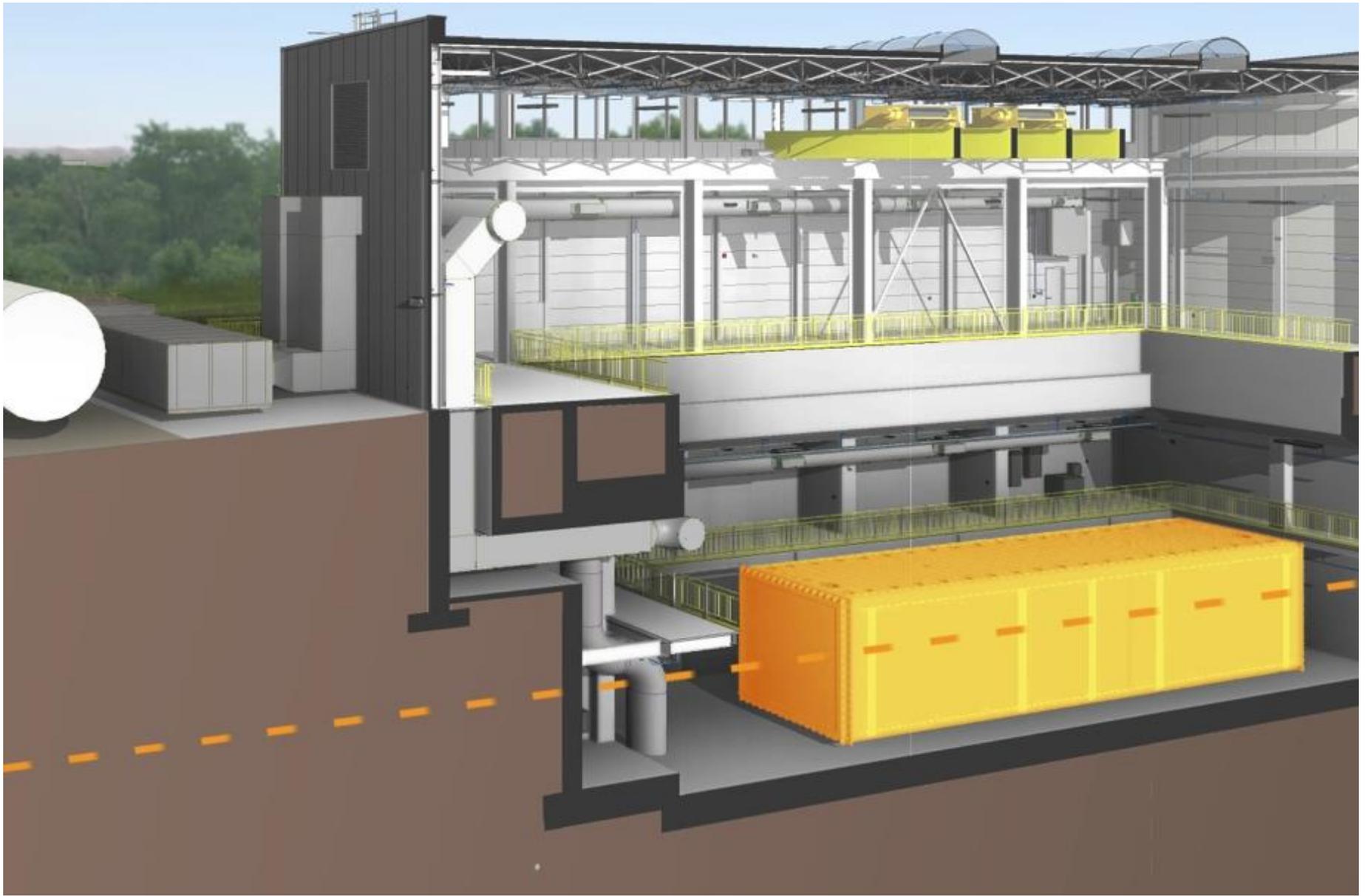


SBN Far Detector Installation & Integration

Fernanda G. Garcia, Steve Dixon, Andy Stefanik, Justin Tillman, John Voirin



Far Detector Installation & Integration Overview

- The SBN Far Detector Installation and Integration (SBN FD I&I) work package aims to develop and implement the plan for installation and integration of the ICARUS detector at FNAL over the next two years and be ready for beam data taking in CY2017
- The recently formed SBN FD I&I team has been active getting information and establishing the strategy
 - Level 2 manager took up her post in Nov 2015
 - Visited CERN and met CERN and INFN collaborators
 - Experienced skill personnel identified - Nov 2015
 - Majority of the team is not at full-time capacity on the project
 - Nevertheless the group is motivated and committed to the task
 - At this point we have focused on
 - T600 detector installation plan
 - Integration CAD model
 - Grounding plan

Resources



WBS 4
Cat James

WBS 4.1.1
Fernanda G. Garcia

Mechanical Support -
Andy Stefanik

Justin Tilman , John Voirin
