wedge plate in place when taper pins are removed.**
- 3. Remove upper and lower taper pin nuts and taper pins to storage using packing material and I.D. labels. NOTE: keep out 5 pins for wedge plate storage in cylinder if wedge plate is to be removed.**
- 4. Prefabricate plywood platform over lower Dewar cover for air jack detensioning support. Assure plywood is sitting on cover flange for proper jack clearance**
- 5. Set up four manned jack tensioning stations starting with a # 1,13,25 and 37. NOTE: use crane to lift tensioners onto jacks.**
- 6. Grease drawbar threads before screwing on puller nuts.**
- 7. Screw on puller nuts, then back off nut 1/8 of a turn gauging 1/4 to 5/16 jack extension clearance; assure this clearance through out detensioning.**
- 8. Hook up hydraulic hoses assuring fittings are all the way on and locked.**
- 9. Raise hydraulic pressure to 11,500 to 12,500 psi checking drawbar nuts release pressure by holding pressure on pin. Record each bolt release 4 bolts X 2 cycles. _____ .**
- 10. Unscrew drawbar nuts 1/2 turn or 3 holes and then slowly release hydraulic pressure opening bypass valve.**

11. Unscrew the first four-puller nuts, leaving air jack up. Increase air jack pressure some to raise drawbar to a balance position for drawbar oval pin removal.
12. Remove the 4 oval pins using vacuum chuck. Install a 2 x 4 x 8" long piece of wood in the oval cylinder holes so the drawbars cannot be lowered

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completely at this time. Number the oval pins at top out side .Rap in packing material and move oval pins to storage.

13. Slowly lower the air jacks with drawbars until they bottom out on the 2x 4. Move to adjacent draw bar.
14. Lift the first 4 drawbars use the lever fixture to raise the drawbar enough to remove the 2 x 4 and lower gently down. Weight is about 90 lbs.
15. After the first set of four drawbars is lowered completely, screw up drawbar nuts to hold up drawbar ring washer up. Leave the four nuts approximately 1/32" loose.
16. Repeat steps 6-10. Then slowly releasing hydraulic pressure, unscrew puller nuts and transfer all tensioning units to the adjacent nut and repeat 11 times until all 48 nuts are loose.
17. Remove air jacks and tensioning units, to storage in northeast lower corner.
18. Remove remaining oval pins use lever fixture to lift drawbars and vacuum chuck to remove oval pins. Number the oval pins at top out side. Rap in packing material and move oval pins to storage.
19. Install packing material around draw bar threads to protect and keep the grease clean.
19. Inspection of complete cylinder for any interference.

___ Check the 40 taper pins removed (no obstacles in holes).

___ Check all lower oval pins removed (no obstacles in holes).

___ Check all coax conductors are removed.

EF-1 upper _____	EF-2 upper _____	EF-3 upper _____
OH-1 upper _____	OH-2 upper _____	OH-2 lower _____

EF-1 lower _____ EF-2 lower _____ EF-3 lower _____
EFC upper _____ EFC-lower _____

_____ Assure EF cooling feed through.

_____ Assure all TF leg-cooling nipples are removed.

_____ Assure all ports are clear of flange extended bolt heads, wiring etc.

_____ Assure all vertical legs to cylinder have some clearance.

(May increase friction or weight of cylinder.)

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_____ Assure all bus and the G-10 bus tunnel have clearance.

