

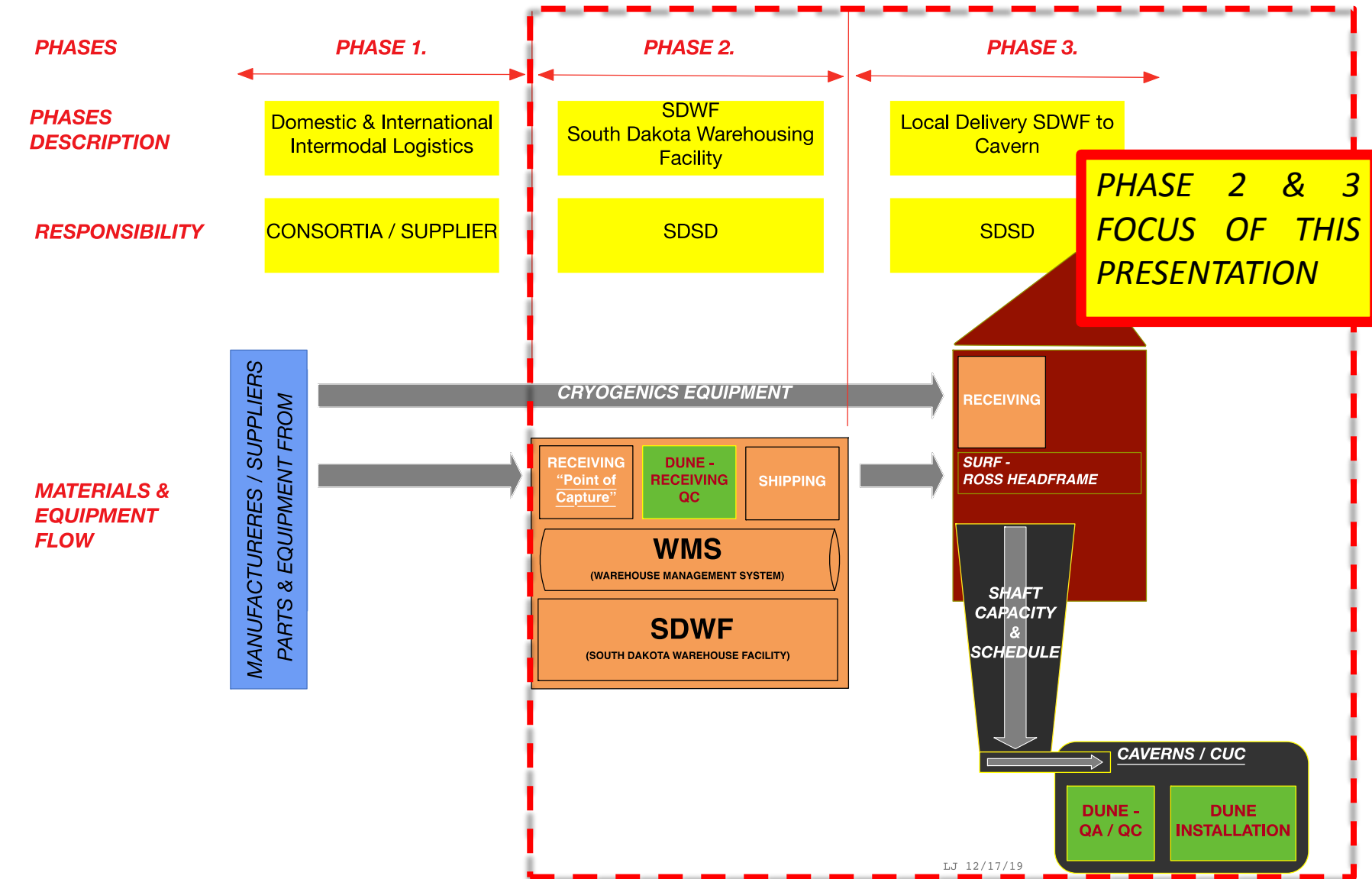
LBNF/DUNE Installation Workshop, 2-4 February 2020