Jim Kilmer

Electrical Support -
Linda Bagby

Baghda Baiboussinov

Cryogenic -
Mike Geynisman

Mike Zuckerbrot

Alignment -
Babatunde OShinowo

Cosmic Ray Tagger -
Bob Wilson

David Warner

Collaboration with
CERN and INFN
colleagues is
imperative throughout
this process

Far Detector Installation & Integration Scope

The SBN far detector installation and integration work package scope includes the following major points:

- Assembly of one warm cryostat
- **Installation of T600 detector** (more later on this presentation)
- Overseeing / joint coordination of cryogenic system installation
 - assembly and testing
 - cooperation between CERN and FNAL
- T600 commissioning & cool-down
- Detector support systems
 - readout support requirements
 - grounding requirements (more later after this presentation)
- Installation of cosmic ray tracker (Detector breakout)
- Installation of overburden (Facility Infrastructure breakout)

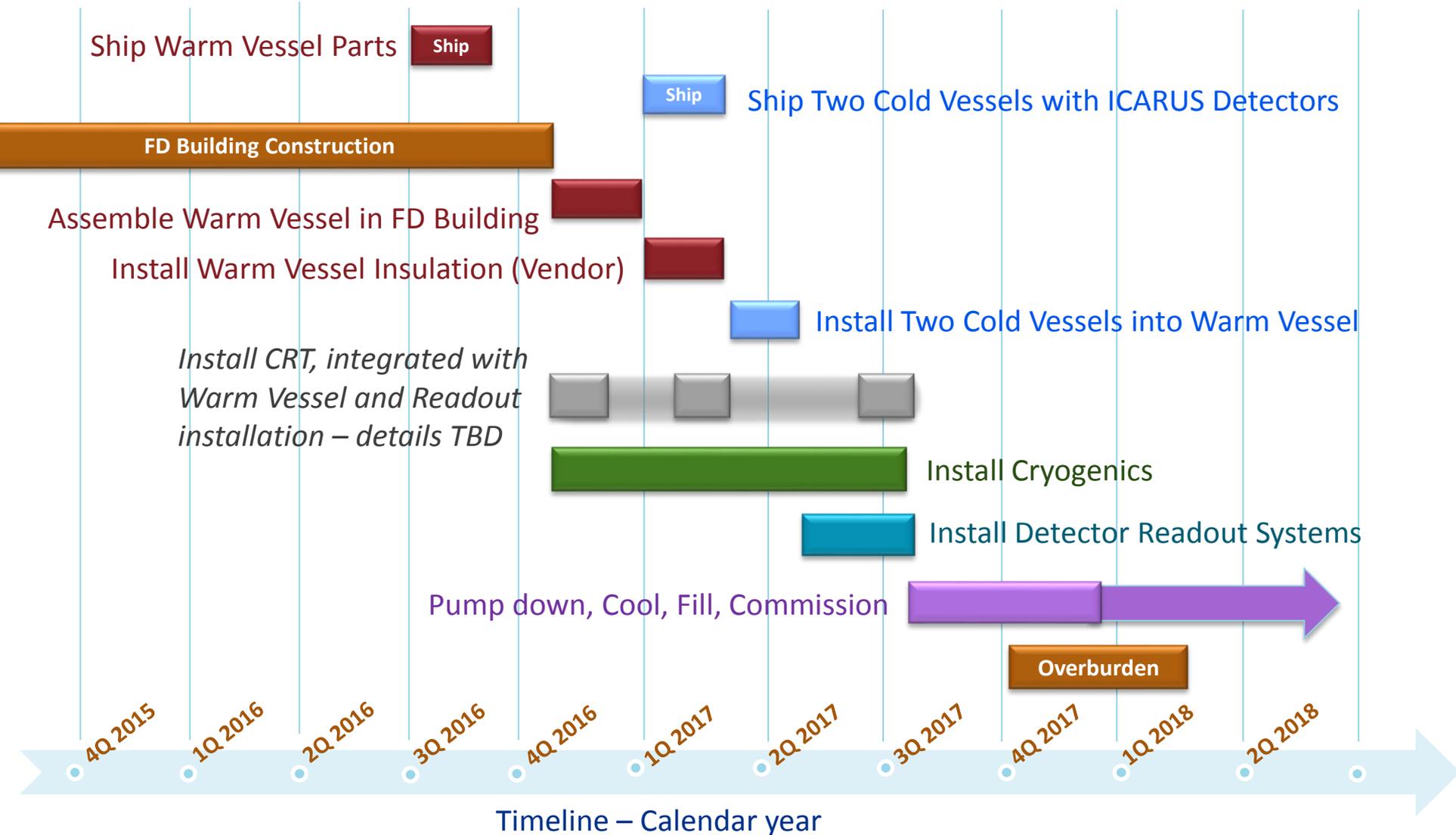
Firming up the high-level integration between the different subsystems is key to maintain schedule