20. Prepare lifting fixture. Move turnbuckles on lifting fixture to outer most position and remove portable strain gauge to assure cylinder clearance.
21. Hoist cylinder-lifting fixture over center of cylinder lining up datum.
22. Lower fixture, assure vertical port clearance
23. Install 6 each 6 x 6 x 3/4" thick plywood pads on cylinder top.
24. Assure fixture is parallel to top of cylinder by adjusting turnbuckles. Lower lifting fixture onto pads.
25. Install cylinder hardware, 10 aluminum pins with nuts facing down, fitted into oval holes located under 4" holes of lift fixture. Install 10 aluminum plates fitted into lift fixture 4" holes. Install the 1-1/8" lifting rods through the lift plate fixture. Assure a full threaded nut under aluminum pins and above the aluminum pad. Hand tightens nuts only. NOTE: Assure 1 1/8 rods are centered in 4" lifting holes. Move plate if necessary.
26. With hoist hook strain gauge operational, start taking a strain. Cylinder should lift off at approx. 66,000 lbs. Record lift of weight: _____.
NOTE: if cylinder does not lift off at 75,000 lbs., drawbars bolts could be installed with oval pins and up to 5-ton jacks- jacked against floor at four 90-degree locations to breaks away cylinder only. Note the 4 drawbar nuts would have to be unscrewed more than 1/2".
27. Raise cylinder 1/2" and assure key pins are released. Leave pins in cover. Assure oval pins are removed if used for jacking.
28. Check cylinder distance to lower cover in the north-east-south-west positions.
29. Use 2-ton chain fall to correct spacing. If that's not enough, the crane can be repositioned in the direction of the highest sides until equal spacing.
CAUTION: do not lose crane centering. Measure spacing about every foot at first as cylinder is raised. Cable reefing requires moving south. Expect no

real change until near the top.

- 30. Remove TF ground cable at G port?**
- 31. ASSURE lift plate and vertical port clearance at all times until clear.**
- 32. ASSURE EF-4 clearance between bus tunnel G-10 adaptors.**
- 33. Move cylinder to set up on upper cover. Use 8-x 8 x 14” hard wood blocks positioned between draw bar bolts in four locations.**
- 34. Leave the lifting fixture secured to the cylinder for now. Note support-upper section of lifting fixture before removing hoist hook.**

Completed by _____ Date _____
Notes or changes _____

PROCEDURE TITLE: Erection of vessel assembly stand

PROCEDURE: Page # 1

- 1. Clear an area in the southeast corner of the cell. Locate floor layout holes for stand base.**
- 2. Move stand base to setup area and dog in existing hole locations. Assure 3/8" G-10 pads are installed under the three base members: one in center and another about 6" in from end of each member.**
- 3. Assemble the three columns as numbered. Install only the lower inboard bolts and nuts allowing the columns to pivot back gently and touch floor. Leave all required hardware at each column location including lower column support beams (also wrenches).**
- 4. Assure column unistrut side supports to walls and wall brackets are on site; also 10 lolly columns to support wedge plate.**
- 5. Move TF core support column to lower base assuring centered to circular scribed lines and securely bolted.**
- 6. Install the plywood disc in column using through bolts around center of column to sit on.**
- 7. Assemble TF support column top plates or core lifting plates in this order. #1 bottom most plate with 2 1/8" center hole; #2 two halves round G-10 spacer blocks; #3 jacking plate with 8 taped holes around edge. Bolt plates together with spacers in-between with four 3/8 bolts. Using 3/8 eyebolts move-assembled plates to top of column lining up the witness mark. Install four 6" long 3/8 studs through column mounting blocks 90° apart into the jacking plate allowing the plate to be jacked level; Assure nothing is sticking through the plate; #4 install the 1/16 Teflon sheet washer; #5 install upper final plate with leather side up and a new insulating plastic.**
- 8. Level this plate assembly in a crisscross manner with a precision level. Use the 3/4" jacking bolts inside column. NOTE: keep plate at the lowest possible**

level nearly touching on the north side of the column. Assure all $\frac{3}{4}$ " jacking bolts are in contact with plate for proper support of TF core.

9. Assure the three vessel support pins and bolts are at location with wrench.

10. Assure TF leg lower s-steel support blocks are removed at the three locations of the stand columns. Also the OH lower coax support block will have to be removed to be able to lower the wedge plate. The support blocks have two G-10 sidepieces; remove the one on the side of the lowest TF arm. CAUTION: When removing the G-10 caps, protect the TF fingers. The blocks will slide straight out.

Date: _____ Initiated by: _____

Note or changes: _____

PROCEDURE TITLE

TF core & vessel assembly lift from cover to assembly stand.