Logistics Planning Overview

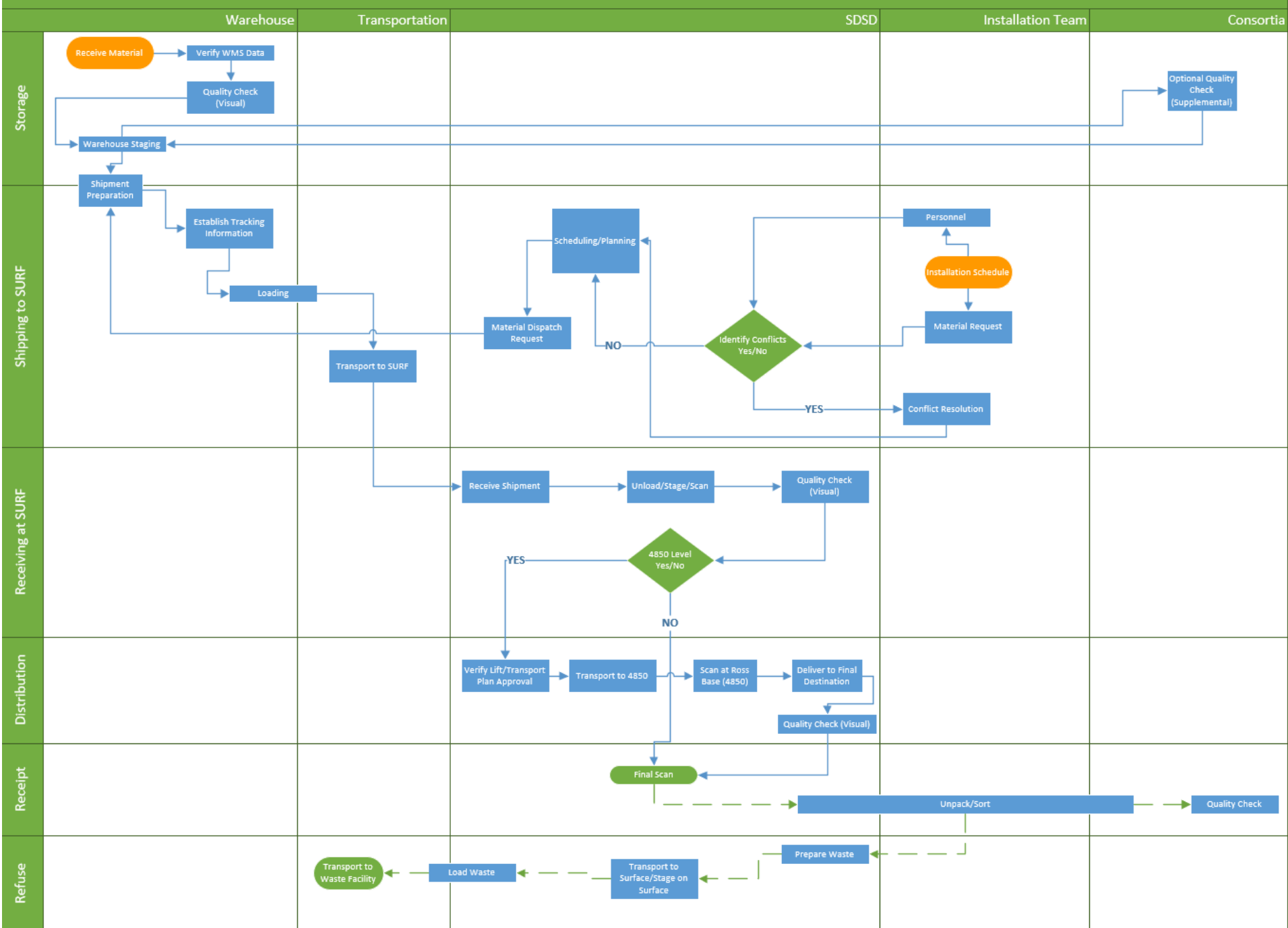
Ladia Jakubec, Joe Pygott, and Patrick Weber
SDSD

Kartause Ittingen, February 2, 2020

Project Logistics Phases & Responsibilities



LBNE/DUNE Logistics Process



Storage



- General

- Warehouse in SD will be primary staging area for all FS activities.
- A warehouse management system (WMS) will be required by the RFP.
- This system will be informed by load list information provided by members of the consortia or consortia.
- The smallest unit of the database will be the packages – WMS will not track individual parts.

- Quality

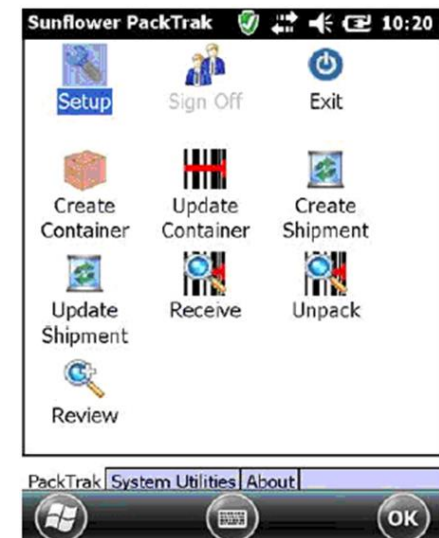
- The warehouse will provide a basic visual check of the packages for obvious visual defects.
- Supplemental quality checks need to be defined – we will need to include information about access for these in the warehouse RFP.
 - Physical modifications to the facility will likely not be possible.
 - Cleanroom will not be available.

Storage

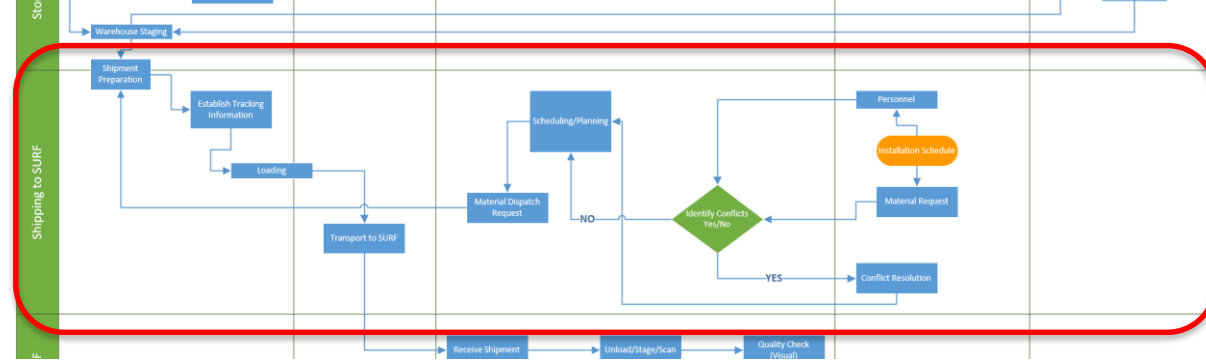


- Utilize Fermilab's existing inventory control software – [Sunflower](#)
 - Cost effective
 - Use existing expertise & support
- Track shipments/containers/assets
- Scanners will be used for Receipt and Inventory Management
- Sunflower will be populated with data from Warehouse Management System
- SURF
 - Ross Shaft surface receipt (scan): SDSD
 - Ross Shaft 4850 receipt (scan): SDSD
 - Cavern or CUC receipt (scan): SDSD / Integration Team
- Sunflower data will be exported in a format that other databases can access.

The screenshot shows the Sunflower software interface. The top section is 'Shipment Summary' with fields for Shipment Number, Transfer Type, User Fields, Shipment Status, Internal Tracking #, and Identifier. Below this are 'From Information' and 'To Information' sections for Organization, Location, and Contact Name. The 'Container Details' section includes Container Number, Status, Created By, Received By, and External Tracking #. The 'Assets' section has a table with columns for Identifier, Describes*, and Status, with checkboxes for Packed By, Unpacked By, and Removed By.



Shipping to SURF



- This will be the most critical phase of the far site logistics chain.
- The installation schedule will be the primary input into the entire chain and will drive underground personnel availability and material movement requests from the warehouse.
- After these requests are received, they will be evaluated for conflicts.
- Any conflicts will be resolved by installation management.
- Only when material is scheduled for delivery underground will it be sent from the warehouse to SURF.
- The orders will be prepared by the warehouse and transported by the trucking contractors to SURF.
- Movement of material and personnel down the shaft is dictated by the assumed transport times.
- The warehouse management system will export data to the logistics database (Sunflower).

Action Item: 81933 *Rigging - get feedback from CERN and others to get a feel for the real times of rigging and delivery down shaft for large items, including rigging test*

- Basic rigging and transportation times as discussed with SDSTA:

| <u>Head - Frame</u> | <u>Lift Type</u> | Load Ross Frame | Unload 4850 | Load 4850 | Unload Ross Frame | Total Round- trip Loading | Shaft Time 1200 ft/min 600 ft/min 500 ft/min | | |
|-------------------------|------------------|-----------------------|----------------|--------------|-------------------------|------------------------------------|---|------|------------------------------|
| | | Min. | Min. | Min. | Min. | Min. | Down | Up | TTL Round trip Time |
| Ross Cage | Personnel Lift | 5.0 | 5.0 | 5.0 | 5.0 | 20.0 | 5.36 | 5.36 | 30.71 |
| Ross Cage | In-Cage Lift | 20.0 | 20.0 | 5.0 | 5.0 | 50.0 | 5.36 | 5.36 | 60.71 |
| Ross Cage | Over-High Lift | 30.0 | 30.0 | 5.0 | 5.0 | 70.0 | 5.36 | 5.36 | 80.71 |
| Ross Cage | Under Cage | 30.0 | 30.0 | 5.0 | 5.0 | 70.0 | 11.79 | 5.36 | 87.15 |
| Ross Skip | Suspended | 30.0 | 30.0 | 0.0 | 0.0 | 60.0 | 9.95 | 5.36 | 75.31 |

Action Items: 81901 & 81913

Evaluate shaft usage w/ CF + steel; floor first / SDSD - identify which items are slung loads & need guide shoes

- Evaluated LBNF Warm and Cold Structure Lists as to rigging requirements against the cage and shaft design parameters.
- Developed time requirements based on preliminary basic shaft operation data.
- The DUNE Lists analysis followed the same methodology.
- This is based on the list from each consortia and all integration activities.
- The Cryogenic LAr and NH2 systems are based on preliminary estimates.
- Specifically derived time requirements for the updated Post CF logistics plan.

Required Transportation Time-Table by Materials Group:

| Delivery Type: | | | Ross Cage & Conventional Skip | | | | |
|------------------------------|----------------------------|------|-------------------------------|-----------|--------|--------|--------|
| Description | | | TYPE OF LIFT | | | | Total |
| | | | I/CAGE | I/CAGE OH | U/CAGE | U/SKIP | |
| Warm Structure | Equipment | Hrs. | 27.3 | 0.0 | 0.0 | 3.8 | 31.1 |
| | Floor | Hrs. | 38.5 | 192.4 | 0.0 | 54.0 | 284.8 |
| | Long walls | Hrs. | 34.4 | 153.4 | 0.0 | 107.9 | 295.7 |
| | Roof | Hrs. | 22.3 | 39.0 | 0.0 | 107.9 | 169.2 |
| | Short wall with opening | Hrs. | 7.1 | 39.0 | 0.0 | 12.6 | 58.6 |
| | Short wall without opening | Hrs. | 7.1 | 36.3 | 0.0 | 12.6 | 56.0 |
| | Grand Total | Hrs. | 136.6 | 460.1 | 0.0 | 298.7 | 895.4 |
| Cold Structure ¹⁾ | | Hrs. | 500.9 | 0.0 | 0.0 | 0.0 | 500.9 |
| APA & Accessories | | Hrs. | 24.3 | 0.0 | 108.9 | 20.1 | 153.3 |
| TPC Electronics | | Hrs. | 61.2 | 0.0 | 0.0 | 0.0 | 61.2 |
| Photon Detector | | Hrs. | 25.3 | 0.0 | 0.0 | 0.0 | 25.3 |
| DAQ | | Hrs. | 33.4 | 0.0 | 0.0 | 0.0 | 33.4 |
| High Voltage | | Hrs. | 24.6 | 33.6 | 1.5 | 0.0 | 59.7 |
| DUNE OTHER | | Hrs. | 891.0 | 0.0 | 383.4 | 676.5 | 1950.9 |
| Lar & NH2 SYSTEMS | | Hrs. | 60.7 | 0.0 | 90.1 | 8.8 | 159.6 |
| Total | | Hrs. | 1697.3 | 493.7 | 493.8 | 995.3 | 3680.1 |

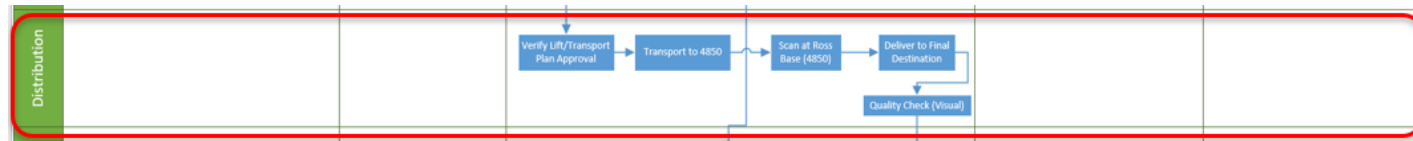
Receiving at SURF



- Items that arrive at SURF will be scanned and then their location will be updated in the logistics database (Sunflower).
- Items will be given a visual inspection to check for damage.
- Damaged boxes will undergo further inspection and if necessary, be returned to the warehouse.
- A small amount of space in headframe will be used to stage items for movement underground.



Distribution



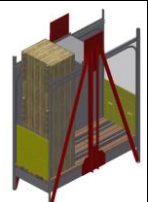
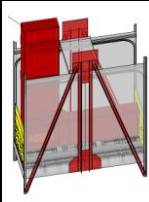
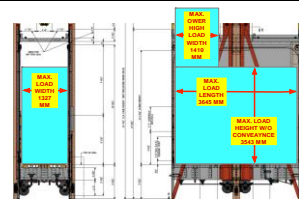
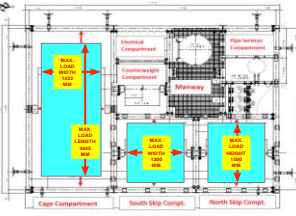
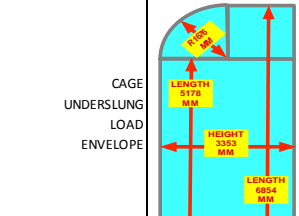
- Verify Lift/Transport Plans (SDSD)
 - Should be developed and approved well before this point
- Transport to 4850
- Material will receive Scan at Ross base (SDSD)
- Delivery to final destination (SDSD)
 - North Cavern
 - South Cavern
 - CUC
- Visual Quality Check (SDSD)



Action Item: 81912 *SDSD - develop template for information needed for material handling in Ross Headframe, through shaft, through drifts to cavern*

- The Check Sheet must be completed for any loads that require rigging. This checklist must be received by the time the item arrives at the SDWF. SDSD and ESH will review to create a specific lifting plan.

| Special Lift Check Sheet | | | | |
|---|----|--|------|-----|
| Date: | | | | |
| Short Description:* | | | | |
| Size: | | | | |
| Length | m | | Inch | 0.0 |
| Width | m | | Inch | 0.0 |
| Height | m | | Inch | 0.0 |
| Weight | mt | | lbs. | 0.0 |
| * Please attach sketch/drawing indicating the Center of Gravity (COG), lifting and/or slinging points as well as any other pertinent details. | | | | |

| ROSS SHAFT LOAD ENVELOPES | | | |
|---|---|--|--------|
| ROSS CAGE LOAD ENVELOPE: | | | |
| | HEIGHT | WIDTH | LENGTH |
| | | MM | |
| MAX. LOAD ENVELOPE | 3543 | 1327 | 3645 |
| MAX. ROOF OPENING FOR OVER-HIGH LOADS | | 1327 | 1410 |
|  |  |  | |
| OVER-HIGH LOAD | L-SHAPE LOAD | CAGE LOAD ENVELOPE | |
| ROSS CAGE AND SKIP COMPARTMENT UNDERSLUNG LOAD ENVELOPES: | | | |
| | HEIGHT | WIDTH | LENGTH |
| | | MM | |
| ROSS CAGE | | | |
| MAX. LOAD ENVELOPE | 3353 | 1422 | 6854 |
| | TOP LEFT CORNER RADIUS | | 1676 |
| | HEIGHT | WIDTH | LENGTH |
| | | MM | |
| ROSS SKIP | | | |
| MAX. LOAD ENVELOPE | 1500 | 1200 | 15000 |
|  | |  | |
| SHAFT LOAD ENVELOPE VIEW | | CAGE UNDERSLUNG LOAD ENVELOPE | |
| <p>CAVEAT:</p> <p>1) FOR ALL UNDERSLUNG OR OVER-HIGH CAGE LOADS PLEASE SUBMIT A DRAWING WITH LIFTING POINTS AND CENTER OF GRAVITY TO DETERMINE FEASIBILITY.</p> <p>2) FOR LOADS OUTSIDE OF THE ENVELOPES OR REQUIRING SPECIAL HANDLING OR FOR ANY OTHER INQUIRIES REGARDING SHAFT MOVEMENTS OR OTHER LOGISTICS ISSUES PLEASE CONTACT: LADIA JAKUBEC / LADIAJAKUBEC@FNAL.GOV / +1 (720) 940-0995</p> | | | |

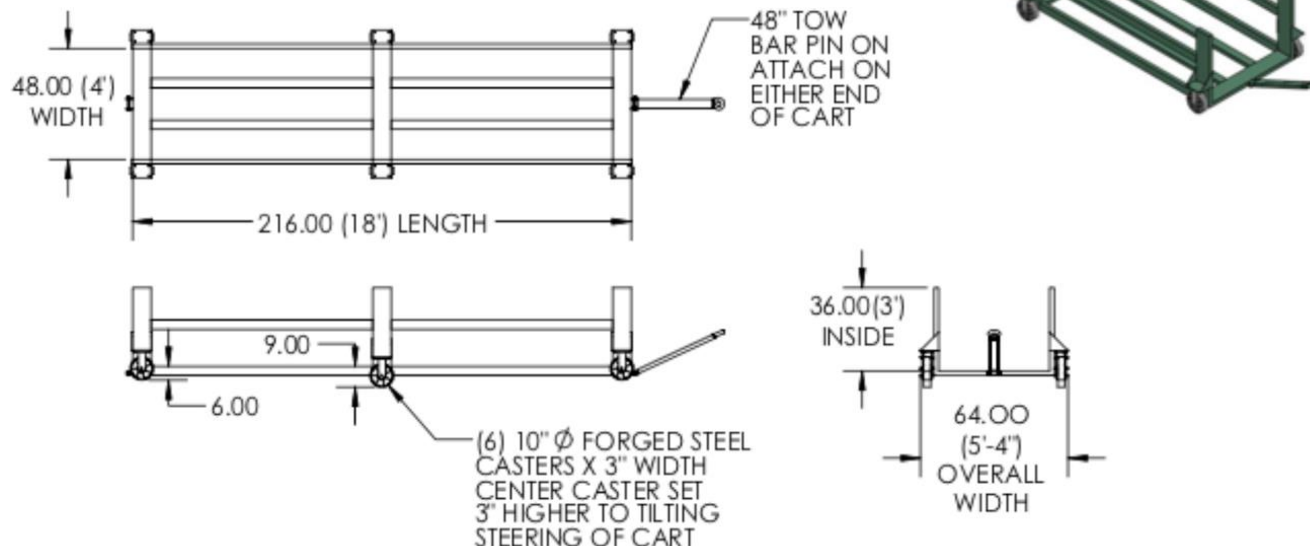
Action Item: 81914

SDSD - establish the specifications of the transport cart based on largest objects (L cryostat pieces, APAs)

Design Specifications:

- Weight Max: 8 mt
- Material Height Max: 5.498 m
- Floor Height Cart Max: 0.202 m (resulting in 0.19 m space under ceiling)
- Drift floor incline: 1.98 deg
- Maneuverability: 360 degrees pivot

TRANSPORT CART CONCEPT
CAPACITY: 8 TONS
WELDED STRUCTURAL TUBING
PAINT: MACHINE GREEN

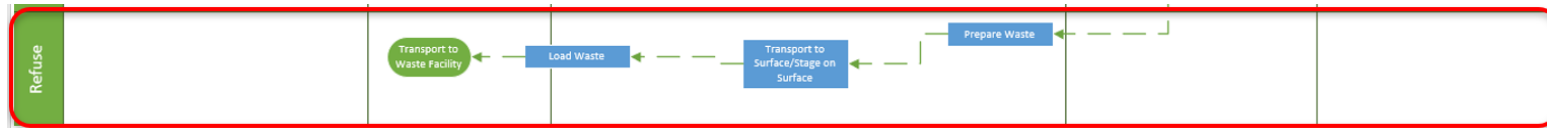


Receipt



- Material will receive final scan by integration personnel at point of final delivery
 - Surface
 - 4850
 - North Cavern
 - South Cavern
 - CUC
- Unpack and Sort Material (SDSD, Installation Team, Consortia)
 - Will need to identify staging areas for certain materials
- Detailed quality checks (Consortia)

Refuse



- Types of Packaging

- Wood
- Cardboard
- Plastic
- Other?



- Prepare waste at 4850 (SDSD)
- Shaft scheduling (SDSD)
 - Cage times account for refuse loading at the 4850 and unloading at the headframe.
- Utilize shipping transport to haul waste away from SURF (SDSD)

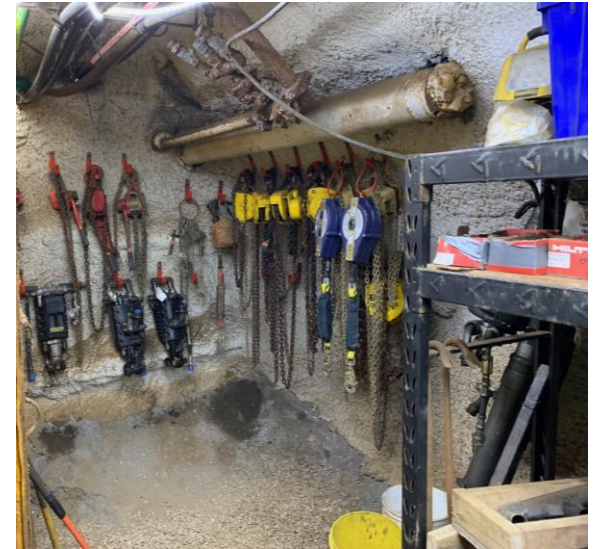


SDWF & SURF QA/QC Functions

- South Dakota Warehouse Facility
 - Warehouse Personnel – visual check for obvious packaging damages only
 - Consortia QA/QC specifications need to be advised as soon as possible to be incorporated into RFP:
 - Frequency
 - Personnel number
 - Space and Equipment requirement
- SURF Headframe Surface
 - SDSTA/Rigging Personnel – visual check for damages (return to SDWF for investigation/resolution)
- Caverns & CUC
 - SDSD visual inspection
 - Consortia Personnel – according to consortia needs

Other Logistical Items

- Movement of equipment
 - Forklifts
 - Carts
- Placement of Accommodations
 - Toilets
 - Handwashing Stations
 - Tables/Chairs (break area)
 - Storage
 - Tools
 - Personal Belongings
 - Temp Office/Computing
- Material Staging



Action Item: 81929

Clarify incoterms. Clarify customs broker payment / arrangement with freight forwarder, FNAL. Who pays customs broker? Informational summary about freight forwarder role

INCOTERMS 2020: Selection based on current delivery practice to FNAL for foreign contributions.

DAP

Delivered at Place

(Insert named place of destination)*

Incoterms® 2020



Import Fees borne by FNAL based on above Incoterms

Applicable to Ocean Freight Only:

- US Import Fees:
 - Freight Forwarder/Customs Broker Charges
 - Importer Security Filing (ISF) \$25
 - Applicable per shipment (Bill of Lading)
 - Applicable at US ports of entry only
 - Customs Brokerage \$125
 - Document Transfer Fee ~\$95 (from outside freight forwarder)
 - Wharfage (Gulf ports only)
 - Destination Terminal Handling Charge (DTHC)
 - Chassis Fee \$35 – 40/container per day
 - Airport Terminal Fee \$105 (air freight only) (destination airport)
- Customs Charges:
 - Merchandise processing fee lesser of \$500 or 0.3464% imported value
 - Duties (if applicable, depending on HTS code)
 - Harbor maintenance 0.125% (only if first port of calling US)

Shipping manual is still in progress.

All shipments must be coordinated with Fermilab to have import fees paid.