Structuring the SBN Far Detector I&I task

WBS 40 SBN/4.1.1 – FD Installation and Integration

- Identify a responsible manager for each subsystem ✓
- Develop a schedule
 - Provisional schedule in progress ✓
 - “Living document” as our understanding matures
- Identify budget needs
 - First top-down (presented in this review) ✓
 - Updating to a bottom-up approach --> system managers define their budget in agreement with project leader
- Account for dependences on or links with other subsystems, schedule and budget
 - Level of granularity will depend on complexity of task
- Define the type and number of documents required for the project
- Define management and communication structure
 - Weekly meetings with managers ✓
 - Increase personnel recruitment in the next months

Far Detector Installation Timeline – Provisional Plan



Cooperation among institutions

- Active communication and close cooperation with CERN and INFN colleagues is essential
 - Maintain consensus and keep the collaboration informed
 - We will seek advice on alternatives to consider during the planning process
 - We are assuming some installation tasks will be collaborative with our colleagues
- We will rely on Claudio Montanari (ICARUS Technical Coordinator) and Marzio Nessi (Head of CERN Neutrino Platform) for our primary point of contact and anticipate a close collaboration with the entire team

Current thoughts on

Detector Grounding (presented later)
Installation of the T300 modules

Installation of the two T300 cold detectors

- The current installation proposal is based on the following:
 - Each unfilled T300 detector weights 52 metric tons (57 US short tons).
 - There are two building cranes; each crane has a capacity of 27.2 metric tons (30 US short tons).
 - We assume we will need a lifting fixture.
 - Fermilab personnel will install the T300s if no rigging contractors are required.
 - We have two other possibilities that depend on the equipment that Fermilab owns:
 - Use a rigging contractor for specific tasks.
 - Use a rigging contractor for the entire installation task.
 - We will work with Fermilab rigging and safety personnel as the installation plan develops. We have already started discussions with rigging personnel.
 - Installation will be in accordance with Fermilab Standards.

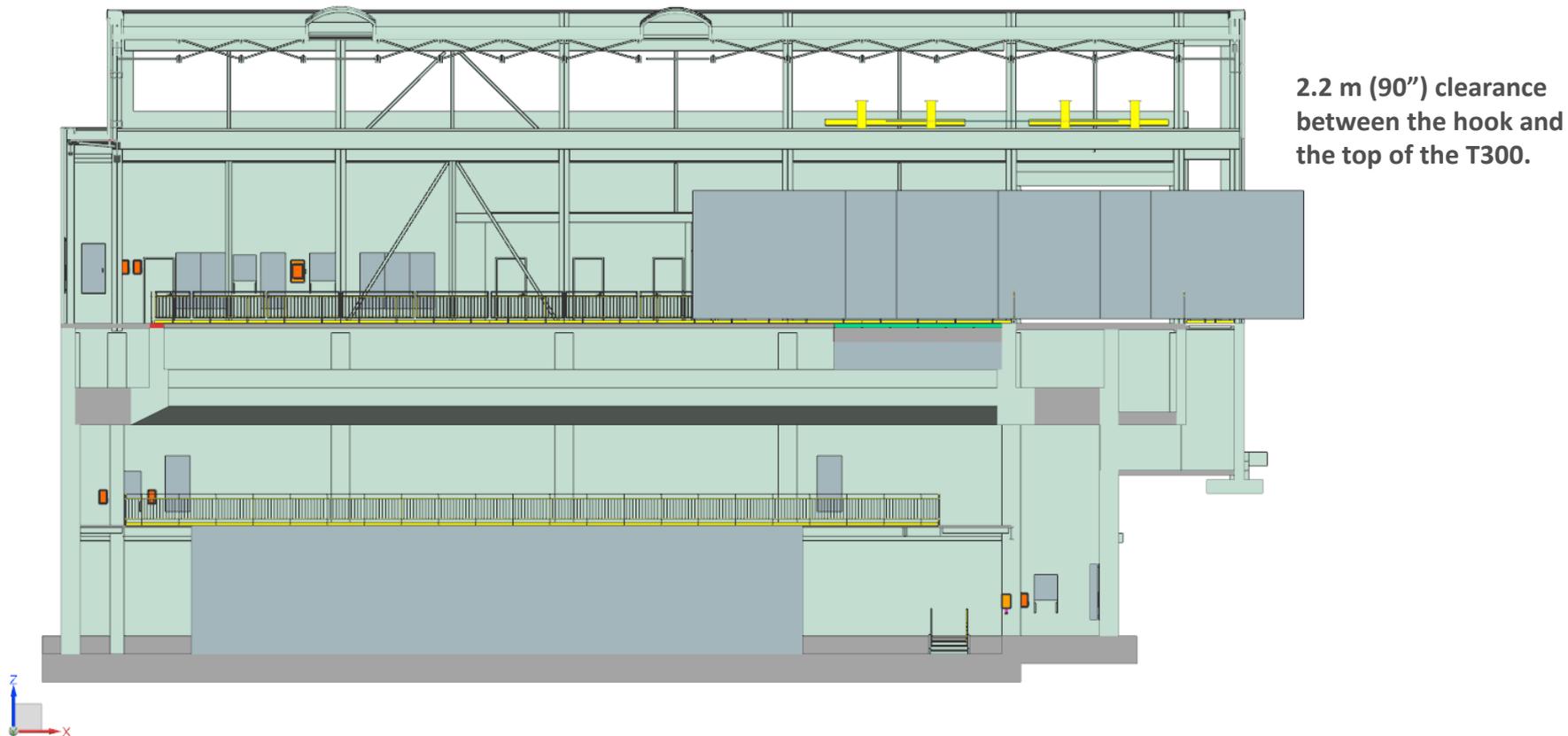
Installation of the two T300 cold detectors

- Each T300 will arrive at Fermilab on a low-boy trailer



Installation of the two T300 cold detectors

- Use rigging contractor to lift the T300 off the trailer and to place it on track rollers so it can be rolled into the building. Fermilab personnel does the rest of the installation work.

