

# LBNF/DUNE-US

*Near Detector I&I - Assessment meeting at FNAL*

## **I&I Management and Coordination**

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# Outline

- TBC
- Summary

# ND I&I Management and Coordination

Resources in I&I WBS	Management and Coordination	
	Hours	FTE
Detector Installation Coordinator (FNAL)	5,304	1.00
Detector Installation Engineer (FNAL)	4,862	0.92
Detector Manufacturing Engineer (FNAL)	3,599	0.68
Electrical Engineering (FNAL)	3,122	0.59
Detector Installation Designer (LBNL and/or FNAL)	2,652	0.50
L2/CAM (LBNL and/or FNAL)	2,652	0.50
<b>Total</b>	<b>22,191</b>	<b>4.18</b>

# Example of WBS definitions

## I&I Support for Cryostat (131.ND.09)

**131.ND.09.01:** This WBS element supports project **management and coordination** of the near detector I&I activities.

**131.ND.09.02:** this WBS area covers common **infrastructure and installation equipment** that will be shared between multiple sub-system

**131.ND.09.03:** This WBS provides the **installation labor** to move the ND-LAr Cryostat components.

This includes forklifts required to unload Cryostat elements from delivery trucks and manipulate them inside and potentially outside of the surface building; it includes all required **rigging labor** to perform forklifting operations according to FESHM requirements.

This WBS also includes the **operations of the 15T surface crane** to move light components (cold membrane parts, mezzanine parts, lid sections).

It includes the **operations of the external crane surface crane to move the 15-50T Cryostat warm structure elements through the hatch and shaft**, to the bottom of the shaft, and pick it up with the 60T cavern crane to the warm structure assembly.

It includes all required **rigging labor to perform crane operations according to FESHM requirements** (i.e. crane operator, signal person, spotter, etc.)

## Cryostat I&I (131.ND.03.06)

**Scope:** This WBS element supports coordination and execution of ND-LAr Cryostat installation. **Installation procedures for L3 elements** are delivered as part of each L3 WBS. **Technician labor for general assembly, welding, and leak checking are included. Vendor labor for cold membrane installation is included.** Technician labor for riggers and crane operators is not included as it is captured in the L2 Installation and Integration WBS.

**Hardware Deliverables:** Partial assembly of cryostat components in surface building or adjacent to it. Assembly of cryostat subsystem in ND hall. Integration of cryostat with associated subsystems including ND-LAr TPC, PRISM, LBNF Cryogenics, and Facilities.

Two stair towers (one external, one internal) and one set of scaffolding to support personnel access during installation are included. Rental costs of lift equipment (i.e. high capacity surface crane, supplemental cavern forklifts/cranes) are excluded. Construction and/or outfitting of facilities on FNAL site to support surface assembly activities are excluded.

**Data Deliverables:** Cryostat top level installation manual, integration procedures, and acceptance report. Critical lift plans. Warm structure final acceptance tests including dimensional measurement and leak check. Cold membrane final acceptance tests including dimensional measurement and leak check.”

# Installation Planning and Engineering

## **I&I responsibility (on project)**

- I&I responsible for the planning of the overall installation sequence, from AUP to close out
- It includes the attribution of layout space, the overall installation schedule, feasibility of parallel activities, the production of CAD installation configuration and drawings
- Coordination of I&I documentation development, and I&I reviews

## **Subsystems (on-project) and Consortia (off-project) scope responsibility:**

- Sub-systems responsible for the planning and engineering of the their detectors installation and assembly process
- Sub-systems responsible for the resource estimates to plan and execute these installation steps

## **DUNE ND Management (on project)**

- Project Controls

## **FNAL support (off project)**

- Punctual support to address questions with respect of FNAL operational functioning

# CAD Integration

## **I&I responsibility (on project)**

- I&I is responsible for integration of the DUNE-ND CAD models
- I&I Coordinates with the subsystems the production of the sub-systems models to be integrated within DUNE-ND
- I&I Coordinates access to the CAD management system (Windchill)
- I&I coordinates with NSCF the design progression of the cavern features (Through Systems/BCR process)
- I&I coordinates the integration at the DUNE-ND into the DUNE level with Jack Fowler (DUNE Systems Engineer)