Procedure: Page # 1

- 1. Install the three TF lifting ring segments on the mounting plate. Assure proper locations. Note do not sit them on the OH coaxes.**
- 2. 0 out reading of 35-ton hoist cable strain gage.**
- 3. Assure lift plate turnbuckles are in the inside lifting eyes and each are equally tightened with plate level. They are no restrictions with the high of the lifting plate because of the new cable strain gage.**
- 4. Assure protective covering is over and around TF upper fingers. 1/16 Teflon or poly. (Don't overlap seam) tape it.**
- 5. Install five 1-7/8 thick hard wood blocks on mounting plates just outside of every other port. This will allow enough clearance above TF rings when lifting plate is lowered.**
- 6. Move lifting plate fixture to top of vessel lining up datum, then lower fixture over ports. Caution going over TF core down to set on the wood blocks.**
- 7. Carefully move onto top of lift plate. Line up TF lifting ring holes using a drift pin. Rings should be able to move. Note lifting plate may have to be lifted to center exactly around TF core for good alignment of rings. It would be best not to remove hoist.**
- 8. Install the TF ringbolts and pins. Note do not force pins; assure ring segments are parallel to bottom of plate as pins are installed. Torque bolts to 200 ft. lbs. (Caution: do not drive dowel pins in over OH coax to far). Assure washers on bolts and some padding around vertical ports to protect heaters from damage from wrenches.**

9. **Install 14 each: 1 1/8" tie rods through lift plate and thread in one turn from bottom of wedge plate. Leave nuts and washers backed off at this time.**
10. **Install 2-ton chain hoist to 35-ton hoist hook using short 2-ton strap. Direct hoist to the southeast corner walls.**
11. **Note: at this time all procedure preparations are to be complete, before big lift to stand.**

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12. **Big lift principles acknowledgement.**
Prior to the rigging for the big lift off the lower cover or off the assembly stand. The TF central column and the lower TF arms are not secured to the vessel or lower wedge plate. A sealing boot between the TF and wedge plate is secured. If the vessel were lifted at this time the TF would stay on the lower cover. Raising the vessel 1/2" would rip the sealing boot attached to the wedge plate and raising another 2" the TF would bottom out on top of the OH support blocks. The big lift is required to lift both the vessel and TF column and arm assembly with out securing one to the other except for hanging the outer half of the lower arms to the wedge plate. The universal lifting plate fixture is used to hang both the vessel, TF and arm assembly.
13. **Remove the three s-steel TF leg lower support blocks under ports B, E, and J. The support block has two G-10 sidepieces; remove the one side of the lowest TF arm. Caution: when removing G-10 screw caps, protect TF fingers. The block will be able to be slid straight out once the G-10 side is removed.**
14. **At the same location B, E, and J, remove the covering to clear the lowest port gussets for the vessel to stand 3" support pins.**
15. **Remove the s-steel TF leg lower support blocks between ports A and B, also between F and G, for ease of removal of the OH coax conductor and LN2 lines. These blocks can be removed without removing the G-10 sides by lifting them straight up.**
16. **Install the lower TF arm temporary support brackets. Use correct brackets if a leg support block is removed on one side of arm use a one ear short bracket, left or right. Assure all 20 arms are supported.**
17. **Inspect lower vertical ports under cover. Assure all wire bundles do not bulge out beyond port flanges and have tight Mylar wrapping. One person is to stand by and watch for interference when vessel is being lifted.**
18. **Install 1/2" x 6" x 6' steel straight edge for dial indicators clamped to vertical ports. Set up indicator to read TF to vessel vertical movement. Install a 10' length of unistrut along side of TF core fingers extending evenly between the**

