

European XFEL. Building a Mega-Project made easy.

*Re-inventing Cabling, Rack management and cable trays
planning & implementation*

Dr. Antonios V. Lalechos

Leplan



9600 magnets

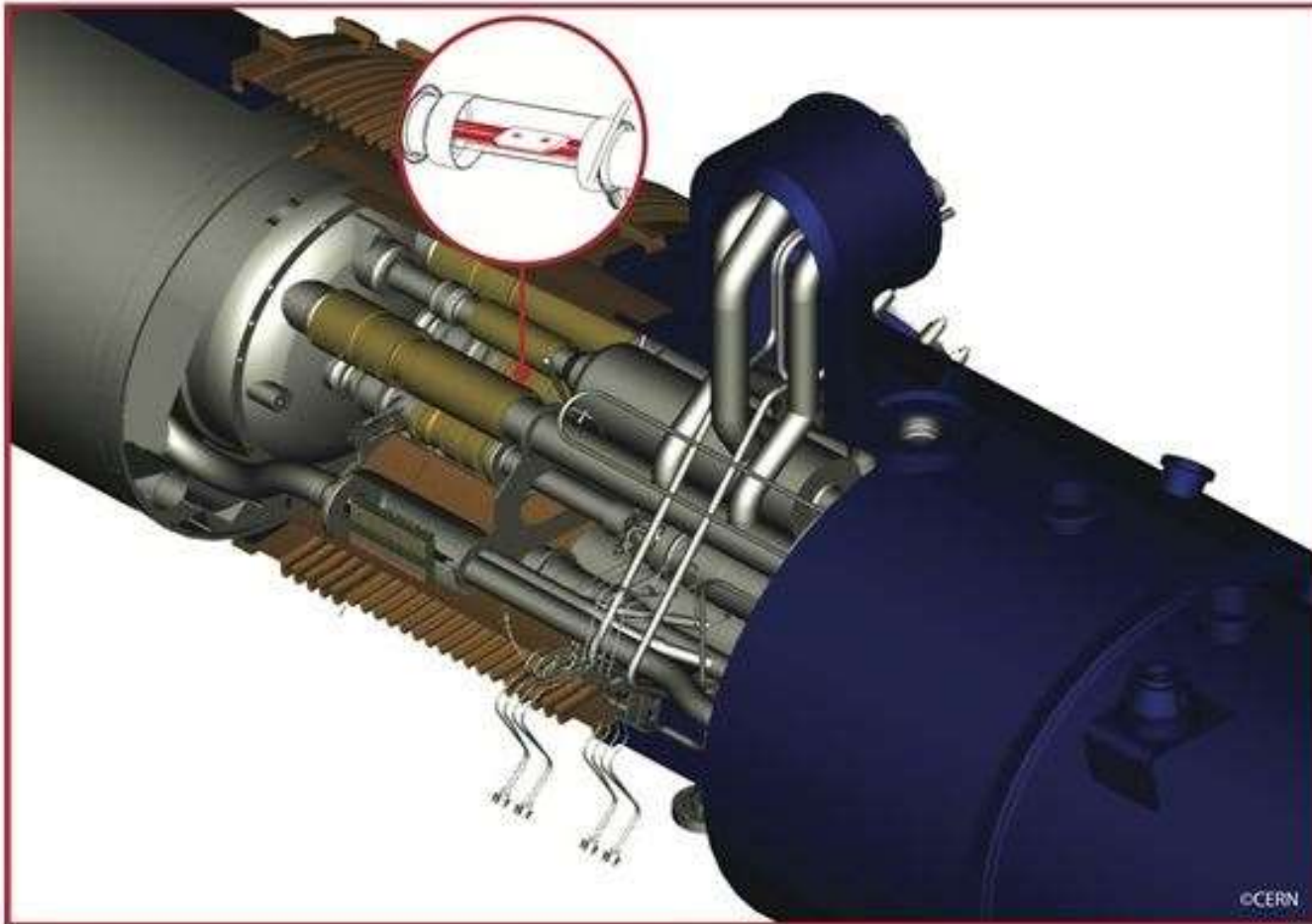
1000s km of cables

1000s Patch Panels

1000s Switch boards

EMPLOYED

ONLY THE BEST



Damage of the LHC magnets in sector 3-4 of the LHC, provoked by the incident which happened on 19 September 2008 (Image: CERN)

Geneva, 16 October 2008. Investigations at CERN¹ following a large helium leak into sector 2-4 of the Large Hadron Collider (LHC) tunnel have confirmed that cause of the incident was a faulty electrical connection between two of the accelerator's magnets. This resulted in mechanical damage and release of helium from the magnet cold mass into the tunnel.

Editorial: The lesson from CERN: Why scientists should celebrate getting it wrong



A technician works in the Large Hadron Collider tunnel Feb. 16, 2016, during a press visit in Meyrin, near Geneva, Switzerland. (Laurent Gillieron / AP)

What went wrong then?

No Unified Documentation!

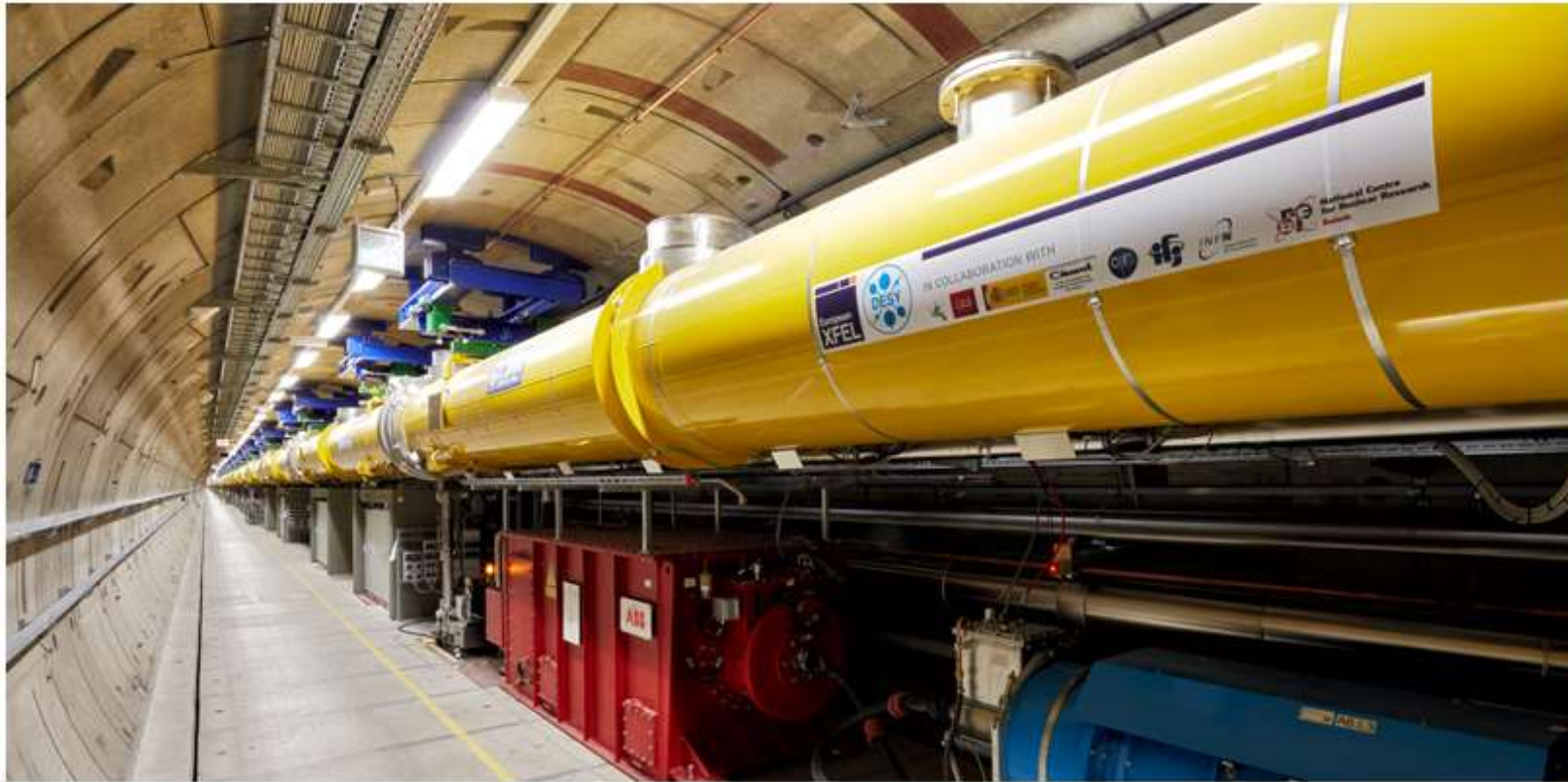
on the design and the documentation. And we are hardly using any off-the-shelf components. Most components are being developed especially for European XFEL and if we do use standard components, we often end up using them for purposes other than their original." Lalechos is also creating the electrical documentation. "The documentation is of central importance because the entire plant is being constantly further developed and modified during operation. For this reason, the engineers always need the latest documentation."

Automated schematic creation – practical even for special projects

Antonios Lalechos is supported in his work by three employees. A concept was initially



Dr. Antonios-Vassilios Lalechos is responsible for the electrical planning of the experiments for the



View into the 2.1-kilometre long accelerator tunnel of European XFEL with the yellow superconducting accelerator modules hanging from the ceiling.



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ΤΕΧΝΟΛΟΓΙΑ-ΕΠΙΣΤΗΜΗ

Πρώτη δέσμη στο μεγαλύτερο λέιζερ ακτίνων Χ στον κόσμο

Δευτέρα, 08 Μαΐου 2017 22:27 • UPD: 22:28



European XFEL/Heiner Müller-Elsner

"Το European XFEL θα μας παράσχει τις πιο λεπτομερείς εικόνες της μοριακής δομής νέων υλικών και φαρμάκων, όπως επίσης και πρωτόγνωρες καταγραφές της εξέλιξης βιοχημικών αντιδράσεων", δήλωσε ο Χέλμουτ Ντος, Διευθυντής του DESY.

Σε λειτουργία το Ευρωπαϊκό XFEL το ισχυρότερο λέιζερ ακτίνων-Χ στον κόσμο



Newsroom, CNN Greece

13:00 Σάββατο, 02 Σεπτεμβρίου 2017



Πηγή: ΑΠΕΜΠΕ

Το ισχυρότερο στον κόσμο **λέιζερ** ακτίνων-Χ, το ευρωπαϊκό XFEL (European X-ray Free Electron Laser), άρχισε επίσημα τη λειτουργία του στο Αμβούργο της **Γερμανίας** την Παρασκευή.

Διαβάστε επίσης



Με κόστος κατασκευής σχεδόν ενάμισι δισεκατομμύριο ευρώ, η νέα επιστημονική υποδομή θα χρησιμοποιηθεί για τη μελέτη της ατομικής δομής της έμβιας και άβιας ύλης (κυττάρων, ιών, μετάλλων κ.α.). Χάρη στο νέο λέιζερ, που αποτελεί ταυτόχρονα κάμερα υψηλής ταχύτητας και μικροσκόπιο, θα καταστεί εφικτή η δημιουργία εικόνων και φιλμ του νανόκοσμου. Μεταξύ άλλων.

Information transparency



Interoperability



Industry 4.0



Integrated

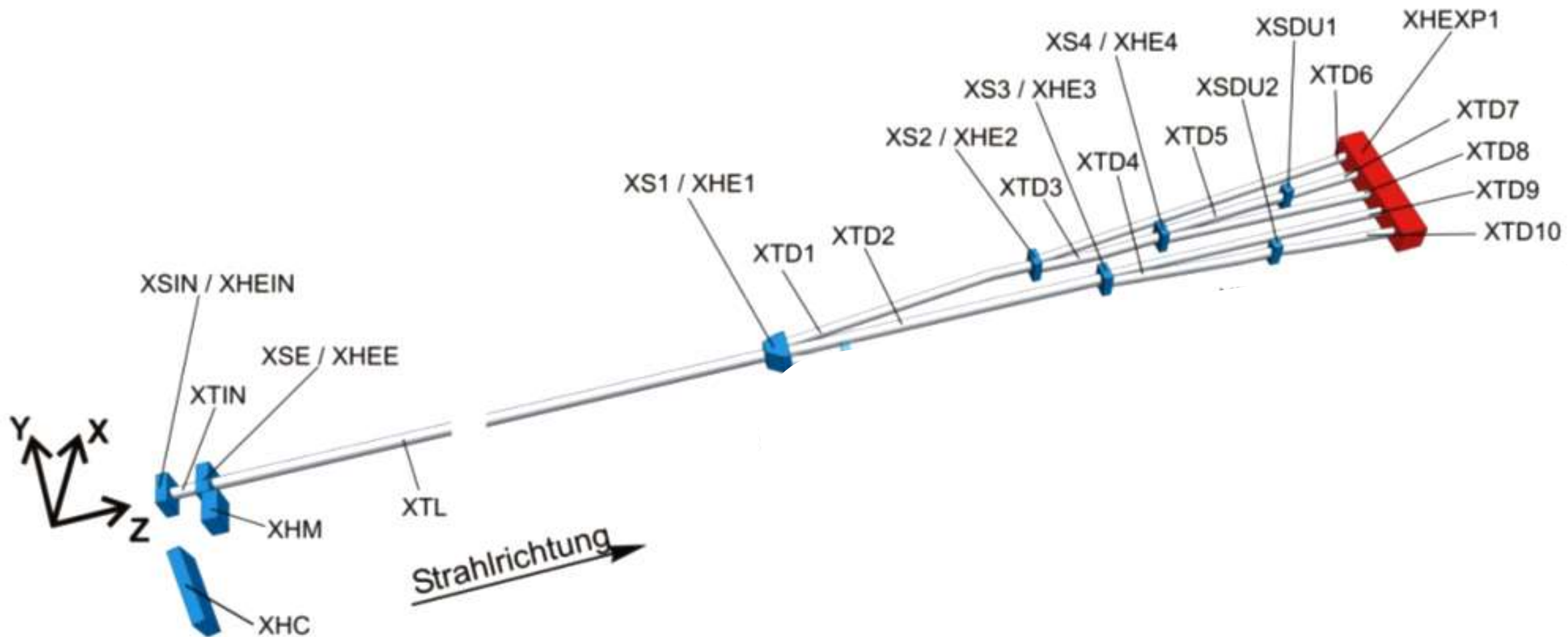


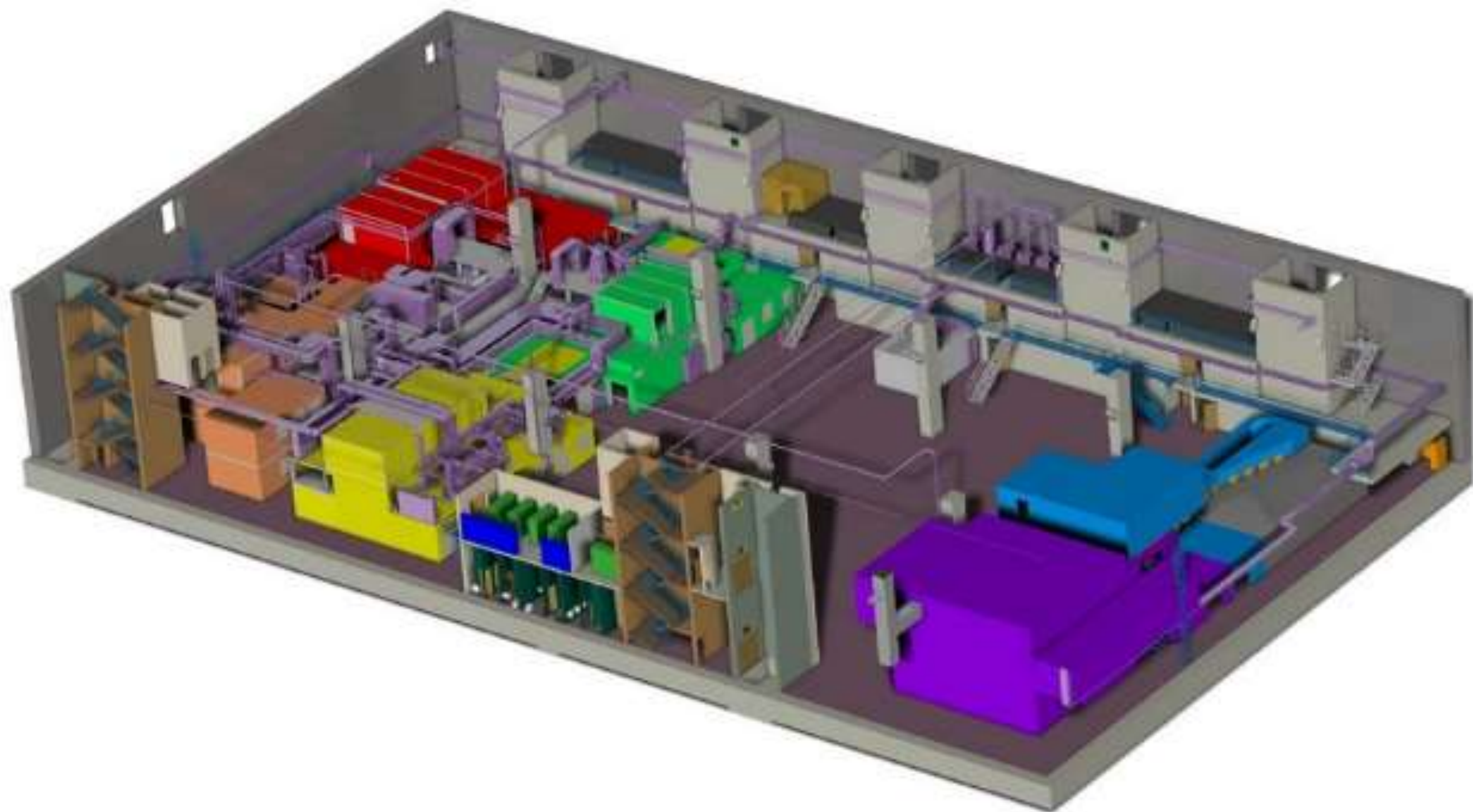
Technical assistance

What we need to build a Mega Project

- Brilliant Idea
- Cash
- Accurate Status Update
 - Milestones
 - Performance
 - Interfaces
- Deliverables

How, what, who, when Why







“Networks”

Infrastructure

DAQ

Control

Console

Timing

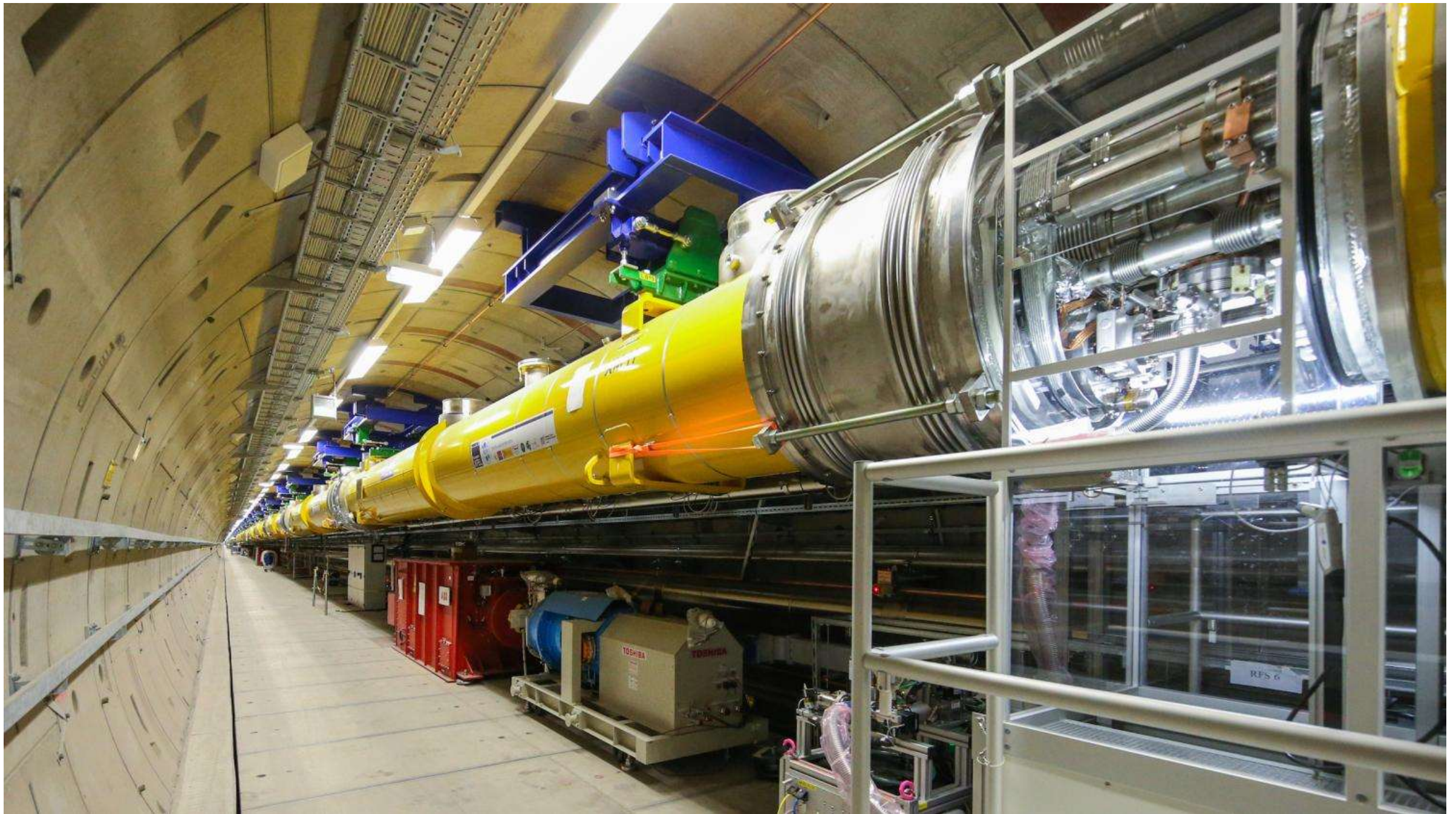
Triggering

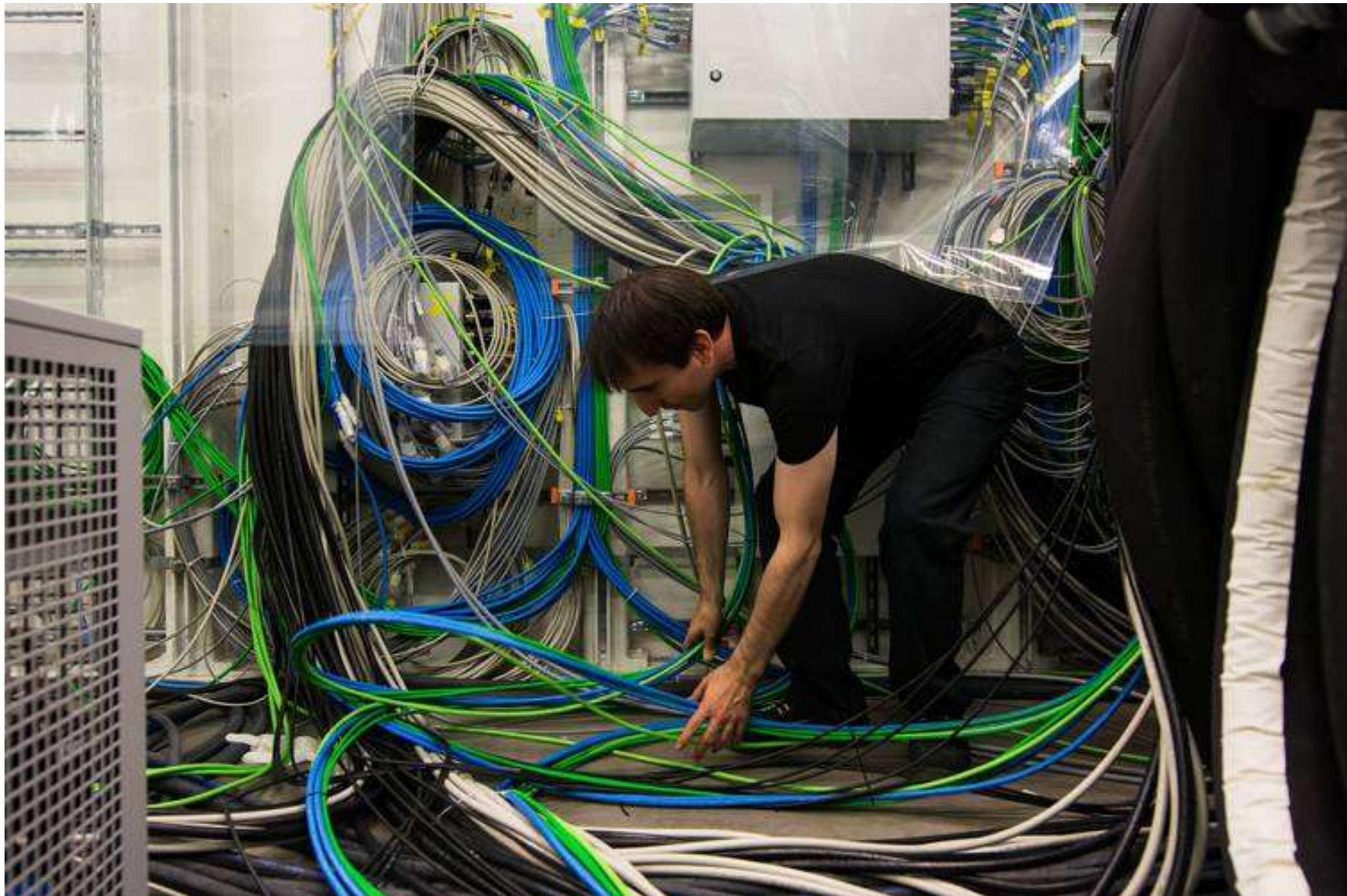
Safety

Storage

Processing

Other...





Installation instructions for:

- **Cables**
 - Fixed installation
 - Patch cables
- **Cable trays**
 - Content management
 - Cable routing
- **Rack Content**
 - Lists racks' content
 - Components allocation inside racks
 - Space reservation / free space calculation



Fixed Installation & Patch Cables

Cable overview

XFEL_F10_001_Special

Cable name	Source (Port)	Target (to)	Cable type	Conductors	Conductors used	Cross-section [mm²]	Length [m]	Function text	Graphical page of cable diagram
40TC.0001-W1	+DTC.0001+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1-X1	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	ETHERLUNER-Cable + Cat7	8	1	0,32	11,11		==F02.001001
40TC.0001-W2	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	ETHERLUNER-Cable + Cat7	8	1	0,32	21,62		==F02.001002
40TC.0001-W3	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+TOL34	ETHERLUNER-Cable + Cat7	8	1	0,32	21,73		==F02.001003
40TC.0001-W4	+DTC.0001+XHEXP1.SABE1.D05.Dg2+HEX1-EB01	+DTC.0001+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1	ETHERLUNER-Cable + Cat7	8	1	0,32			==F02.001004
40TC.0001-W5	+DTC.0001+XHEXP1.SABE1.D05.Dg2+HEX1-EB01-X2	+Dg21+HEX1.CN+XHEXP1.SABE1.D05.WVL+SP02-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32	21,31		==F02.001005
40TC.0001-W6	+Dg21+HEX1.CN+XHEXP1.SABE1.D05.WVL+SP02-XAF	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+PP02-X2P	ETHERLUNER-Cable + Cat7	8	1	0,32	36,77		==F02.001006
40TC.0001-W7	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+HAG15-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32			==F02.001007
40TC.0001-W8	+DTC.0001+XHEXP1.SABE1.D05+CanRelay-U1	+DTC.0001+XHEXP1.SABE1.D05+WVL+XD1	OLFLUX CLASSIC 110 H	3	3	1,8			==F02.001008
40TC.0001-W9	+DTC.0001+XHEXP1.SABE1.D05+CanRelay-U1	+DTC.0001+XHEXP1.SABE1.D05+CanRelay-U1	System-Cable	10	2	1,8			==F02.001009
40TC.0001-W10		+DTC.CAN0+XHEXP1.SABE1.D05+EB01-D01	System-Cable	10	2	1,8			
40TC.0001-W11	+DTC.0001+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	ETHERLUNER-Cable + Cat7	8	1	0,32	11,17		==F02.001010
40TC.0002-W1	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	ETHERLUNER-Cable + Cat7	8	1	0,32	21,62		==F02.001011
40TC.0002-W2	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+TOL34	ETHERLUNER-Cable + Cat7	8	1	0,32	21,73		==F02.001012
40TC.0002-W3	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+HAG15-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32	21,73		==F02.001013
40TC.0002-W4	+DTC.0002+XHEXP1.SABE1.D05.Dg2+HEX1-EB01	+DTC.0002+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1	ETHERLUNER-Cable + Cat7	8	1	0,32			==F02.001014
40TC.0002-W5	+DTC.0002+XHEXP1.SABE1.D05.Dg2+HEX1-EB01-X2	+Dg21+HEX1.CN+XHEXP1.SABE1.D05.WVL+SP02-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32	37,91		==F02.001015
40TC.0002-W6	+Dg21+HEX1.CN+XHEXP1.SABE1.D05.WVL+SP02-XAF	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+PP02-X2P	ETHERLUNER-Cable + Cat7	8	1	0,32	36,77		==F02.001016
40TC.0002-W7	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+HAG15-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32			==F02.001017
40TC.0002-W8	+DTC.0002+XHEXP1.SABE1.D05+CanRelay-U1	+DTC.0002+XHEXP1.SABE1.D05+WVL+XD1	OLFLUX CLASSIC 110 H	3	3	1,8			==F02.001018
40TC.0002-W9	+DTC.0002+XHEXP1.SABE1.D05+CanRelay-U1	+DTC.0002+XHEXP1.SABE1.D05+CanRelay-U1	System-Cable	10	2	1,8			==F02.001019
40TC.0002-W10		+DTC.CAN0+XHEXP1.SABE1.D05+EB01-D01	System-Cable	10	2	1,8			
40TC.0002-W11	+DTC.0002+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	ETHERLUNER-Cable + Cat7	8	1	0,32	9,46		==F02.001020
40TC.0003-W1	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	ETHERLUNER-Cable + Cat7	8	1	0,32	21,62		==F02.001021
40TC.0003-W2	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+TOL34	ETHERLUNER-Cable + Cat7	8	1	0,32	21,73		==F02.001022
40TC.0003-W3	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+HAG15-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32	21,73		==F02.001023
40TC.0003-W4	+DTC.0003+XHEXP1.SABE1.D05.Dg2+HEX1-EB01	+DTC.0003+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1	ETHERLUNER-Cable + Cat7	8	1	0,32			==F02.001024
40TC.0003-W5	+DTC.0003+XHEXP1.SABE1.D05.Dg2+HEX1-EB01-X2	+Dg21+HEX1.CN+XHEXP1.SABE1.D05.WVL+SP02-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32	36,22		==F02.001025
40TC.0003-W6	+Dg21+HEX1.CN+XHEXP1.SABE1.D05.WVL+SP02-XAF	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+PP02-X2P	ETHERLUNER-Cable + Cat7	8	1	0,32	36,77		==F02.001026
40TC.0003-W7	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+HAG15-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32			==F02.001027
40TC.0003-W8	+DTC.0003+XHEXP1.SABE1.D05+CanRelay-U1	+DTC.0003+XHEXP1.SABE1.D05+WVL+XD1	OLFLUX CLASSIC 110 H	3	3	1,8			==F02.001028
40TC.0003-W9	+DTC.0003+XHEXP1.SABE1.D05+CanRelay-U1	+DTC.0003+XHEXP1.SABE1.D05+CanRelay-U1	System-Cable	10	2	1,8			==F02.001029
40TC.0003-W10		+DTC.CAN0+XHEXP1.SABE1.D05+EB01-D01	System-Cable	10	2	1,8			
40TC.0003-W11	+DTC.0003+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	ETHERLUNER-Cable + Cat7	8	1	0,32	27,93		==F02.001030
40TC.0004-W1	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	ETHERLUNER-Cable + Cat7	8	1	0,32	21,62		==F02.001031
40TC.0004-W2	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+TOL34	ETHERLUNER-Cable + Cat7	8	1	0,32	21,73		==F02.001032
40TC.0004-W3	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D01.RCK08+HAG15-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32	21,73		==F02.001033
40TC.0004-W4	+DTC.0004+XHEXP1.SABE1.D05.Dg2+HEX1-EB01	+DTC.0004+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1	ETHERLUNER-Cable + Cat7	8	1	0,32			==F02.001034
40TC.0004-W5	+DTC.0004+XHEXP1.SABE1.D05.Dg2+HEX1-EB01-X2	+Dg21+HEX1.CN+XHEXP1.SABE1.D05.WVL+SP02-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32	37,93		==F02.001035
40TC.0004-W6	+Dg21+HEX1.CN+XHEXP1.SABE1.D05.WVL+SP02-XAF	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+PP02-X2P	ETHERLUNER-Cable + Cat7	8	1	0,32	36,77		==F02.001036
40TC.0004-W7	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+PP02-X2P	+HEX1.F02+Dg21+HEX1.CN+XHEXP1.SABE1.D01.RCK08+HAG15-XAF	ETHERLUNER-Cable + Cat7	8	1	0,32			==F02.001037
40TC.0004-W8	+DTC.0004+XHEXP1.SABE1.D05+CanRelay-U1	+DTC.0004+XHEXP1.SABE1.D05+WVL+XD1	OLFLUX CLASSIC 110 H	3	3	1,8			==F02.001038
40TC.0004-W9	+DTC.0004+XHEXP1.SABE1.D05+CanRelay-U1	+DTC.0004+XHEXP1.SABE1.D05+CanRelay-U1	System-Cable	10	2	1,8			==F02.001039
40TC.0004-W10		+DTC.CAN0+XHEXP1.SABE1.D05+EB01-D01	System-Cable	10	2	1,8			
40TC.0004-W11	+DTC.0004+XHEXP1.SABE1.D05.Dg2+HEX1-EB01_B31+AF1	+HEX1.F02+Dg21+HEX1.ETA+XHEXP1.SABE1.D05+HEXP1.X1P	ETHERLUNER-Cable + Cat7	8	1	0,32	27,93		==F02.001040

Cable overview

Cable name	Source (from)	Target (to)	Cable type	Conductors	Conductors used	Cross-section [mm]	Length [m]
=DTC.GIGE1-W1	=DTC.GIGE1++XHEXP1.SASE1.D05.GigE1+BX1-EBOX_BX1-KF1-X1	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D05.field+PP51-X1F	ETHERLINE® Cat6a + Cat.7	8	1	0,32	11.11
=DTC.GIGE1-W2	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D05.field+PP51-X1B	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D21.RCK99+PP52-X2B	ETHERLINE® Cat6a + Cat.7	8	1	0,32	21.52
=DTC.GIGE1-W3	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D21.RCK99+PP52-X2F	==Infra.FXE=GigE1.Infra.TN.mTCA++XHEXP1.SASE1.D21.RCK99+mTCL34.Slo	ETHERLINE® Cat6a + Cat.7	8	1	0,32	21.73

Cable overview

Cable name	Source (from)	Target (to)
=DTC.GIGE1-W1	=DTC.GIGE1++XHEXP1.SASE1.D05.GigE1+BX1-EBOX_BX1-KF1-X1	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D05.field+PP51-X1F
=DTC.GIGE1-W2	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D05.field+PP51-X1B	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D21.RCK99+PP52-X2B
=DTC.GIGE1-W3	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D21.RCK99+PP52-X2F	==Infra.FXE=GigE1.Infra.TN.mTCA++XHEXP1.SASE1.D21.RCK99+mTCL34.Slo

Cable type	Conductors	Conductors used	Cross-section [mm]	Length [m]
ETHERLINE® Cat6a + Cat.7	8	1	0,32	11.11
ETHERLINE® Cat6a + Cat.7	8	1	0,32	21.52
ETHERLINE® Cat6a + Cat.7	8	1	0,32	21.73

Similar reports needed

- ☐ Connector types at source/destination of cable

- ☐ Pin Assignment

- ☐ Labels

- ☐ Phases of work

Installation instructions for:

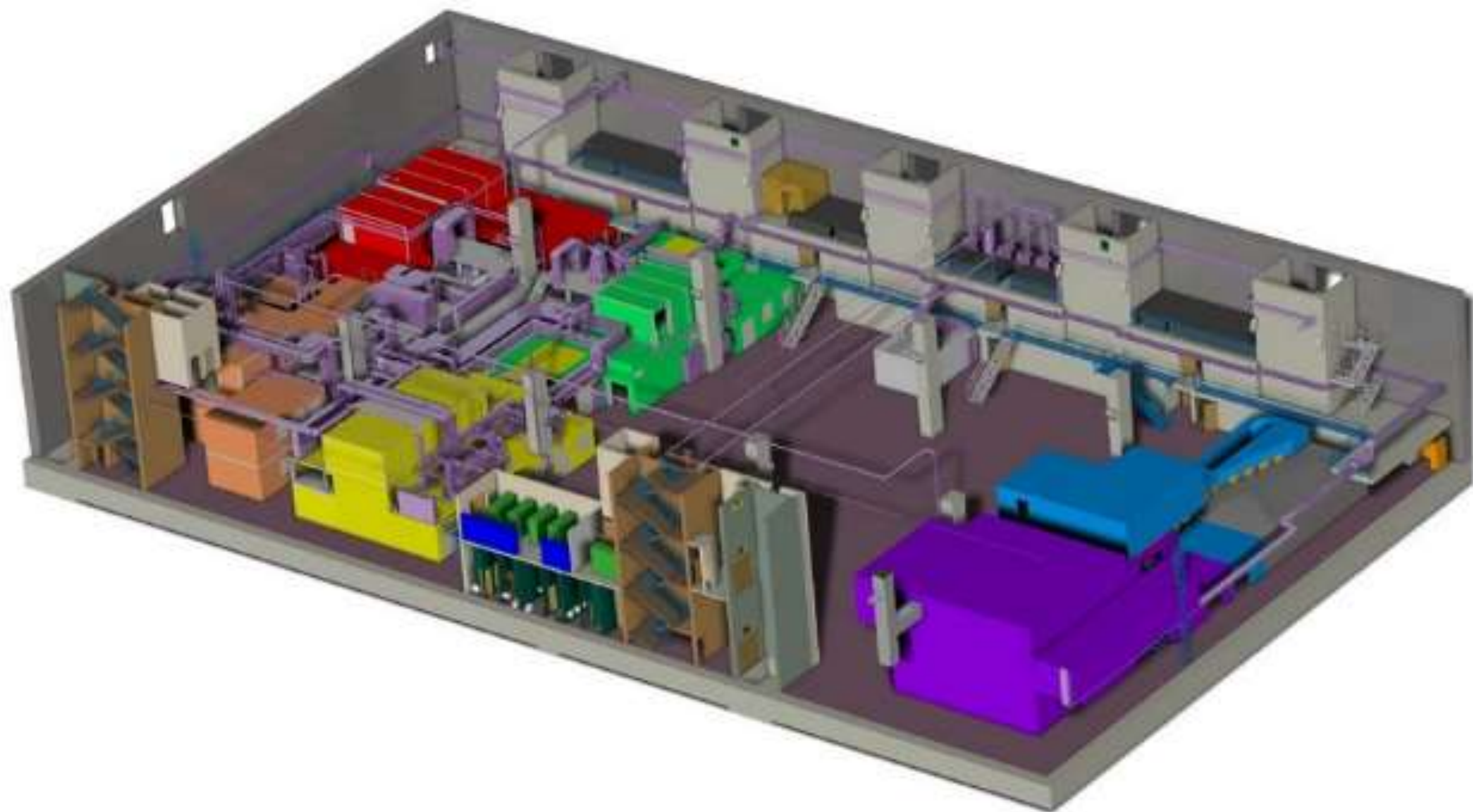
- Cables
 - Fixed installation
 - Patch cables
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 - Content management
 - Cable routing
- Rack Content
 - Lists racks' content
 - Components allocation inside racks
 - Space reservation / free space calculation



Installation instructions for:

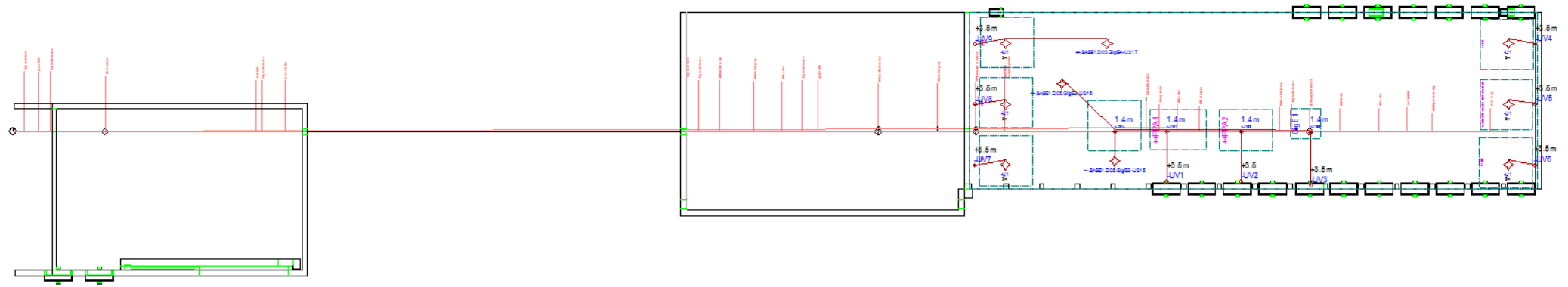
- Cables
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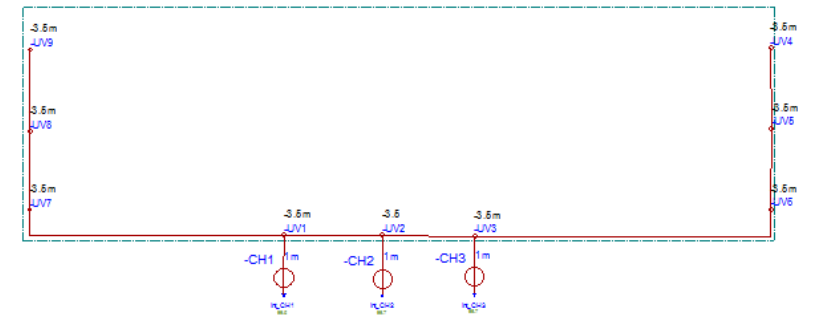
++D05.field

Ground Floor - Zero Point Level



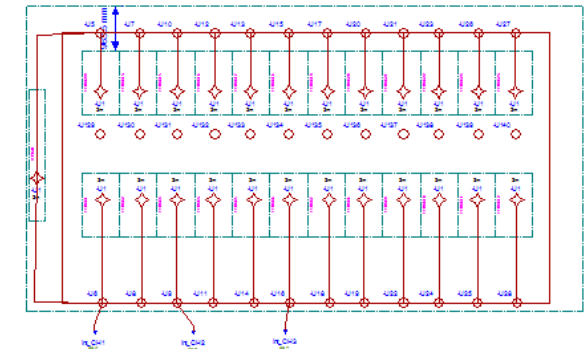
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Ground Floor - Cable Trays Level



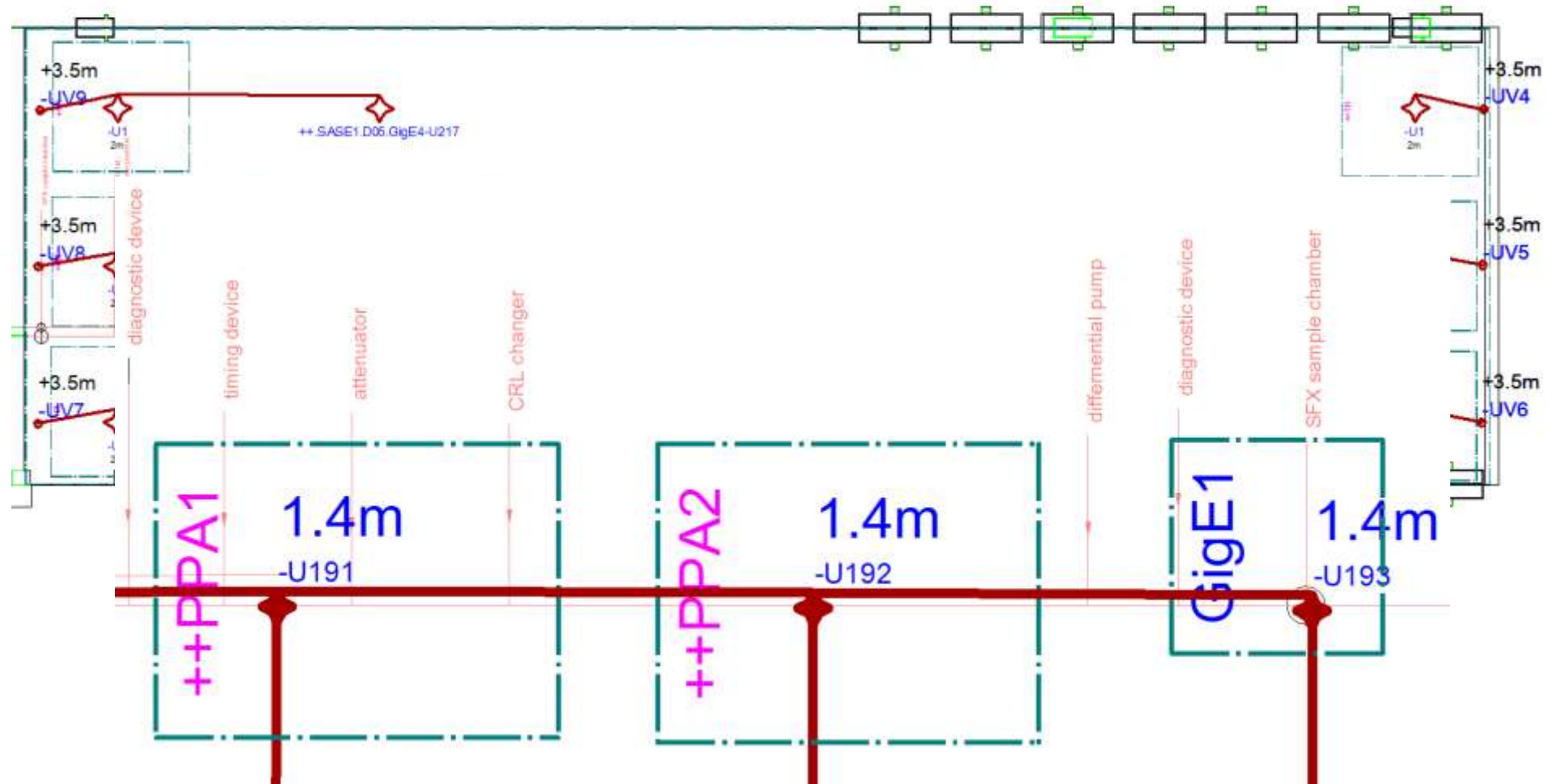
++D21

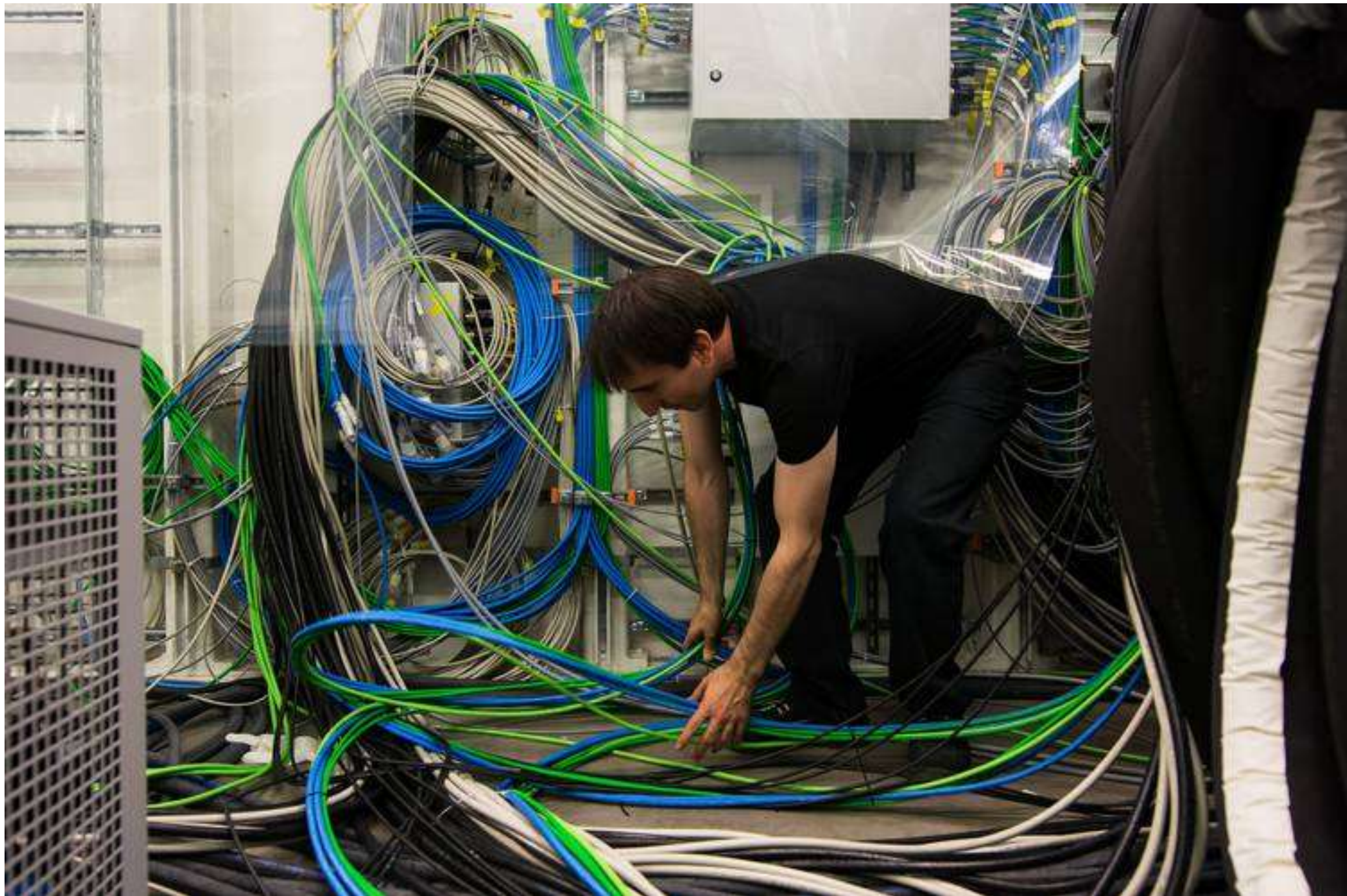
Rackroom Floor - Double Floor Level



Cable Trays Planning

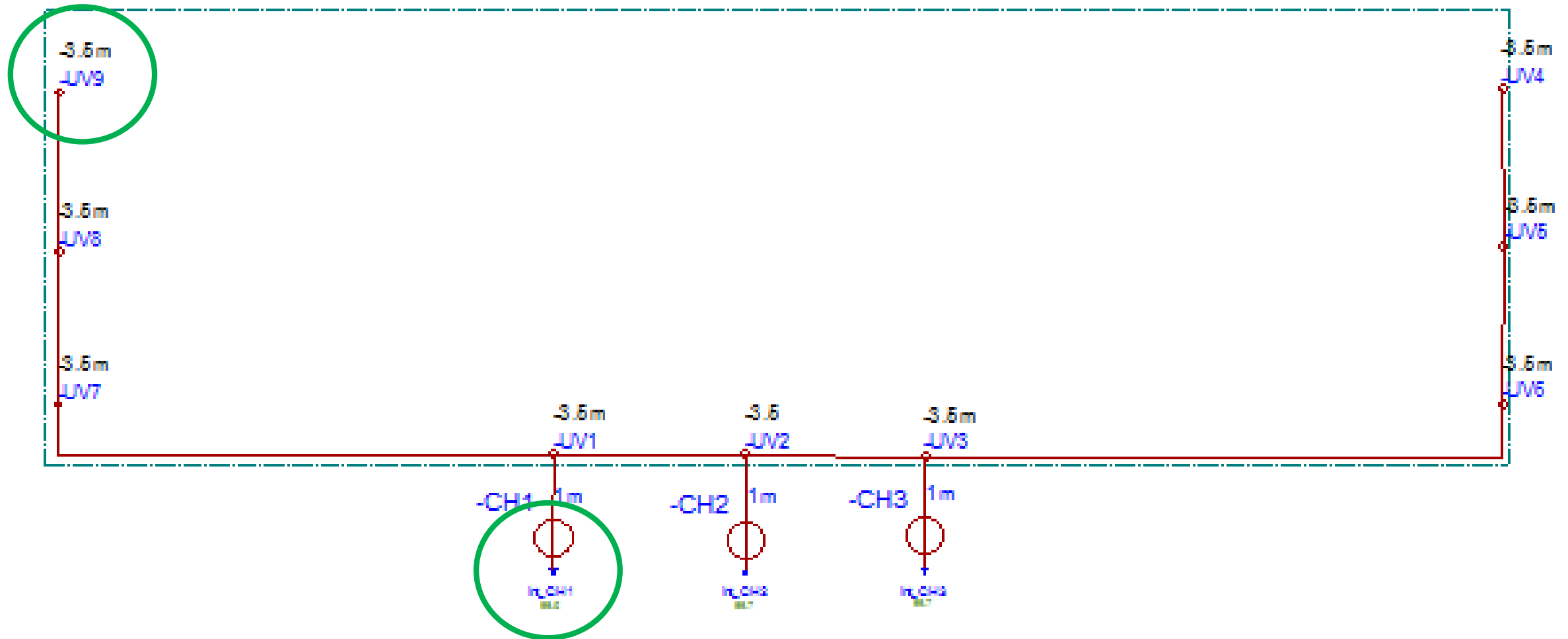
Ground Floor - Zero Point Level





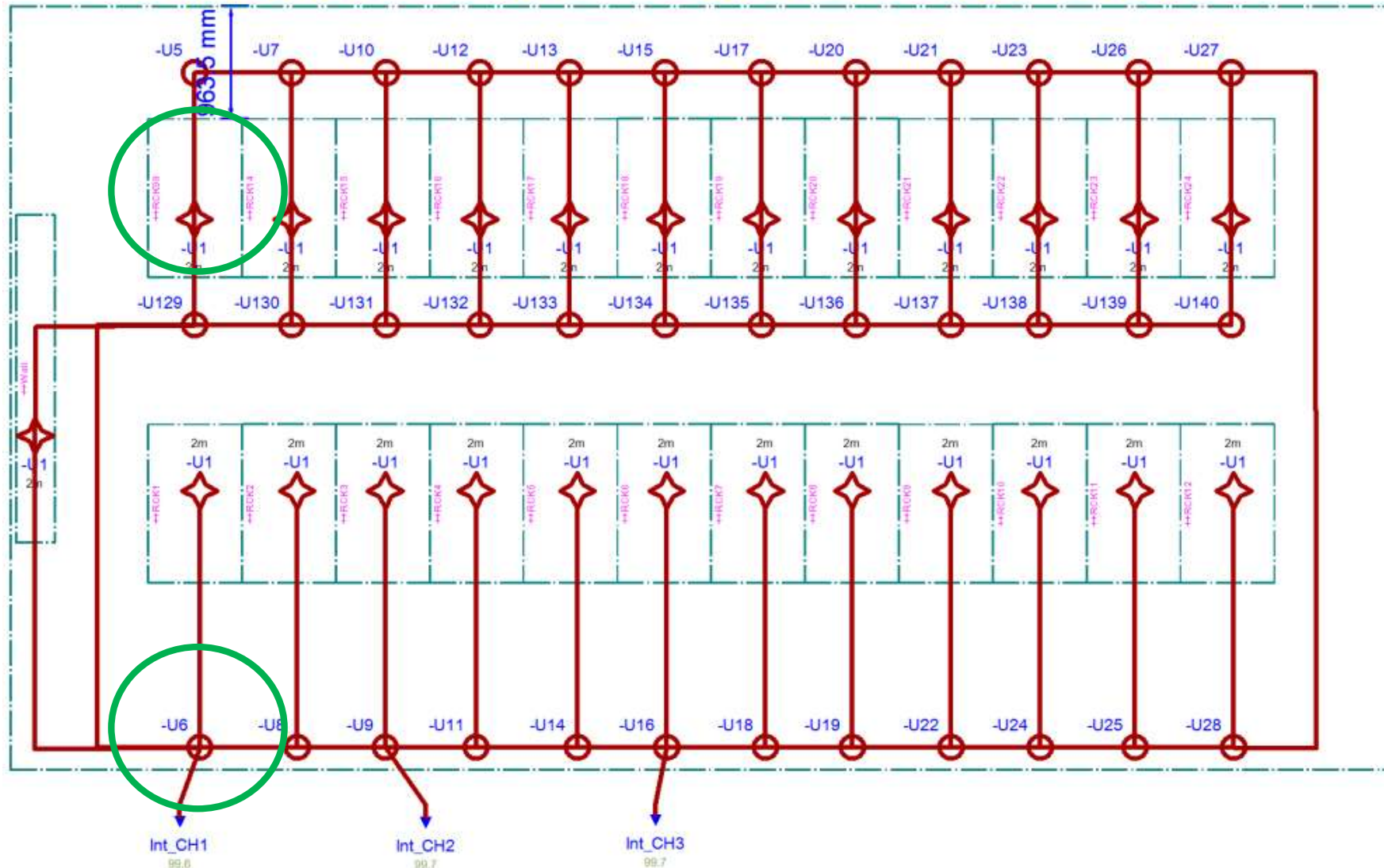
Cable Trays Planning

Ground Floor - Cable Trays Level

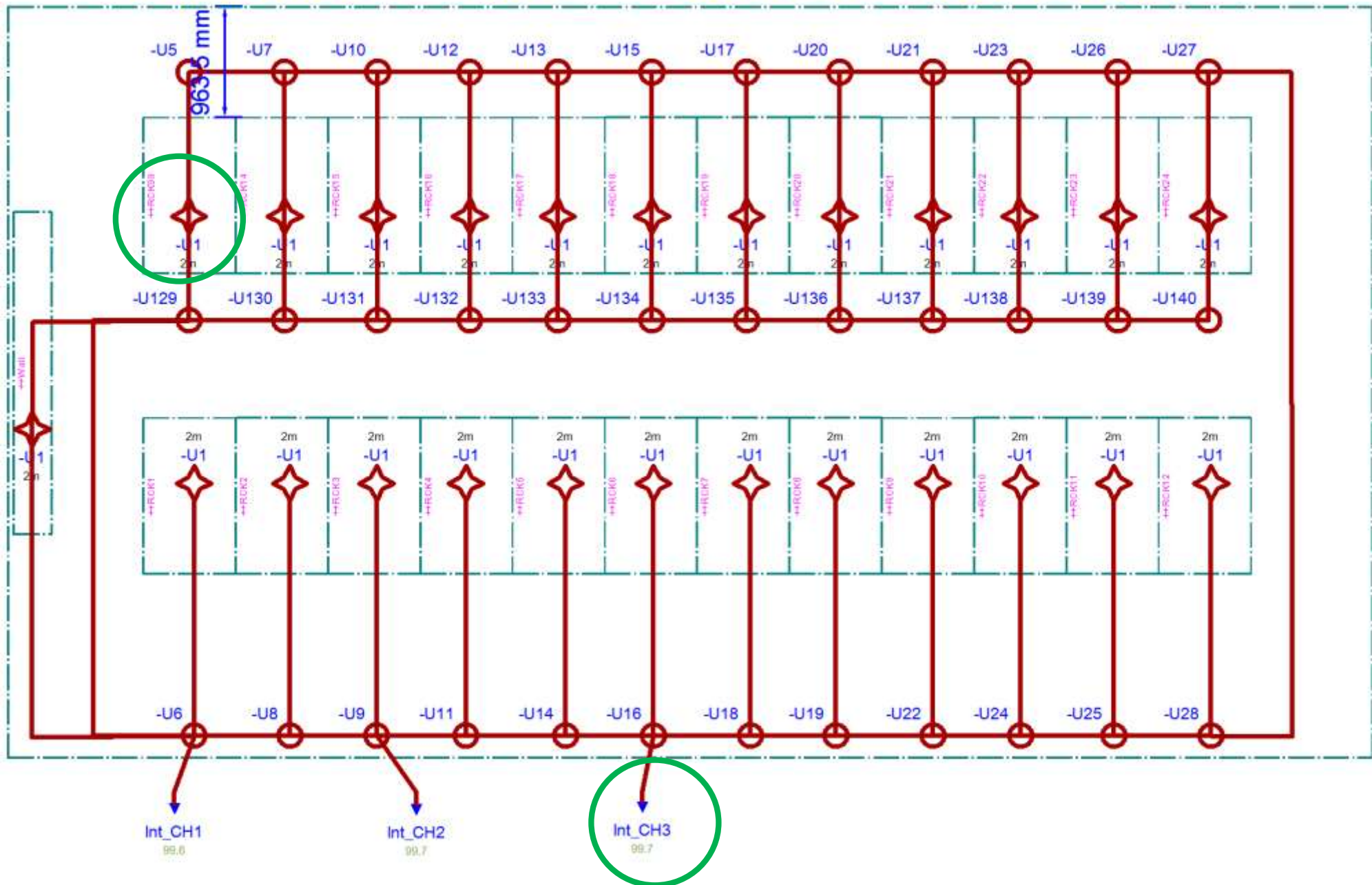


“Rack-room” Planning

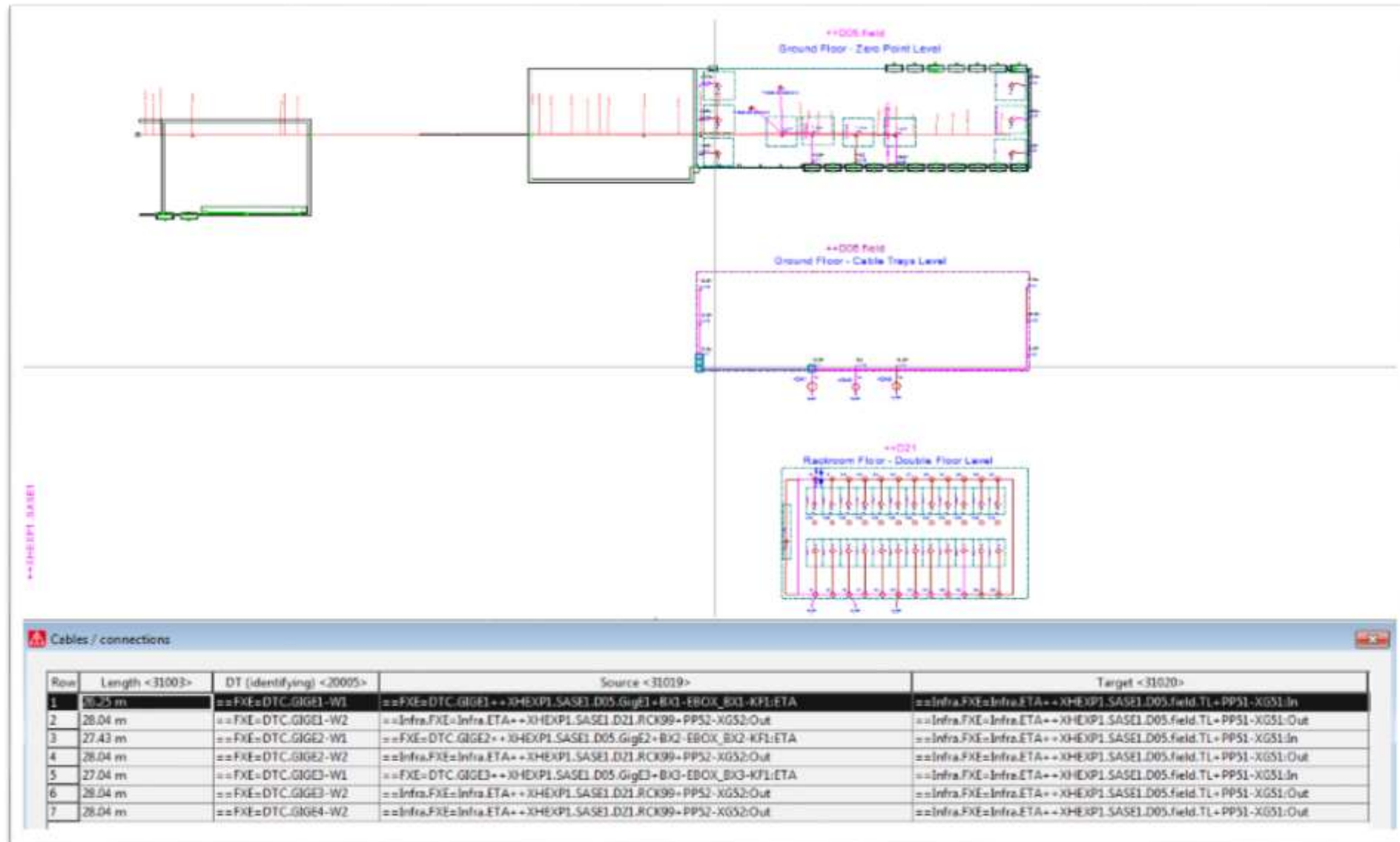
Rackroom Floor - Double Floor Level



Rackroom Floor - Double Floor Level



Cable Trays Content Management



Dynamic Data Completion – IEC Norm

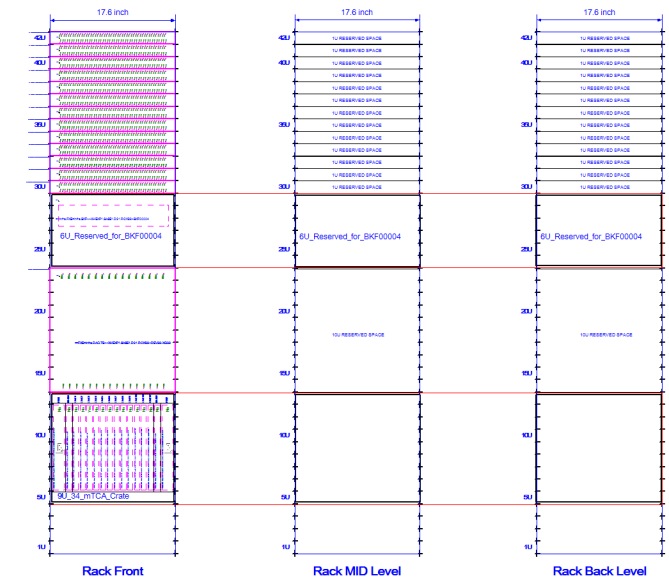
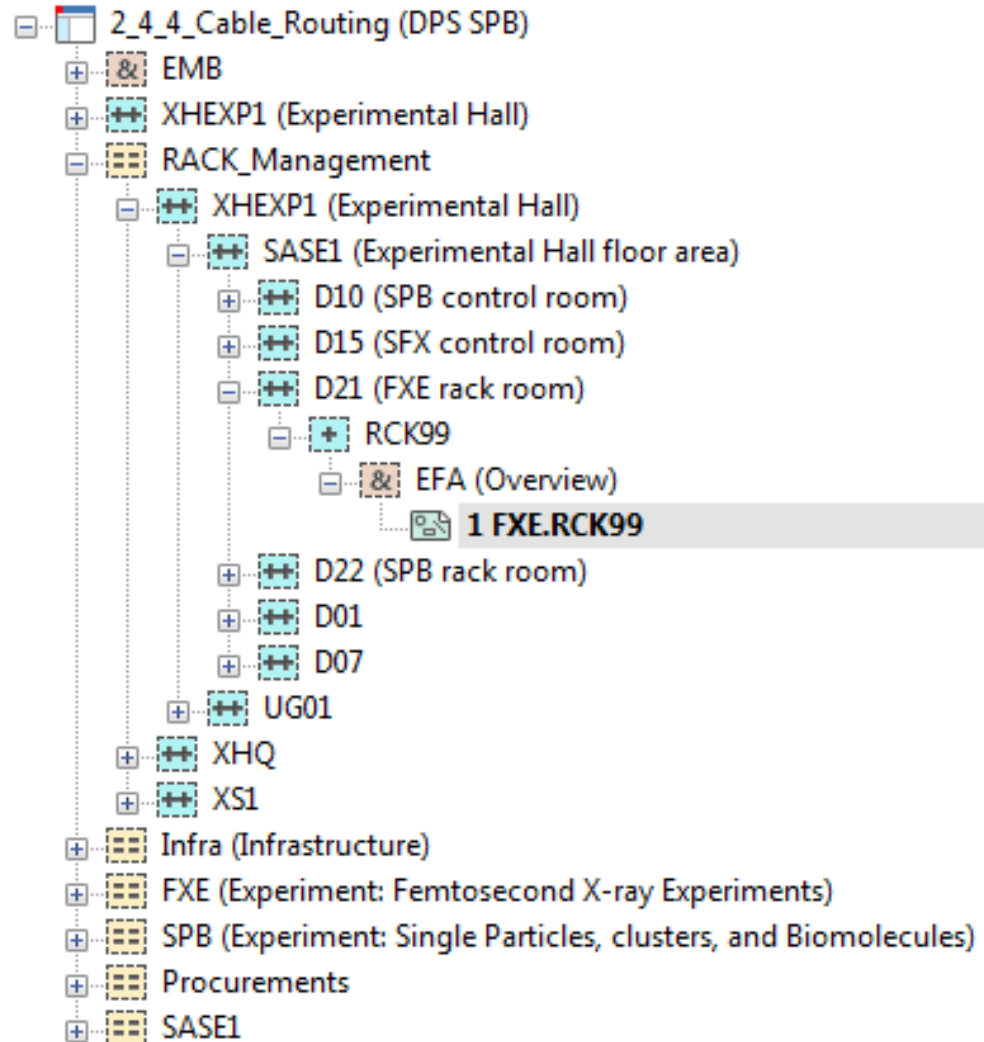
Example: Power Socket

- **Main Function** Distribution
- **Sub Function** 220VAC
- **Location** Building_X.Floor_Y.Room_Z
- **Installation Location** Wall_NW

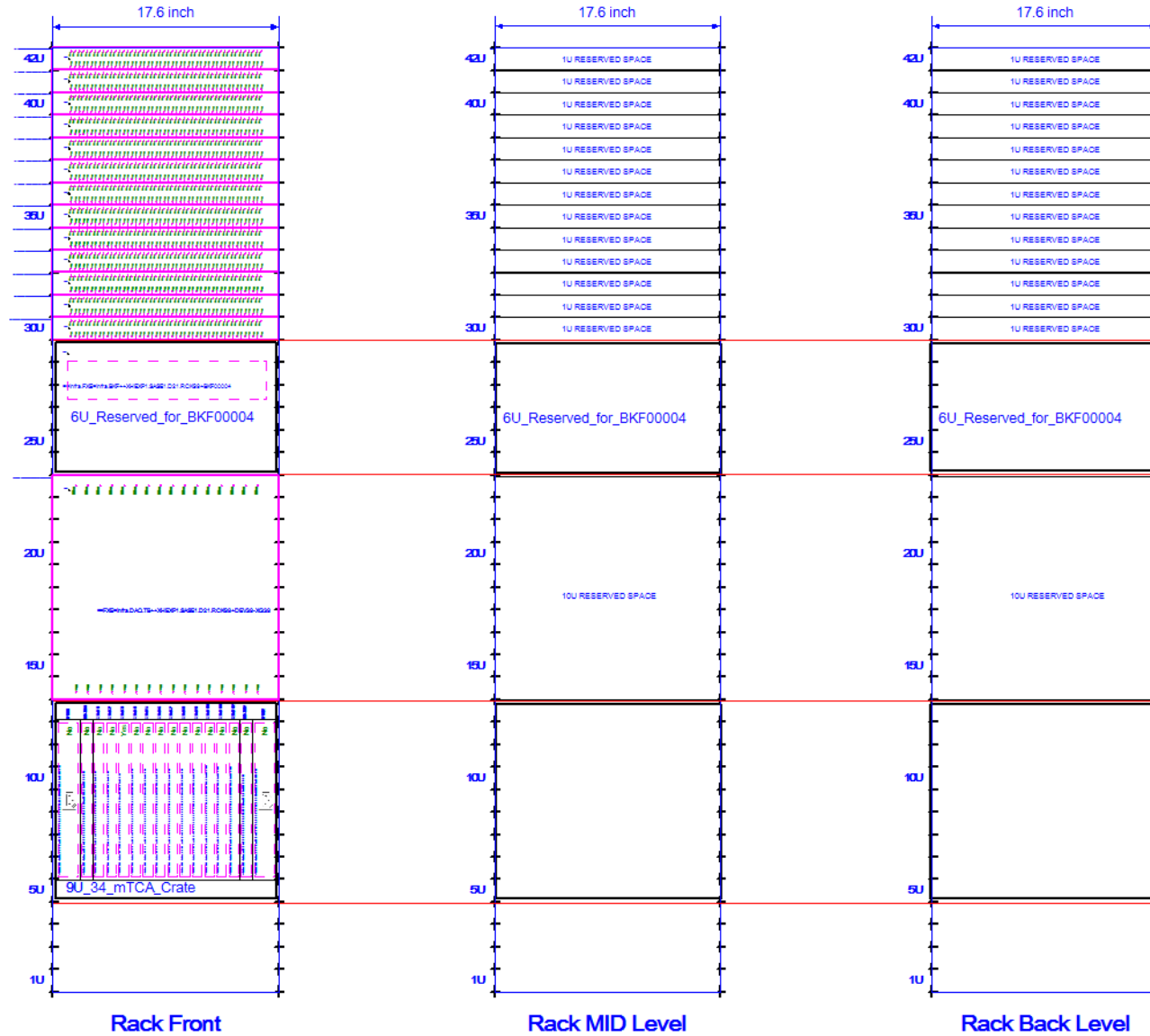
IEC Norm example:

==DISTR =220VAC ++BLD1.FL5.RM21 +WL_NW

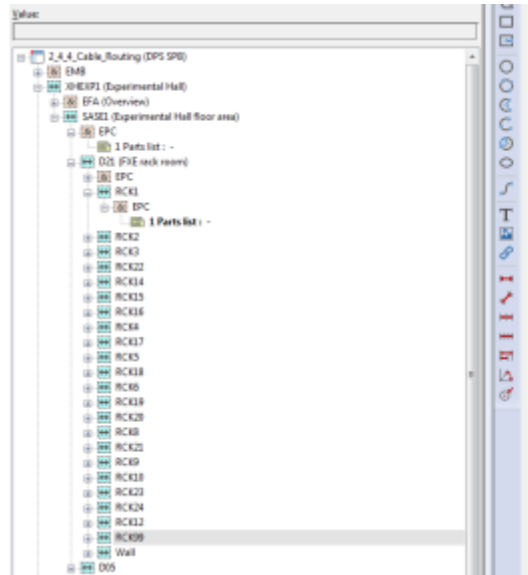
Rack Content Management – Rack Views



Rack Content Management – Rack Views

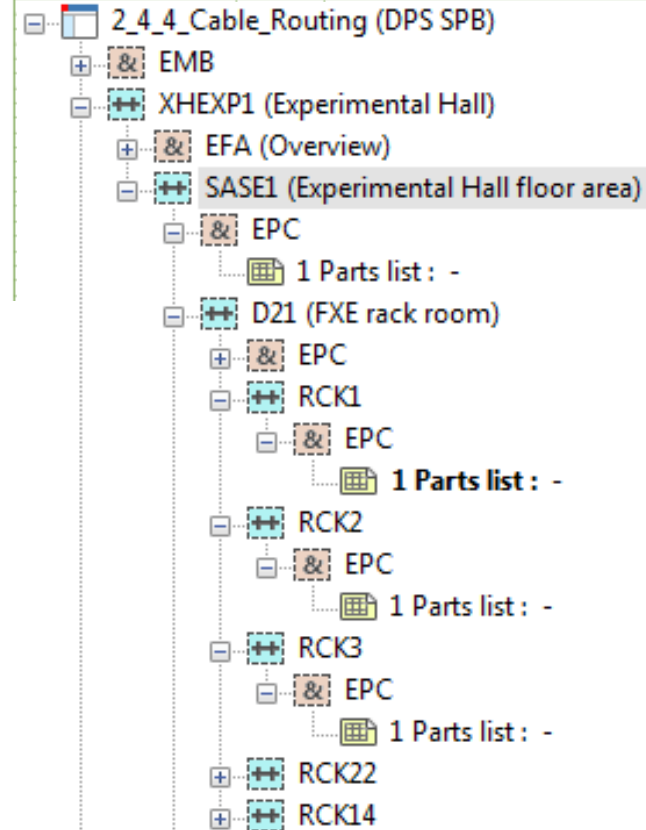


Rack Content (“BOMs”/ Views)



Parts list

XPEL_F01_001

[illegible]

Framework Definition

“A combination of software utilities able to “automatically”
produce BOMs, cable lists, Connection diagrams etc”

Custom Solution to overcome **limitations**

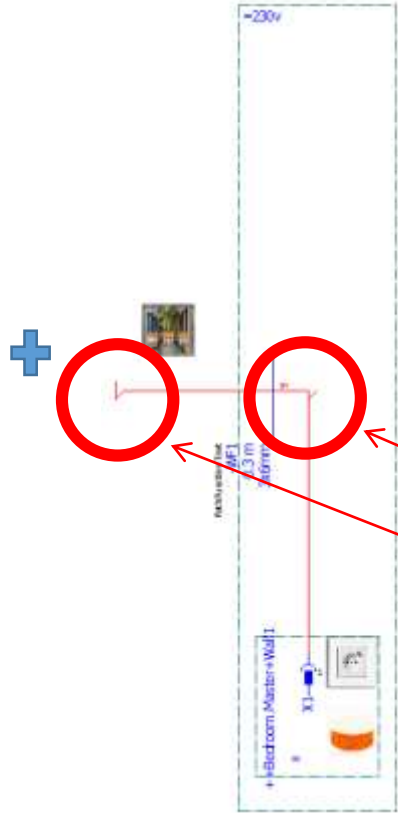
Complexity:

- 1000s sensors
- 1000s motors
- 1000s PLC components
- 1000s Network components
- 100s Racks
- **1 person**

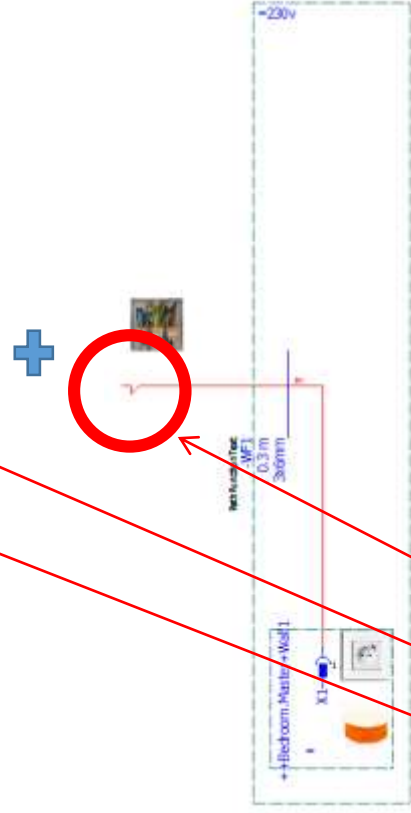
Functions Concept



Single
Function

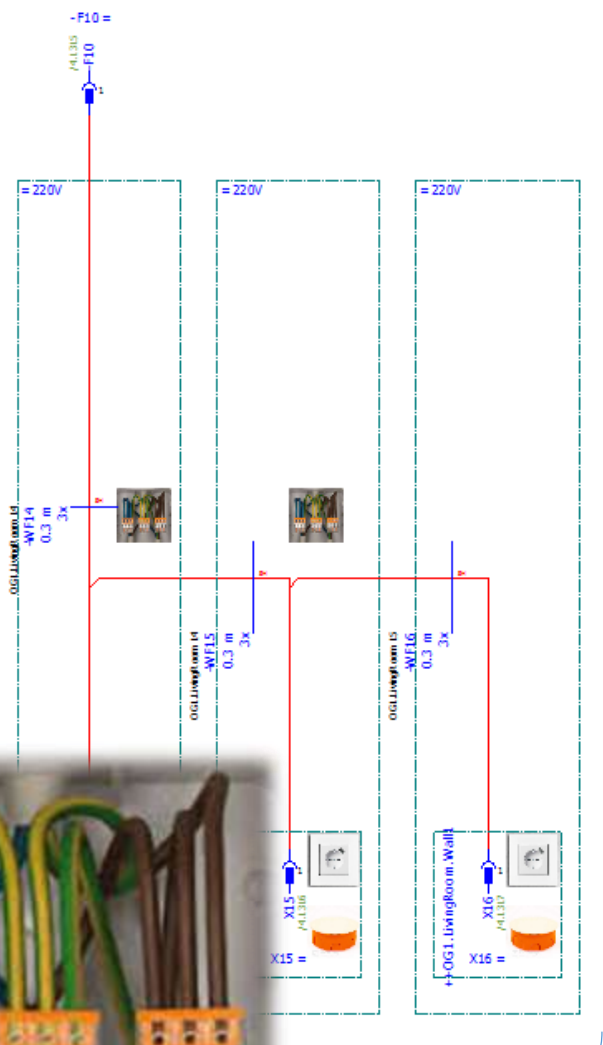


Single
Function

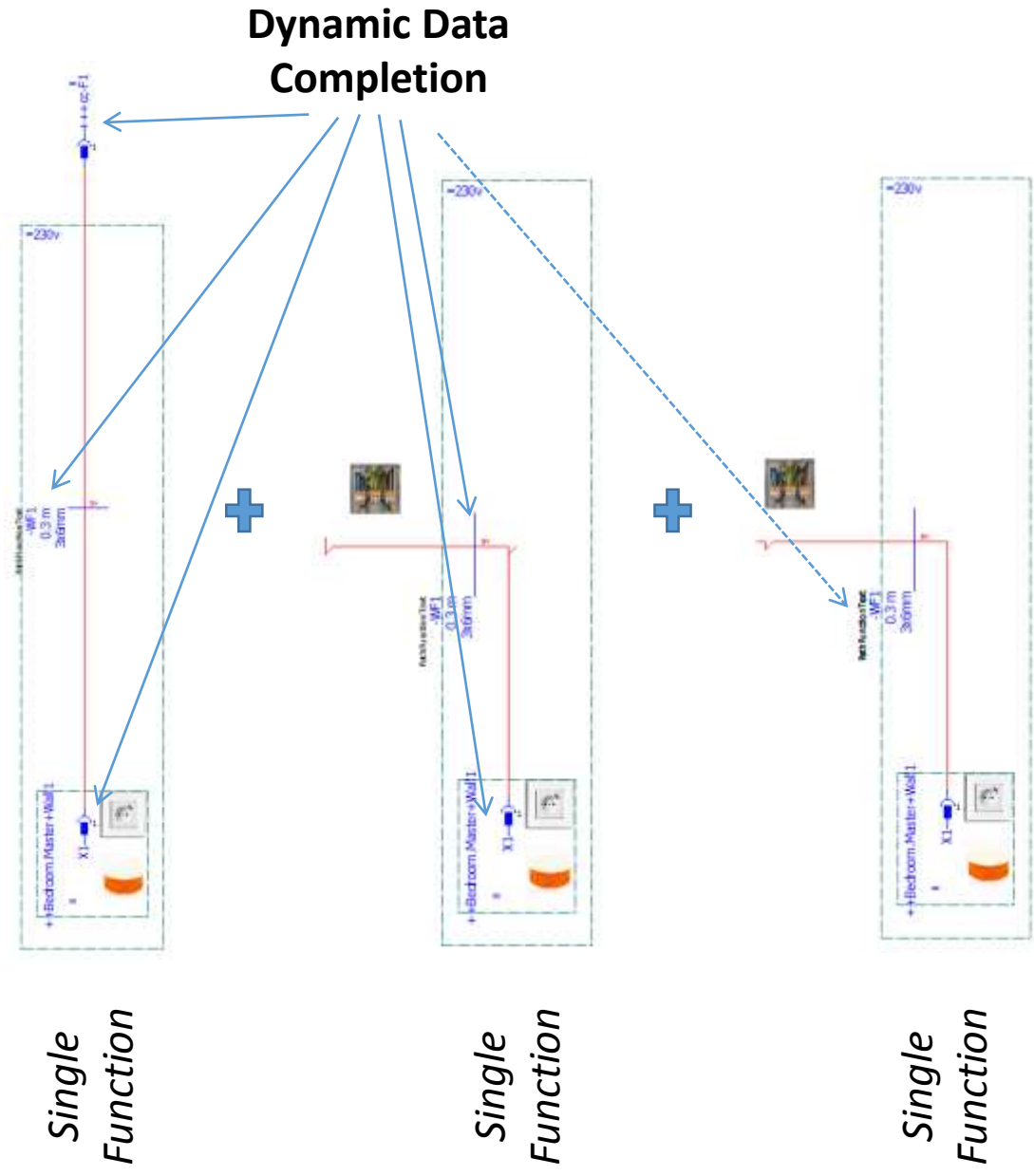


Single
Function

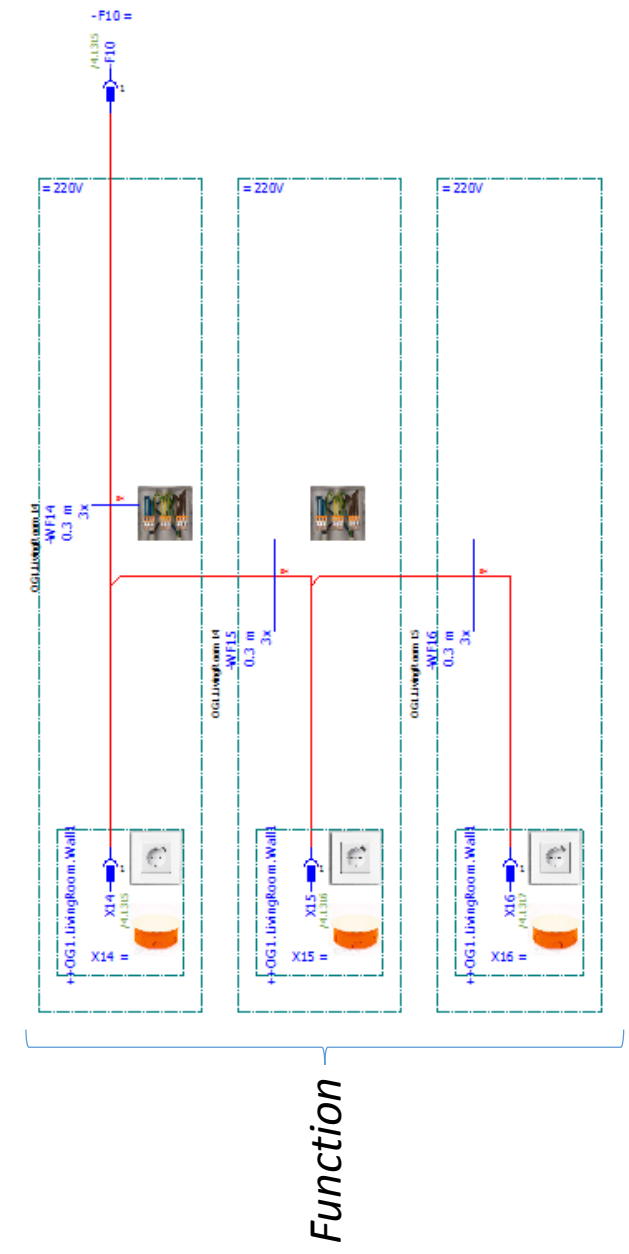
Processing

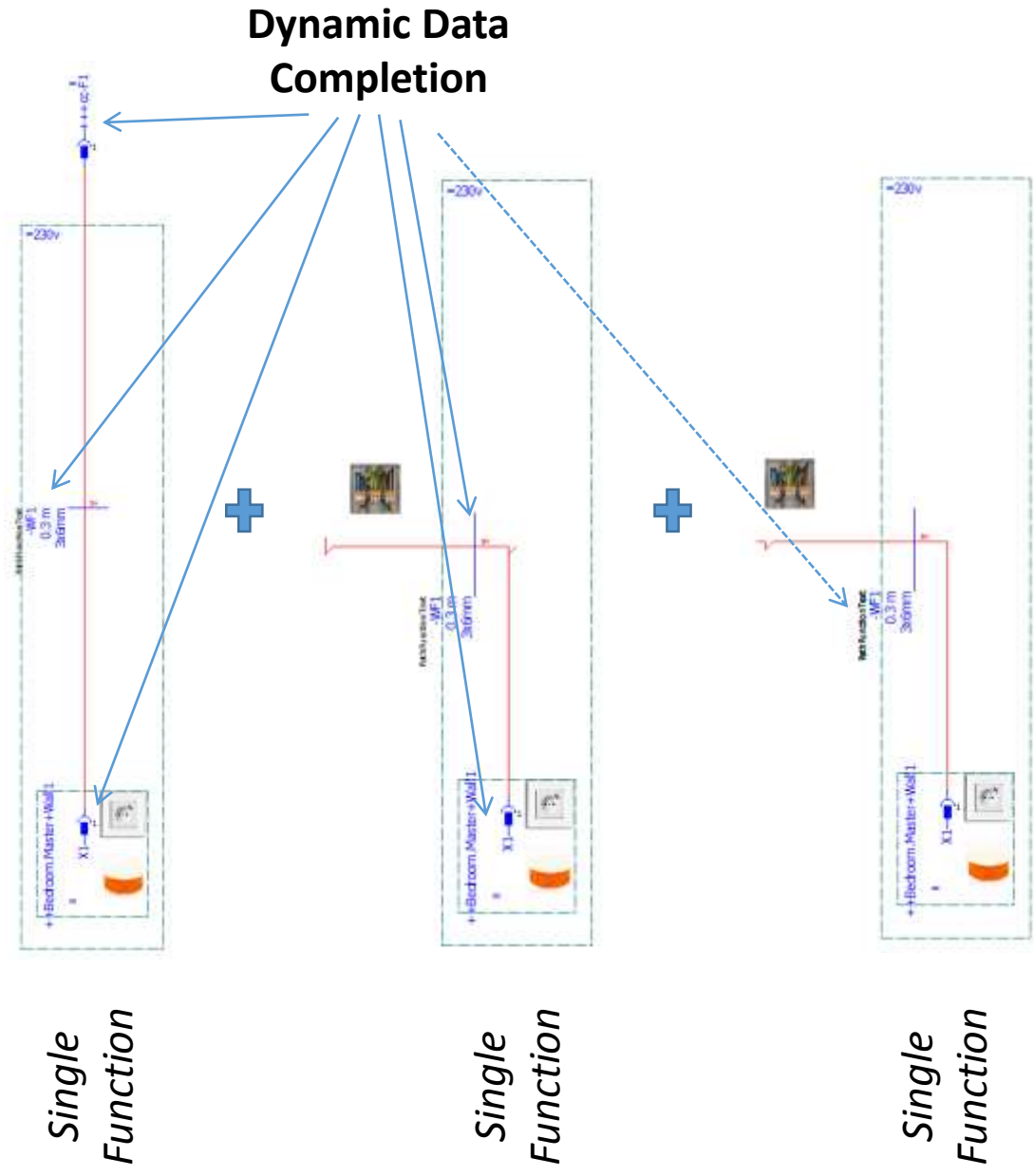


Function

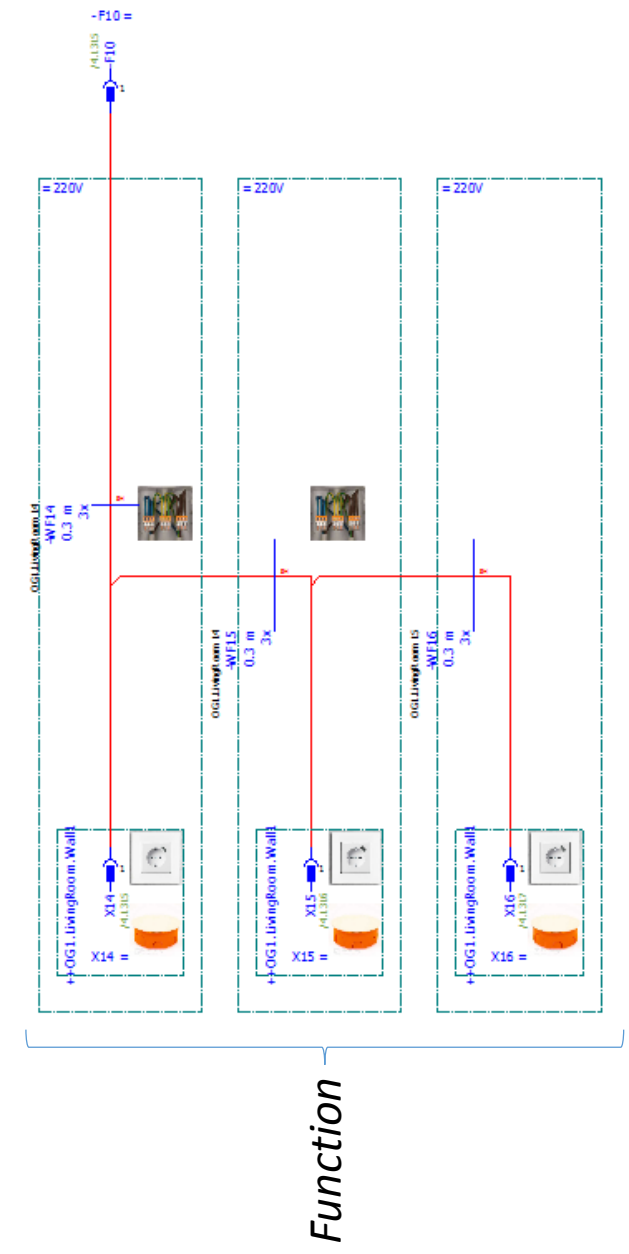


Processing





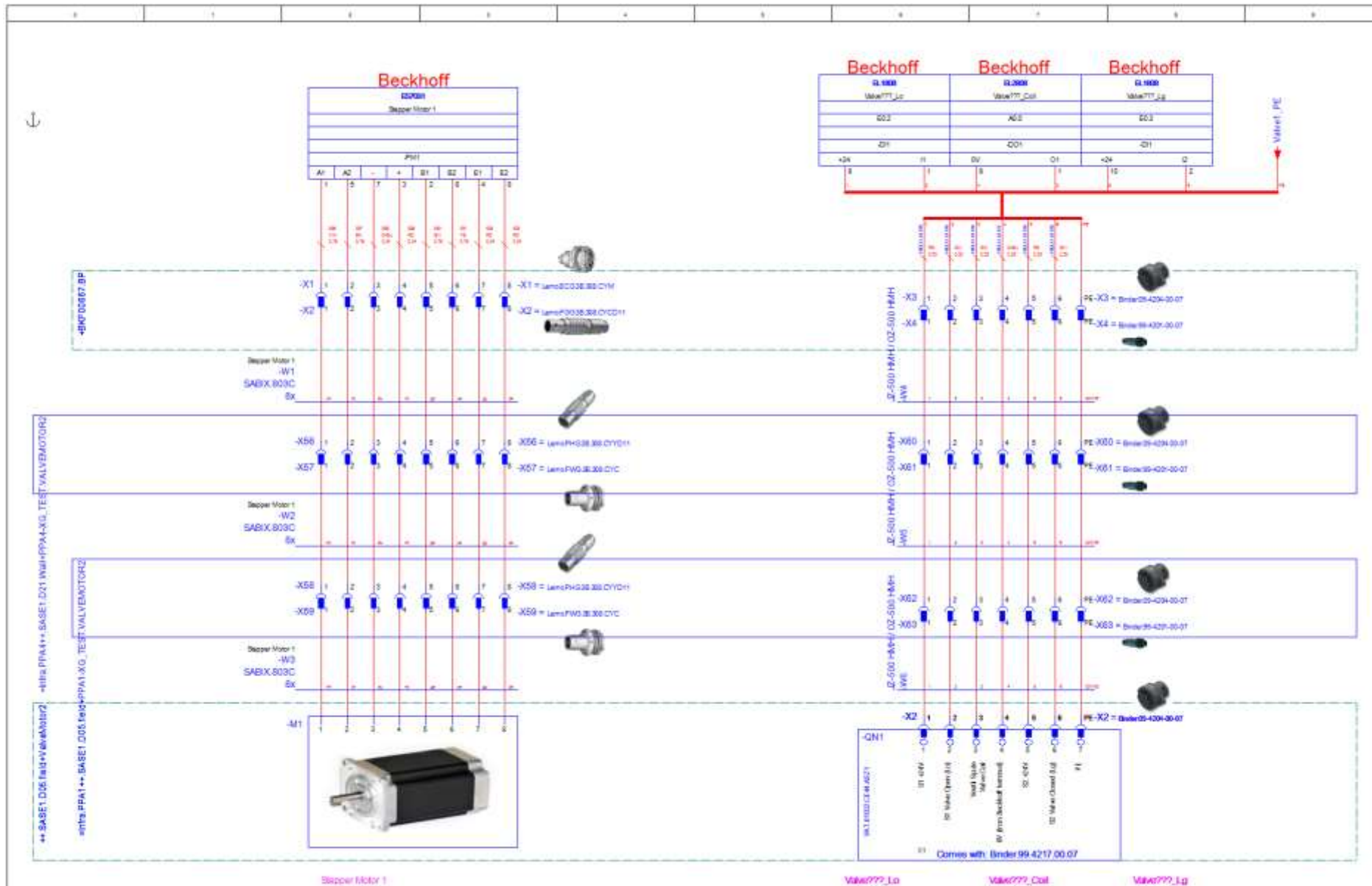
Processing



Project Specs

- X amount of motors
- Y1 amount of thermal sensors of Z2 type
- Y2 amount of thermal sensors of Z2 type
- ...
- ...
- ...

How the Information are used by eCAD Design Team



How the Information are used

Diagram illustrating the use of variables in a Beckhoff PLC system, showing a variable definition dialog box overlaid on a ladder logic diagram.

The diagram shows three Beckhoff PLC modules (EL 5001, EL 5002, EL 5003) connected to a power supply (Value1_PU) and a motor (Stapper Motor 1). The modules are labeled with their respective addresses: EL 5001 (Value1_Lo), EL 5002 (Value1_Coil), and EL 5003 (Value1_Lg). The motor is labeled with its address: Stapper Motor 1.

The variable definition dialog box is titled "Properties (components) Placeholder object". It contains the following information:

- Placeholder object: Display | Symbol data
- Name: [Empty field]
- Assignment: Values
- Category: All categories
- Table with 2 columns: Row, Variable
- Table content:

Row	Variable
5	
6	==<<COMPONENT_==><<COMPONENT_==><<COMPONENT_==>.field<<COMPONENT_==>
7	
8	=<<+.BP
9	
10	
11	==<<==>=Infra.PPA<BACKROOM_AGGREGATED_PP_No><<Backroom><<BACKROOM_AGGREGATED_PP_Wall or RCK with No>>PPA<BACKROOM_AGGREGATED_PP_No>-XG<<COMPONENT_==>
12	
13	==<<==>=Infra.PPA<EXP_HUTCH_AGGREGATED_PP_No><<ExpHutch><<field>PPA<EXP_HUTCH_AGGREGATED_PP_No>-XG<<COMPONENT_==>

- ☒ Only display properties with value in Variable column
- ☐ Only display properties with value in Current value column
- ☒ Page properties

The dialog box also includes a Preview window showing a schematic diagram of the motor and its connections. The buttons at the bottom are OK, Cancel, and Apply.

Master Project Integration

What variables are needed?

AssignmentValues

↑↓

Variable
Page_Description_StepperMotor_Multiline_Page
==
+
ExpHutch++
Rackroom++
COMPONENT_==
COMPONENT_ =
COMPONENT++
COMPONENT+
EXP_HUTCH_AGGREGATED_PP_No
RACKROOM_AGGREGATED_PP_No
RACKROOM_AGGREGATED_PP_Wall_or_RCK_with_No

◀ ||| ▶

[illegible]

Custom Solution Implemented

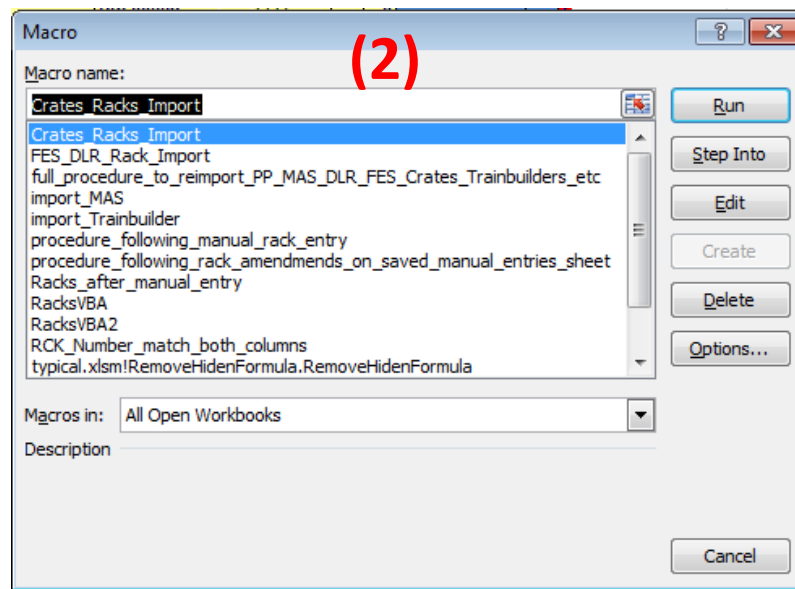
BKF00665	EFA	0	!	VALVE_MOTOR1	RCK99	6	FXE	BKF00665	XHEXP1.SASE1.D05	XHEXP1
BKF00665	EFS	0	!							
BKF00667	EFA	0	!							
BKF00667	EFS	0	!							
BKF00667	EFA	0	!							
BKF00667	EFS	0	!	VALVEMOTOR2						
RCKPSU	EFS	0	!							
BKF00666	EFS	0	!							
BKF00666	EFA	0	!							

(1)

=INDEX(Crates_Chassis!\$T:\$T, MATCH(E15,Crates_Chassis!\$Q:\$Q,0))

INDEX(array, row_num, [column_num])

INDEX(reference, row_num, [column_num], [area_num])

[illegible]

Specs Database

Network Equipment

Lights

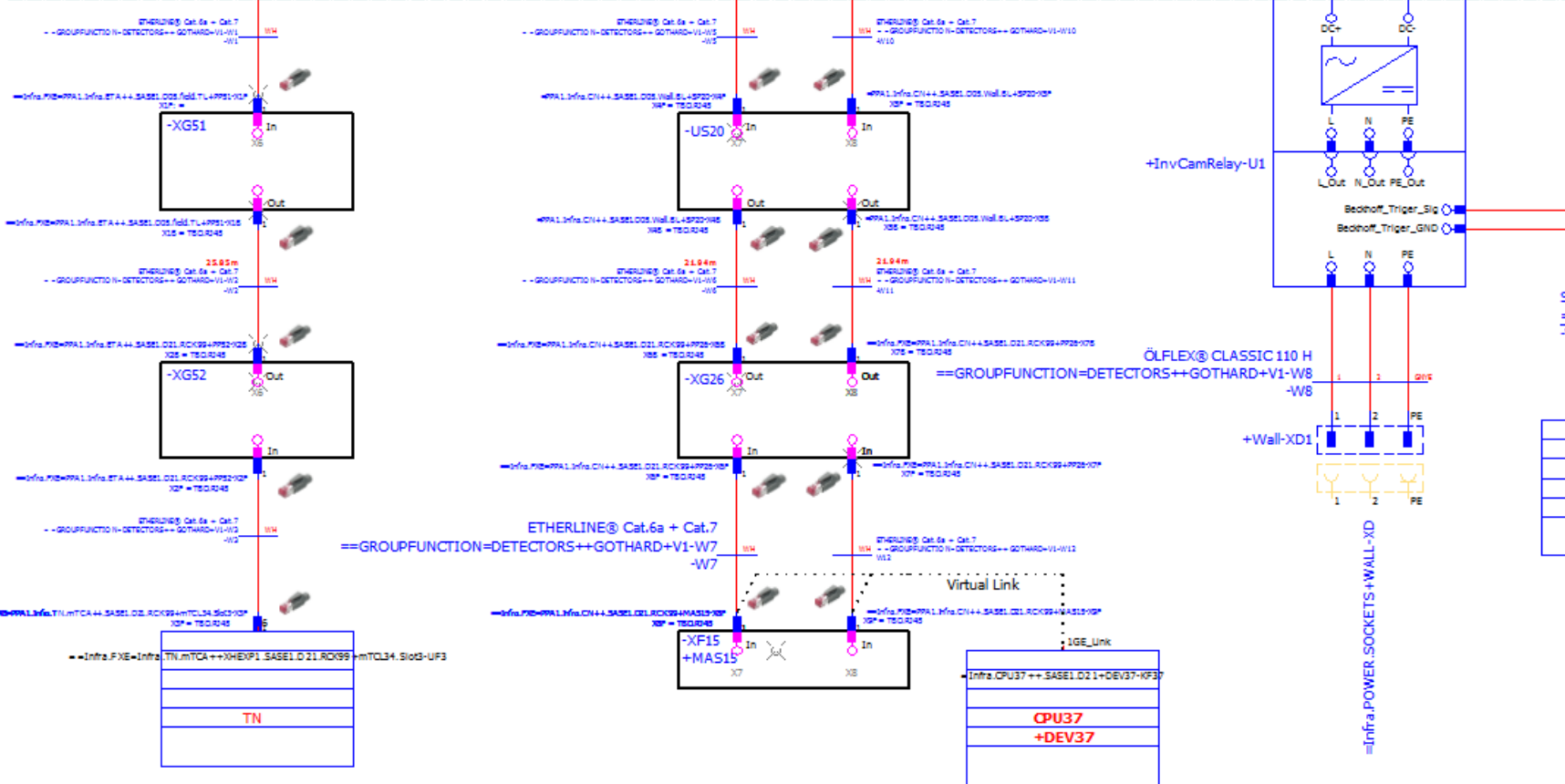
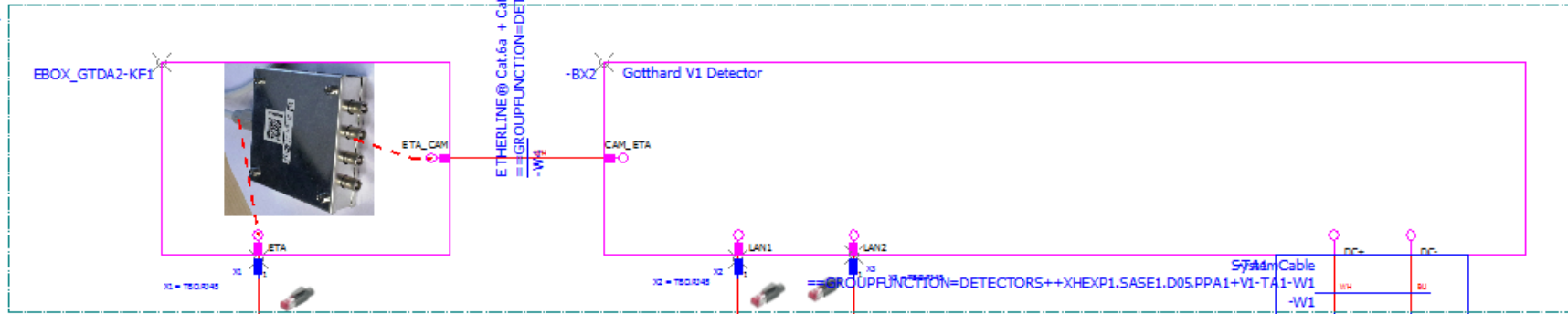
Cameras

Projects

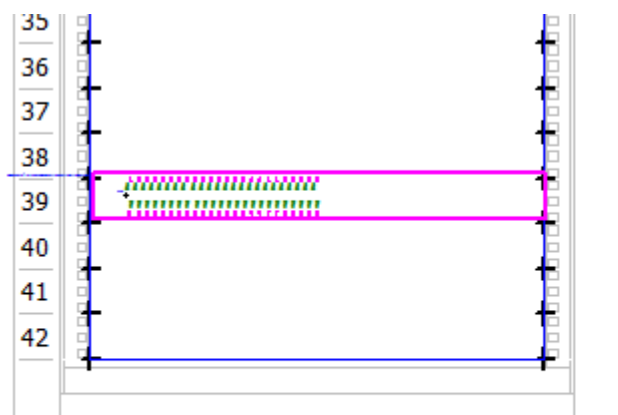
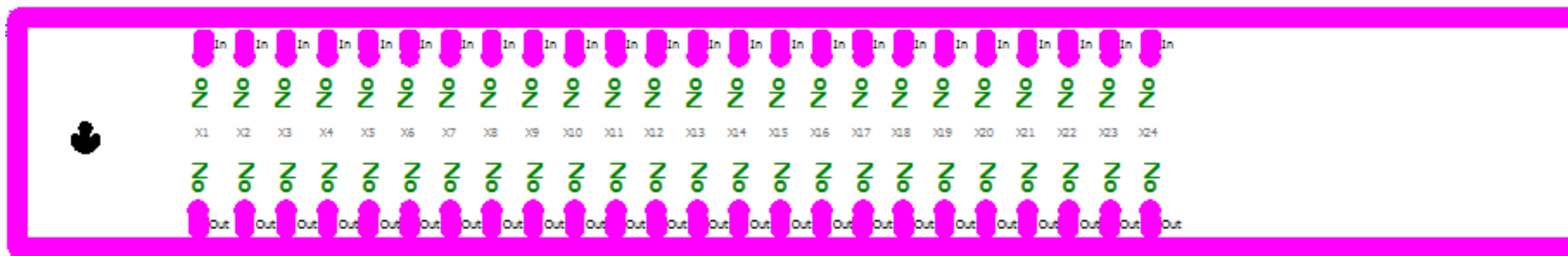
Custom Solution Implemented

- Master Project Integration
 - Why
 - Unified installation documents (cable lists, parts lists...)
 - Error checking
 - i.e. Avoid short-circuits during design, No duplicate cable labels, etc
 - Reproducibility of existing projects without extra eCAD designer work/involvement
 - Managed by only 1 person

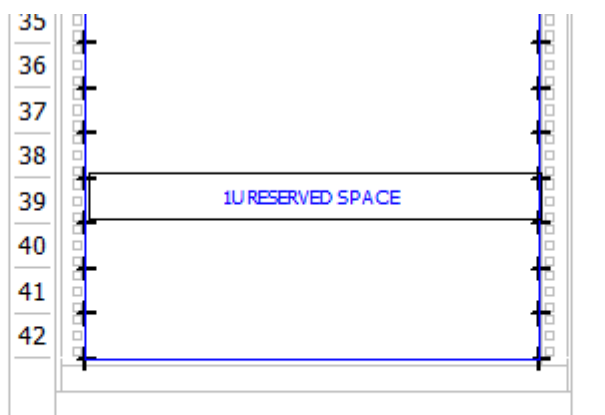
+XHEXP1.SASE1.D05.PPA1



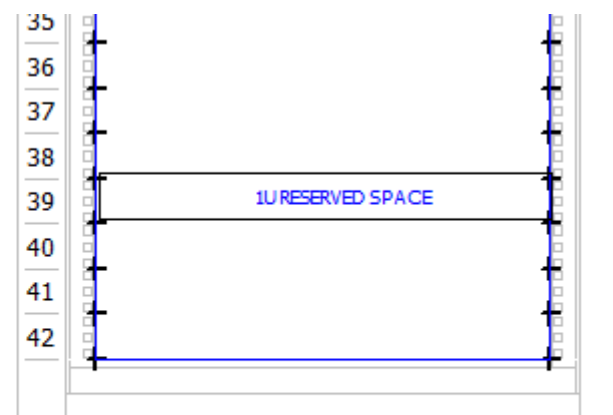
[illegible]



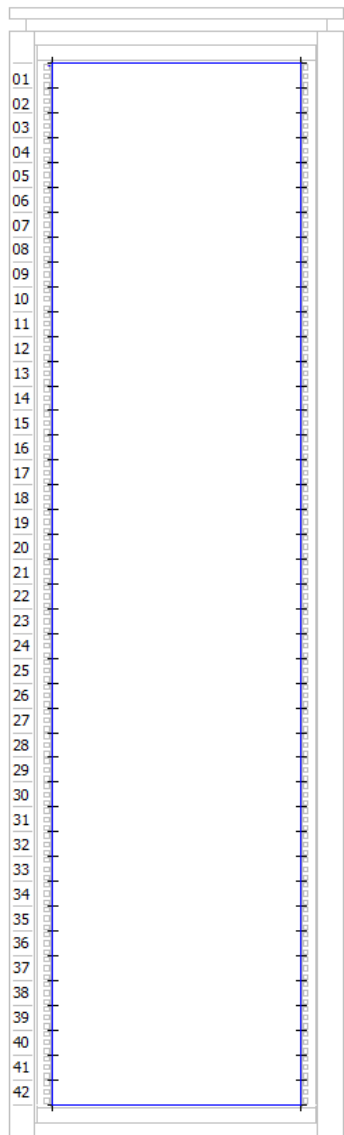
Rack Front



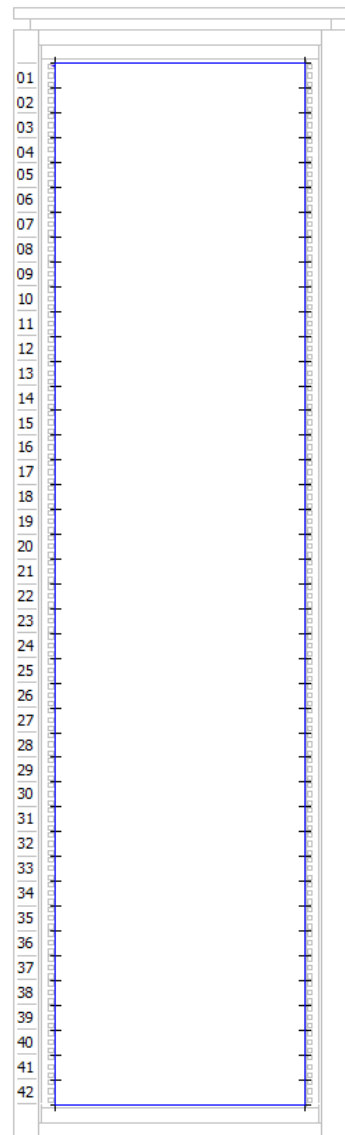
Rack MID Level



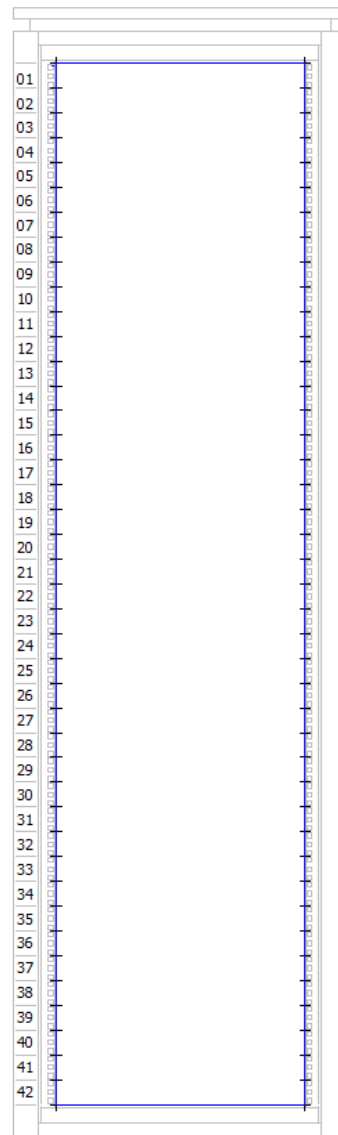
Rack Back Level



Rack Front



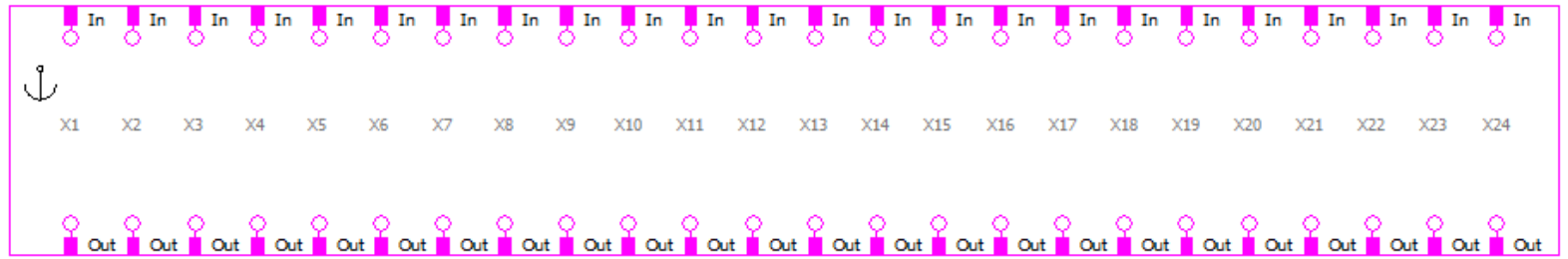
Rack MID Level



Rack Back Level



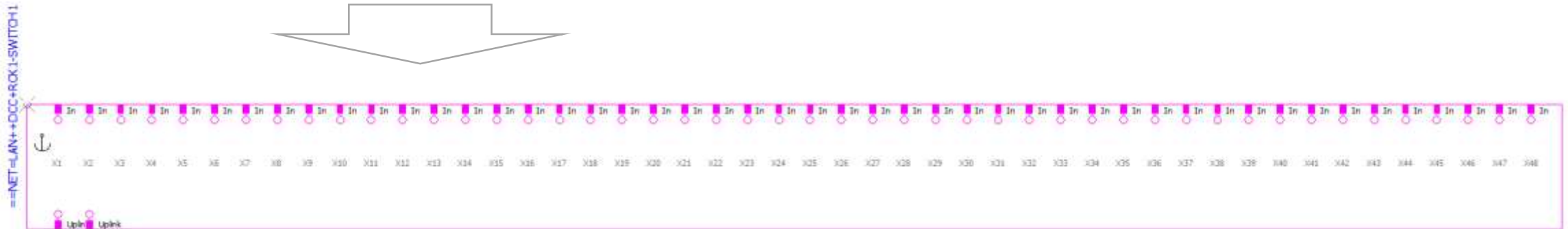
-XG?

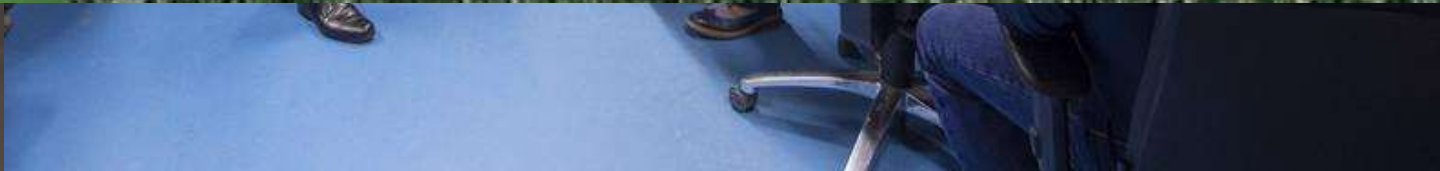


48 ports Network Switch



24 ports Patch Panel





DATACENTER CABLING / RACK MANAGEMENT

- Import Networks' Infrastructure:
 - Racks
 - Managed Switches
 - Unmanaged Switches
 - Patch-panels
 - Power Supply
 - UPS (rack mounted components)
 - Define Cooling direction of each rack
- Import
 - Components (CPUs, Automation Items, Rack mounted equipment)

Import Networks Infrastructure

Switches

Patch-Panels

Racks

“Projects”

The image shows a detailed technical table, likely a camera schedule or layout plan. The table is organized into columns with various headers and data entries. The columns are color-coded: yellow for the first few columns, green for the next few, blue for the next few, and white for the last few. The rows are numbered 1 through 10. The table is part of a larger document, with other pages visible in the background. A blue arrow points from the top right corner of the image towards the table.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																																																																																

Moving from planning to building...

- Parts List

- