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| Traveler Title | CRYOMODULE TUNNEL INSTALLATION |
| Traveler Abstract | This traveler details the cryomodule tunnel installation process, starting from the test lab and ending with the cryomodule installed in the designated north or south linac zone |
| Traveler ID | C100R-INSTA-CM |
| Traveler Revision  | R1 |
| Traveler Author | F. Humphry |
| Traveler Date | 1-Apr-22 |
| NCR Informative Emails | areilly,fischer,kdavis |
| NCR Dispositioners | drury,fhumphry |
| D3 Emails | areilly,fischer,kdavis,drury,fhumphry |
| Approval Names | F. Humphry | J. Fischer | M. Drury | A Reilly |
| Approval Signatures |  |  |  |  |
| Approval Dates |  |  |  |  |
| Approval Title | Author | Reviewer | SME/WCLead | Project Manager |

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| References | List and Hyperlink all documents related to this traveler. This includes, but is not limited to: safety (THAs, SOPs, etc), drawings, procedures, and facility related documents. |
| [Reference Title](https://mis.jlab.org/mis/apps/mis_forms/operational_safety_procedure_form.cfm?entry_id=88362) | Standard Lifting Safety Doc? | Standard CM Lifting Safety Doc? | Standard CM Installation procedure? |  |
| Ref to operations safety form above; doesn't work |  |  |  |  |

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| Revision Note |  |
| R1 | Initial release of this Traveler. |

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| Step No. | Instructions | Data Input |
| **A** | **Day before transporting cryomodule to accelerator** |
| **Coordinate with Radiation Control Group**. All refurbished cryomodule are typically radioactive/activated.Identify the Ram Tag Number and associated dose rates.Identify all rope boundaries prior to the move including the North & South accesses building off-loading area. | [[RadConControlTech]] <<USERNAME>>[[RadConControlDate]] <<TIMESTAMP>>[[RAMTagNumber]] <<TEXT>>[[DoseRates]] <<TEXT>>[[RadConComments]] <<COMMENT>> |
| B | Cryomodule being installed into the CEBAF Tunnel.Location in Tunnel. | [[CMSN]] <<CMSN>>[[TunnelLocation]] <<TEXT>> |
| **Loading Cryomodule onto flatbed transport trailer** |
| 0 | Date of Move and Responsible Person | [[ResponsiblePerson]] <<SRFCMP>>[[StartDateTime]] <<TIMESTAMP>> |
| 1 | Back the flatbed transport trailer into the test lab North rollup door access area. Be sure the flatbed trailer is far enough into the loading zone to allow for overhead crane access. | [[FlatbedBackup]] <<USERNAME>>[[FlatbedBackupDate]] <<TIMESTAMP>> |
| 2 | Retrieve the cryomodule spreader bar located above the CMTF entrance. Lower and align the beam over the cryomodule being transported to the linac. | [[SpreaderTech]] <<USERNAME>>[[SpreaderDate]] <<TIMESTAMP>> |
| 3 | **Note**: Return end can always goes towards the cab of the transport truck and the beamline ion pump is always at the back of the trailer. | [[RECTransportTech]] <<USERNAME>>[[RECTransportDAte]] <<TIMESTAMP>> |
| 4 | Rig the load using **lift plan specified** shackles & lifting slings. Use the *RED C100* or *YELLOW C50* spreader bar lifting eye location appropriately. | [[LiftTech]] <<USERNAME>>[[LiftDate]] <<TIMESTAMP>> |
| 5 | **Note**: The return end can side of the cryomodule is heavier than the supply end. Position the slings accordingly taking into account for the additional return end can weight. | [[RECSlingTech]] <<USERNAME>>[[RECSlingDate]] <<TIMESTAMP>> |
| 6 | Hoist up to put tension on the slings. Walk around the module checking for sling interferences / twisted slings. | [[WalkaroundTech]] <<USERNAME>>[[WalkaroundDate]] <<TIMESTAMP>> |
| 7 | Crane/Hoist cryomodule up off the floor. Reposition/shift slings appropriately achieving a level cryomodule. | [[HoistTech]] <<USERNAME>>[[HoistDate]] <<TIMESTAMP>> |
| 8 | Disconnect any ion pump power supplies at this time. **Note:** log pressure before turning off. | [[DisconnectTech]] <<USERNAME>>[[DisconnectDate]] <<TIMESTAMP>>[[PressureReading]] <<SCINOT>> |
| 9 (dupp?) | **Note**: Return end can always goes towards the cab of the transport truck and the beamline ion pump is always at the back of the trailer. | [[RECCabTech]] <<USERNAME>>[[RECCabDate]] <<TIMESTAMP>>  |
| 10 | Lower the cryomodule onto the transport truck trailer. Align the cryomodule over the transport truck saddles. The crane operator should be standing on the floor front side between the two center saddles for the best vantage point during the alignment phase. The crane operator should reposition himself to the back of the trailers beamline ion pump end when finally lower the cryomodule into the saddles.**Note**: Pay close attention to possible ion pump interference when lowering the cryomodule into the saddles.**Note:** Return saddle outer feet may catch beam when lowering into saddles.**Note:** C100 style cryomodule. Use 4&5 waveguides as a centering reference.**Note:** C50 style cryomodule. Use bridging ring flanges as a reference. | [[LowerCryoTech]] <<USERNAME>>[[LowerCryoTech]] <<TIMESTAMP>> |
| 11 | Unhook sling shackles and put the spreader bar on the floor or put it back over the test cave storage area. | [[UnhookTech]] <<USERNAME>>[[UnhookDate]] <<TIMESTAMP>>[[UnhookComment]] <<COMMENT>> |
| 12 | Tie the cryomodule down utilizing the transport trailer tie down straps.  | [[TieDownTech]] <<USERNAME>>[[TiedownDate]] <<TIMESTAMP>> |
| 13 | Transport the cryomodule to either the North or South access building to be offloaded. | [[TransportCryoTech]] <<USERNAME>>[[TransportCryoDate]] <<TIMESTAMP>> |

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| Step No. | Instructions (Should there be more instructions here?) | Data Input |
| **Unloading Cryomodule from flatbed transport trailer** |
| 14 | Rig the cryomodule using the two dedicated lifting slings at designated lifting points **specified in lift plan.** | [[CryoRigTech]] <<USERNAME>>[[CryoRigDate]] <<TIMESTAMP>> |
| 15 | Lift the cryomodule high enough to allow the trailer to pull out of the building. | [[CryoLiftTech]] <<USERNAME>>[[CryoLiftDate]] <<TIMESTAMP>> |
| 16 | Lower the cryomodule down close to floor allowing for the orange transport wheel installation.Install wheels at appropriate TOW / TRAIL end of the cryomodule. **Note:** The 1 1/2" x 1 1/2" holed ears attached to the wheel assemblies always point outboard. | [[CryoLowerTech]] <<USERNAME>>[[CryoLowerDate]] <<TIMESTAMP>> |

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| Step No. | Instructions | Data Input |
| **Moving Cryomodule into Tunnel** |
| 17 | Lower the cryomodule into the tunnel.Turn wheels assemblies in the correct direction before final touchdown on floor. | [[TunnelLowerTech]] <<USERNAME>>[[TunnelLowerDate]] <<TIMESTAMP>> |
| 18 | Unhook slings from trolley 1 and 2.  | [[UnhookTech]] <<USERNAME>>[[UnhookDate]] <<TIMESTAMP>> |
| 19 | Push the cryomodule into the stub area making the transition into the linac area. | [[PushStubTech]] <<USERNAME>>[[PushStubDate]] <<TIMESTAMP>> |
| 20 | Install towing and trailing hardware.  | [[InstallTowTech]] <<USERNAME>>[[InstallTowDate]] <<TIMESTAMP>> |
| 21 | Attach tow hook to electric cart. Designate trailing bar rear steering person as well as lead person up front that will be directly communicating with the driver. | [[CartTech]] <<USERNAME>>[[CartComment]] <<TIMESTAMP>>> |
| 22 | Pull cryomodule to designated zone. Have people / spotters at each end of the cryomodule making sure the cryomodule doesn’t come in contact with something | [[PullTech]] <<USERNAME>>[[PullDate]] <<TIMESTAMP>>[[PullComment]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| **Positioning Cryomodule in Tunnel** |
| 23 | **Module arrives at designated location**. Disconnect and remove all the towing and trailing hardware. | [[ModuleArriveTech1]] <<USERNAME>>[[ModuleArriveDate1]] <<TIMESTAMP>>[[ModuleArriveTech2]] <<USERNAME>>[[ModuleArriveDate2]] <<TIMESTAMP>> |
| 24 | Rotate the eight installation wheel 90 degree to allow the module to move easily in the zone. | [[RotateTech]] <<USERNAME>>[[RotateDate]] <<TIMESTAMP>> |
| 25 | Run up the upstream and downstream saddle feet to prevent contact with the zone floor plates. | [[RunTech]] <<USERNAME>>[[RunDate]] <<TIMESTAMP>> |
| 26 | Push the module into place over the floor plates. Typically need 3 to 4 people at each end of the module. | [[PushTech]] <<USERNAME>>[[PushDate]] <<TIMESTAMP>> |
| 27 | **Remove installation wheels.** Remove the downstream end first. The larger outer saddle feet act as outriggers **(stability)** when you’re removing the upstream wheels**.**  | [[RemoveTech]] <<USERNAME>>[[RemoveDate]] <<TIMESTAMP>> |
| 28 | **Upstream/downstream location**. Center the cryomodule in the zone by using the adjacent cryomodules as a reference. Use the floor jack & porta power to adjust the upstream/downstream position. Alignment group would like to see it within a 1/4" | [[UpDownTech]] <<USERNAME>>[[UpDownDate]] <<TIMESTAMP>> |
| 29 | **Cryomodule height/plumb in zone**. Adjust saddle feet accordingly to achieve the correct height. Position the floor jack under the end can bridging ring flange. **Note!** Adjust the upstream end first. The downstream end saddle blue feet act as outriggers keeping the module stable when lifting the upstream. **The cryomodule height is 27 1/4" BL centerline to floor.** | [[CryoHeightTech]] <<USERNAME>>[[CryoHeightDate]] <<TIMESTAMP>> |
| 30 | CM installation is complete | [[SignoffPerson]] <<SRFCMP>>[[CompleteDateTime]] <<TIMESTAMP>> |