- edges of lifting plate. Block up each end of the unistrut with a lead brick at the 1 1/8 o.d. lifting rods. Install 2 lead bricks leaning on unistrut at each end to hold it from any movement. Install dial indicator at center near fingers from unistrut to lifting plate to measure plate deflection. Assure you can read both indicators from a ladder.
19. Raise lifting plate slowly assuring TF lifting ring centers properly on TF. Jog hoist, lifting to 14,000 lbs additional weight indicated on strain gauge. Record lift plate deflection on travel indicator _____. .025 to .035" is about right. Also set other indicator for TF vertical movement to 0". A note to remember the recorded deflected in the lift plate is equal to 14,000 lbs, load that is about the right amount of lift to keep the TF column and arm assembly up in place with little movement during the big lift.
 20. Lower hoist to approximately 5,000 lbs. Hand tighten 1-1/8" nuts until rods are tensioned near equally. Have wrench available.
 21. Jog hoist using short increments, watching plate deflection increase, also TF to vessel movement. If TF movement drops more than .030" before lift off readjust lift plate for 14,000 lb deflection by releasing the 1-1/8" nuts some watching deflection increase. When deflection reading nears total of step #19, vessel is near lift off. (Caution: do not exceed plate deflection reading in step #19 by more than 20%). Vessel should lift off at about 56,000 lbs.
 22. If plate deflection is max and vessel didn't lift off, Try step 23. If no success then lower hoist to about .010" on deflection indicator and tighten the rod nuts equally judging how much deflection decrease is needed or just reduce it .005" and try again.
 23. Using a crow bar between cover and wedge plate, oscillate load to assure no hang-ups. Avoid scuffing up plates.
 24. Jog up assembly about 1/8". Caution: assure TF lower G-10 insulator pan extension between cover and wedge plate doesn't rise with wedge plate. Using a flat piece of 1/4" stock about 3' long with a knife edge at the end to pry the insulator away from the wedge plate, again caution not to over stress the G-10.
 25. Continue jogging up assembly assuring G-10 insulator stays down. Once it is down and clear, raise assembly for the 5" OD G-10 ring extension at center of core to clear lower cover. See if it gets bumped when TF arms become clear and vessel could shift at some point. The lower vertical ports should help keep centered.

26. Continue rising at low speed, watching strain gauge for load increase; 200 lbs should be safe. Assure vertical port clearance under cover; get okay from observer below. Adjust for hoist spooling.
27. Check level of assembly, measure from cover to wedge plate. Adjust level at this time to less than 1/16". Use a 2-ton chain fall for correction.
28. Raise vessel to hoist auto stop. Before moving to stand, inspect G-10 lower plan and the 5" OD ring extension for any damage.
29. Move assembly to center over stand. Assure all personnel are clear of load. Lower assembly and rotate vessel, A-port to near south wall for stand column alignment.
30. Lower assembly to about 1/16" between TF core bottom and stand column. Raise the three vessel support columns and complete the bolting, keeping the columns vertically level. Tighten bolts to about 200 lbs.
31. Install the three 3" support pins to vessel, screwing bolts in all the way but have the pins adjustable.
Rotate vessel to center the stand support pins between port gussets, compromise centers of the three columns.
Rotate pins to the bottom of the support pad slots and tighten to about 200 lbs. Assure pins do not roll while tightening, changing level.

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32. Jog the assembly down; release approximately 25,000 lbs of the load onto stand columns. Leaving about 32,000 remaining on strain gauge.
33. Adjust plates of TF core stand by jacking up on the 3/4" bolts inside the stand column. Use a torque wrench and start with a 30 ft. screwing up the eight jacking bolts. Assure plates are level with bottom of core (use feeler). Also assure the eight 3/8" plate bolts are loose.
34. Continue rising plates evenly, releasing about 200 to 300 lbs. load from crane. Check strain gauge. Note: may have to increase torque to raise core.
35. Assure two of the stand columns are secured to the walls with unistrut.
36. Install 10 lolley columns under wedge plate right in front of each vertical port, very snug. One person should judge even torque on the 10 columns, raise them to release about 500 lbs. load from crane, check strain gauge.
37. Release vessel assembly load to 200 lbs. and assure wood wedge shims are between lift plate and vessel.

- 38. Remove the three TF lifting ring segment bolts and pins to storage. Release vessel load to 0, and remove the fourteen 1 1/8" rods and nuts to storage. Assure rod threads are protected.**
- 39. Remove lifting plate fixture to storage on top of cylinder.**
- 40. Remove TF lifting ring segments to storage. Inspect rings and TF bearing area for damage or scuffing.**

Date: _____ **Initiated by:** _____
Note or change: _____

PROCEDURE TITLE: TF Core assembly removal

With upper and lower wedge plate removed, OH upper and lower coaxial conductors and TF core LN2 lines removed.

- 1. Review of sequence of disassembly.**
- 2. Remove two small upper OH blocks and remove springs.**
- 3. Install the same upper OH blocks and remove springs.**
- 4. Remove two small lower blocks to storage.**
- 5. Install OH support plates with wood blocking in place of small lower blocks.**
- 6. Remove two large upper blocks to storage.**
- 7. Remove two large lower blocks to storage.**
- 8. Install OH support wood blocking and steel banding in place of large lower OH blocks.**

9. Remove OH temporary support plates and wood to storage.
10. Install TF assembly lifting fixture (5" shaft type).
11. Remove last two upper OH support blocks to storage.
12. Remove TF assembly to storage.

Check off each detail step.

1. Prepare removal of OH support blocks.
 - A. Install 10/32 x 2" plastic screws into spring assemblies of all upper and lower blocks.
 - B. Using G-10 tapered wedge blocking installed between center of outer surface of OH support block and outer wall of vessel at EF-1 position, wedge these blocks in firmly to keep the OH support block from tilting back when removing. Caution: beware of heaters with tapered blocking. Use these tapered blocks on all 8-support block removals.
 - C. Remove OH support block remaining bolts. Caution: do not unscrew bolts unevenly. 1 to 1 ½ turns on each bolt, keeping OH blocks level and sharing bolt loading.
2. Remove the two upper small OH blocks setting them on wood at location and remove springs, keeping them in stacks for storage. Caution: use leather under OH block to protect heaters.
3. Reinstall OH upper blocks using eight equally spaced bolts.
4. Remove two small lower blocks to storage. Caution: protect TF fingers completely with leather. Have two men remove block. Repeat step #1.
5. Install OH temporary support plates. Cut wood blocking to assume OH load when plates are secured in place of small lower blocks.
6. Remove large upper blocks to storage. Repeat step #1.
7. Remove large lower blocks to storage. Repeat step #1. Again, have two men remove block and protect fingers.
8. Install OH fitted wood support blocks. Two long and two short in place of each large support blocks. Use ¾" wide steel banding wire and two separate raps of three bands thick. Use band clamps with screws to hold in place and as extra security. Also use a reverse type crimp clamp. Assure bands are tight but not so tight that they may snap from over tension. Caution: as the

bands are being installed, assure OH boot material doesn't get pinched or damaged. May need leather under bands.

9. Remove OH temporary support plates and wood to storage. Caution: release plates slowly assuring OH doesn't move in relation to TF.
10. Install TF assembly lifting fixture. Assemble 5" lifting shaft-steeped end down with 2" swivel eye at top. Lift shaft with large hoist and strain gauge. Assure leather is wrapped around the 5" shaft at step; to protect TF bore from being scraped. Also at top of TF is a G-10 insulator which reduces the TF-6" bore eye. Tape on some leather to protect this G-10 insulator. Lower shaft into TF bore until about 6" from bottom. Have a person with a tape measure extended up through the 2" hole at the bottom lifting plate. Lower hoist slowly assuring shaft doesn't get hung up going through lower insulator. Assure shaft touches bottom-lifting plate. Install 2" bolt, hand snug.
11. Remove last two small upper support blocks. Wedge blocking not required (no spring tension). Remove blocks to storage.
12. Remove TF assembly to storage.
 - A. Assure lower TF fingers are protected fully with Teflon wrap 1/16 in (in storage).
 - B. Prepare storage area with 4" thick plywood spacer ring for TF core and fixture to sit on.
 - C. Remove the eight 3/8 bolts from inside stand column. They hold the TF core fixture bottom plate to column.
 - D. Take strain on hoist, lift off at 13,000 lbs. Assure centering of 5" shaft in core and core in vessel.
 - E. Raise TF guiding from top keeping centered by hand.
 - F. Move to storage in C-MOD cylinder in center of wedge plate or move to lower cover using 4" thick plywood spacer ring and four cable come longs to secure top of 5" shaft to igloo blocks.

Date: _____ Initiated by: _____
Note or changes: _____