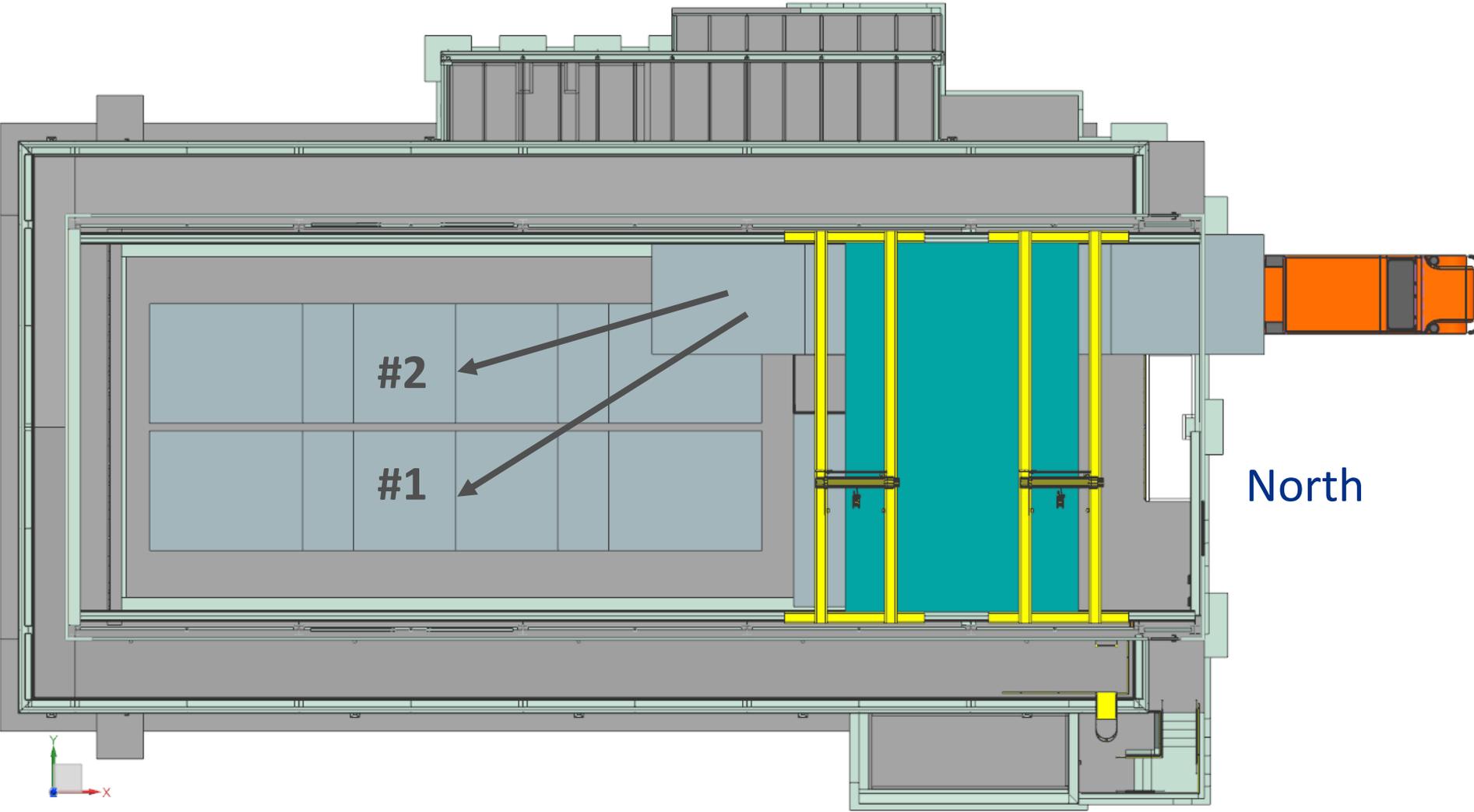


T300 Lifting Fixture

- ICARUS lifting fixture.



T300 Installation Route



Installation of the two T300 cold detectors

- Next stage on the process is to work with CERN to
 - Obtain 3D models and drawings in a workable electronic format.
 - Verify weights and lift points on all the components that will reside in the far detector service building
 - Especially lift points for the T300 which will allow the lifting fixture to be designed
 - Determine which institution will provide the T300 lifting fixture for installation
 - Verify support points under the T300 modules so we know where to place the rollers
 - ...

Conclusions

- SBN Far Detector installation and integration plans have started
 - Team recently formed to develop the plan
 - Personnel will increase as we continue working on this
 - Preliminary structure on management and communication is in place
 - Provisional schedule exists
 - Accumulating and updating information on tasks, schedule, and manpower as the team learn more about installation
 - Effort focus on the most urgent needs
 - Ongoing development of a plan for T600 detector installation
 - Preliminary thoughts on detector grounding

Backup

Basis of Estimate for Tasks under

Summary Task Name: **Far Detector Integration & Installation (SBN-II-I)(FI)**
 Summary WBS: **40SBN/4.4.1**
 Summary Unique ID: **243**
 Summary BOE Number: **4041**

WBS	UID	ID	Task Name	n in Days	Start Date	Finish Date	Fixed Cost M&S	All Labor (With Overhead)	All Materials (With Overhead)	Project Base Est Cost
40SBN/4.4.1			Far Detector Integration & Installation (SBN-II-I)(FI)	655	10/1/2015	5/11/2018				\$2,412,357
40SBN/4.4.1.1	2433	1230	FD Installation Program Management (SBN-II-I)(FI)(PM)	502	10/01/15	09/29/17	\$0	\$523,655	\$0	\$523,655
40SBN/4.4.1.1.1	2438	1231	FY16 Program Management Support (Q1) (FNAL - Labor) (SBN-II-I)(FI)(PM)	61	10/01/15	12/30/15	\$0	\$48,049	\$0	\$48,049
40SBN/4.4.1.1.2	2439	1232	FY16 Program Management Support (Q1) (FNAL - M&S) (SBN-II-I)(FI)(PM)	61	10/01/15	12/30/15	\$0	\$0	\$0	\$0
40SBN/4.4.1.1.3	2440	1233	FY16 Program Management Support (Q2) (FNAL - Labor) (SBN-II-I)(FI)(PM)	63	01/04/16	03/31/16	\$0	\$49,624	\$0	\$49,624
40SBN/4.4.1.1.4	2441	1234	FY16 Program Management Support (Q2) (FNAL - M&S) (SBN-II-I)(FI)(PM)	63	01/04/16	03/31/16	\$0	\$0	\$0	\$0
40SBN/4.4.1.1.5	2442	1235	FY16 Program Management Support (Q3) (FNAL - Labor) (SBN-II-I)(FI)(PM)	64	04/01/16	06/30/16	\$0	\$50,412	\$0	\$50,412
40SBN/4.4.1.1.6	2443	1236	FY16 Program Management Support (Q3) (FNAL - M&S) (SBN-II-I)(FI)(PM)	64	04/01/16	06/30/16	\$0	\$0	\$0	\$0
40SBN/4.4.1.1.7	2444	1237	FY16 Program Management Support (Q4) (FNAL - Labor) (SBN-II-I)(FI)(PM)	64	07/01/16	09/30/16	\$0	\$50,412	\$0	\$50,412
40SBN/4.4.1.1.8	2445	1238	FY16 Program Management Support (Q4) (FNAL - M&S) (SBN-II-I)(FI)(PM)	64	07/01/16	09/30/16	\$0	\$0	\$0	\$0
40SBN/4.4.1.1.9	2517	1239	FY17 Program Management Support (Q1) (FNAL - Labor) (SBN-II-I)(FI)(PM)	60	10/03/16	12/29/16	\$0	\$78,038	\$0	\$78,038
40SBN/4.4.1.1.10	2518	1240	FY17 Program Management Support (Q1) (FNAL - M&S) (SBN-II-I)(FI)(PM)	60	10/03/16	12/29/16	\$0	\$0	\$0	\$0
40SBN/4.4.1.1.11	2519	1241	FY17 Program Management Support (Q2) (FNAL - Labor) (SBN-II-I)(FI)(PM)	63	01/03/17	03/31/17	\$0	\$81,899	\$0	\$81,899
40SBN/4.4.1.1.12	2520	1242	FY17 Program Management Support (Q2) (FNAL - M&S) (SBN-II-I)(FI)(PM)	63	01/03/17	03/31/17	\$0	\$0	\$0	\$0
40SBN/4.4.1.1.13	2521	1243	FY17 Program Management Support (Q3) (FNAL - Labor) (SBN-II-I)(FI)(PM)	64	04/03/17	06/30/17	\$0	\$83,322	\$0	\$83,322
40SBN/4.4.1.1.14	2522	1244	FY17 Program Management Support (Q3) (FNAL - M&S) (SBN-II-I)(FI)(PM)	64	04/03/17	06/30/17	\$0	\$0	\$0	\$0
40SBN/4.4.1.1.15	2523	1245	FY17 Program Management Support (Q4) (FNAL - Labor) (SBN-II-I)(FI)(PM)	63	07/03/17	09/29/17	\$0	\$81,899	\$0	\$81,899
40SBN/4.4.1.1.16	2524	1246	FY17 Program Management Support (Q4) (FNAL - M&S) (SBN-II-I)(FI)(PM)	63	07/03/17	09/29/17	\$0	\$0	\$0	\$0
40SBN/4.4.1.2	2456	1247	FD Installation Planning (SBN-II-I)(FI)(IN)	300	10/29/15	01/12/17	\$0	\$406,797	\$127,514	\$534,311
40SBN/4.4.1.2.1	2457	1248	Development of FD Facility CAD Model - Stage 1 for Input to Cryogenics Design (FNAL - Labor) (SBN-II-I)(FI)(IN)	55	12/07/15	02/26/16	\$0	\$41,372	\$0	\$41,372
40SBN/4.4.1.2.2	2458	1249	Develop Outline of FD Installation Process and the Associated WPA (FNAL - M&S) (SBN-II-I)(FI)(IN)	60	10/29/15	01/29/16	\$0	\$20,785	\$0	\$20,785
40SBN/4.4.1.2.3	2459	1250	Develop and Approve T600 Cold Cryostats Pressure Testing per FESHM (FNAL - Labor) (SBN-II-I)(FI)(IN)	80	11/12/15	03/11/16	\$0	\$13,857	\$0	\$13,857
40SBN/4.4.1.2.4	2525	1251	Continued Development of FD Facility CAD Model (FNAL - Labor) (SBN-II-I)(FI)(IN)	90	02/29/16	07/05/16	\$0	\$67,700	\$0	\$67,700
40SBN/4.4.1.2.5	2526	1252	Develop FD Cryostats Installation Plan (FNAL - Labor) (SBN-II-I)(FI)(IN)	120	02/01/16	07/19/16	\$0	\$166,280	\$0	\$166,280
40SBN/4.4.1.2.6	2527	1253	Planning Package - FD Readout Support (FNAL - Labor) (SBN-II-I)(FI)(IN)	120	07/20/16	01/12/17	\$0	\$96,804	\$0	\$96,804
40SBN/4.4.1.2.7	2528	1254	Planning Package - FD Readout Support (FNAL - Labor) (SBN-II-I)(FI)(IN)	120	07/20/16	01/12/17	\$100,000	\$0	\$127,514	\$127,514
40SBN/4.4.1.3	337	1255	Installation of T600 at FNAL (SBN-FD-C)(IT)	401	10/05/16	05/11/18	\$0	\$358,281	\$852,986	\$1,211,267
40SBN/4.4.1.3.1	2506	1256	Install Warm Vessel Structure in FD Building (FNAL - Labor) (SBN-FD-C)(IT)	40	10/05/16	12/01/16	\$0	\$124,616	\$0	\$124,616
40SBN/4.4.1.3.2	2507	1257	Oversight of vendor install insulation onto Warm Vessel (FNAL - Labor) (SBN-FD-C)(IT)	40	12/02/16	02/02/17	\$0	\$18,897	\$0	\$18,897
40SBN/4.4.1.3.3	2509	1258	(T3) - [Ready] - Warm Vessel Ready to Receive T600 (SBN-FD-C)(IT)	0	02/02/17	02/02/17	\$0	\$0	\$0	\$0
40SBN/4.4.1.3.4	338	1259	Installation of T600 at FNAL (FNAL - Labor) (SBN-FD-C)(IT)	60	02/03/17	04/27/17	\$0	\$100,867	\$0	\$100,867
40SBN/4.4.1.3.5	732	1260	Installation of T600 at FNAL (FNAL - M&S) (SBN-FD-C)(IT)	60	02/03/17	04/27/17	\$150,000	\$0	\$192,673	\$192,673
40SBN/4.4.1.3.6	737	1261	Installation of T600 at FNAL (CERN - Labor) (SBN-FD-C)(IT)	60	02/03/17	04/27/17	\$0	\$0	\$0	\$0
40SBN/4.4.1.3.7	738	1262	Installation of T600 at FNAL (CERN - M&S) (SBN-FD-C)(IT)	60	02/03/17	04/27/17	\$0	\$0	\$0	\$0
40SBN/4.4.1.3.8	739	1263	(T3) - [Complete] - Installation of T600 at FNAL (SBN-FD-C)(IT)	0	04/27/17	04/27/17	\$0	\$0	\$0	\$0
40SBN/4.4.1.3.9	2529	1264	Vendor Install Insulation onto Warm Vessel (CERN - M&S) (SBN-FD-C)(IT)	40	12/02/16	02/02/17	\$0	\$0	\$0	\$0
40SBN/4.4.1.3.10	2530	1265	Planning Package - Installation of readout (FNAL - Labor) (SBN-FD-C)(IT)	80	04/28/17	08/21/17	\$0	\$44,262	\$0	\$44,262
40SBN/4.4.1.3.11	2531	1266	Planning Package - Installation of readout (FNAL - M&S) (SBN-FD-C)(IT)	80	04/28/17	08/21/17	\$30,000	\$0	\$38,535	\$38,535
40SBN/4.4.1.3.12	2534	1267	Planning Package - Install Overburden (FNAL - Labor) (SBN-FD-C)(IT)	80	01/22/18	05/11/18	\$0	\$69,639	\$0	\$69,639
40SBN/4.4.1.3.13	2535	1268	Planning Package - Purchase FD Overburden (FNAL - M&S) (SBN-FD-C)(IT)	60	10/03/17	01/02/18	\$475,000	\$0	\$621,778	\$621,778
40SBN/4.4.1.4	339	1269	Commissioning & Cool-down of T600 at FNAL (SBN-FD-C)(CC)	101	08/21/17	01/19/18	\$0	\$143,124	\$0	\$143,124
40SBN/4.4.1.4.1	340	1270	Commissioning & Cool-down of T600 at FNAL (FNAL - Labor) (SBN-FD-C)(CC)	101	08/21/17	01/19/18	\$0	\$143,124	\$0	\$143,124
40SBN/4.4.1.4.2	740	1271	Commissioning & Cool-down of T600 at FNAL (FNAL - M&S) (SBN-FD-C)(CC)	101	08/22/17	01/19/18	\$0	\$0	\$0	\$0
40SBN/4.4.1.4.3	741	1272	Commissioning & Cool-down of T600 at FNAL (CERN - Labor) (SBN-FD-C)(CC)	101	08/22/17	01/19/18	\$0	\$0	\$0	\$0
40SBN/4.4.1.4.4	742	1273	Commissioning & Cool-down of T600 at FNAL (CERN - M&S) (SBN-FD-C)(CC)	101	08/22/17	01/19/18	\$0	\$0	\$0	\$0
40SBN/4.4.1.4.5	743	1274	(T3) - [Complete] - Commissioning & Cool-down of T600 at FNAL (SBN-FD-C)(CC)	0	01/19/18	01/19/18	\$0	\$0	\$0	\$0