## **Subsystems (on-project) and Consortia (off-project) scope responsibility:**

- Sub-Systems are responsible for design and CAD models of their detectors

## **DUNE support (CCA on project)**

- DUNE Systems is responsible for the integration of the DUNE-ND models with Near Site Conventional Facilities (NSCF), Beamline and Far Detectors (FD)

# Electrical Support

## I&I responsibility (on project)

- Coordination and management of power distribution requirements/specifications (including safety protocols)
- Resources to perform power distribution design and cost estimates (EE engineer on ND I&I scope and budget)
- Resources to deploy power distribution
- Electrical engineering oversight during installation
- Design of the cable routing all the way to the detector racks
- Installation support for the detectors (lifting the racks, etc...)

## Subsystems (on-project) and Consortia (off-project) scope responsibility:

- Sub-systems responsible for design and installation of the power supply and electronics of the detectors

## DUNE-ND Management (on project)

- ND systems engineering support

## FNAL

- Electrical access to site, installation inspections, LOTO

# Shipping & Receiving

## I&I responsibility

- I&I only responsible for shipping & receiving of I&I Components covered in I&I WBS (e.g. rigging equipment, power distribution components, etc...)
- I&I responsible for readiness of space to receive materials shipped directly to the surface building

## Subsystems (on-project) and Consortia (off-project) scope responsibility:

- Shipping to FNAL
- Support on-site if special receiving inspection needed

## FNAL responsibility (Operations, off project):

- Receiving services (signoff, etc...)
- Distribution support to and from “Storage” (more details in next slide)



# Materials distribution from receiving to storage to surface building

## I&I responsibility (on project)

- Coordination of material transportation within FNAL
- Labor for handling materials from storage to surface captured in I&I (on project)

## Subsystems (on-project) and Consortia (off-project) scope responsibility:

- Communication of shipping information to I&I, special instructions to I&I
- Presence at the surface building to start integration/installation (e.g. readiness of integration fixtures and personnel)

## FNAL support (off project)

- Trucks, transportation vehicles and drivers are provided by FNAL (operations budget, off project)
- Hubert Kimmons-Mosby and Michael Pfaff from FNAL distribution team provide us guidance for planning

# Safety

## I&I scope/responsibility in ES&H

- I&I follow FNAL safety protocols (FESHM) for all aspects of I&I
- I&I follow LBNF/DUNE Integration Detector Installation ES&H Plan (WIP) to adhere to FESHM
- I&I serves as a liaison between sub-system leads and LBNF/DUNE ES&H Coordinators for I&I activities
- I&I will ensure that no installation activities be performed without signed and approval procedures

## Subsystems (on-project) and Consortia (off-project)

### scope responsibility:

- The sub-systems are responsible for the development and approval of their installation/lifts procedures
- The procedures will be reviewed and approved per FESHM rules and regulations

## FNAL (operations) and DUNE support (Common Cost allocation)

- ES&H oversight performed/provided by FNAL for inspections, ORC reviews, work permits
- Duane Newhart is the safety coordinator for the Near Detector

## I&I scope in QA/QC

- I&I will develop a QC Plan outlining the QC requirements for their components through the procurement, receiving and installation phases
- I&I performs work in accordance with the requirements of the LBNF/DUNE QA Plan
- Only QA/QC of I&I components is I&I responsibility

## Subsystems (on-project) and Consortia (off-project) scope responsibility:

- Sub-systems and consortia are responsible for establishing the sub-systems QA/QC protocols for interfaces with I&I

## DUNE support (Common Cost allocation)

- Kevin Fahey is the QA Manager for LBNF/DUNE
- James Mateyack is the QA/QC coordinator for the DUNE Near detector

# Installation Coordinator

- Coordination of I&I readiness (pre-installation years)
- Coordination with FNAL rigging, EE, receiving and distribution teams
- On the field coordination of I&I activities (installation years)
- I&I on the field ES&H
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- Areas:
  - From storage to surface
  - From Storage to Cavern (shaft)
  - Cavern activities

**Coordinate/ ensure/verify readiness for**

**Staff, materials, procedures, work permits, safety**

**Verify that floor managers have work plans and safety approval in place**

	Management and Coordination	
Overall Installation Duration (Days)	663	
Resources in I&I WBS	Hours	FTE
<b>Detector Installation Coordinator (FNAL)</b>	<b>5,304</b>	<b>1.00</b>
Detector Installation Engineer (FNAL)	4,862	0.92
Detector Manufacturing Engineer (FNAL)	3,599	0.68
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Detector Installation Designer (LBNL and/or FNAL)	2,652	0.50
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<b>Total</b>	<b>22,191</b>	<b>4.18</b>

# Installation Engineer

- Coordination of installation engineering and planning with the subsystems/consortia
- Coordination with EE and NSCF
- Management of I&I interfaces and requirements
- Management of the overall installation sequence
- Installation layouts
- Equipment layouts (mezzanines, floor space)
- BOE development support

**Floor Manager Top Floor, responsible for:**

**IMPACT, job hazard analysis, approval, link the engineering notes**

**Work Activity Plan, Job hazard analysis, burn permits...**

**Print, review and collect signoff on job cards**

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# Material planning engineer

- Planning of materials logistics and receiving from storage and to the surface building and cavern
- Verification of QA/QC readiness ahead of receiving materials
- Verification of safety readiness ahead of receiving materials
- Readiness of assembly areas
- Readiness of installation equipment
- Readiness of installation teams
- Manufacturing knowledge to handle specification deviations

## Floor Manager - Bottom Floor

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# Electrical Engineer

- Power Distribution Design
- Power Distribution BOE
- Common design elements (transformers, rack protection...)
- Oversight/guidance for detector specific elements (from rack to detector)
- Installation Verification
- Commissioning support (noise mitigation)

	Hours	FTE.Years
■ 09 ND Integration & Installation	91,020	51.5
■ 01 ND I&I Management & Coordination	46,720	26.4
■ 03 Detector Integration Designer	8,730	4.9
⊕ A10578 Detector Integration Designer - FY22 Q4 - LBNL	332	0.19
⊕ A10580 Detector Integration Designer - FY23 - LBNL	1,326	0.75
⊕ A10590 Detector Integration Designer - FY24 - LBNL	1,326	0.75
⊕ A10600 Detector Integration Designer - FY25 - LBNL	1,326	0.75
⊕ A10610 Detector Integration Designer - FY26 - LBNL	884	0.50
⊕ A10620 Detector Integration Designer - FY27 - LBNL	442	0.25
⊕ A10630 Detector Integration Designer - FY28 - LBNL	442	0.25
⊕ A10640 Detector Integration Designer - FY29 - LBNL	884	0.50
⊕ A10650 Detector Integration Designer - FY30 - LBNL	884	0.50
⊕ A10660 Detector Integration Designer - FY31 - LBNL	884	0.50

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# Integration Designer

- CAD integration
- CAD design of equipment and EE routings layouts
- Produce and maintain installation and interface drawings

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# L2/CAM

- Performs I&I Management function (EVMS, reviews)
- Coordinates the I&I effort
- Supervises Installation Engineer and Integration Designer
- Works in tandem with Installation Coordinator
- Time split between Management and I&I
- 3 FTE.Years on I&I
- Low FTE on I&I in early years
- Ramps up for installation

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# Summary

- I&I scope captured and defined per work breakdown structure and definitions
- Division of scope between I&I and Sub-systems defined and documented (N2, ICDs, Block Diagrams)
- I&I requirements and specifications are defined and under revision control (DOORS, BCR process)
- NSCF at 100% final design that meets requirements. Updating through BCRs.
- I&I risks captured in risk registry
- Resource estimates methodology based on bottom-up estimates
- Uncertainty in line with conceptual design level of maturity
- All resource estimates are loaded in the ND sub-project RLS (P6)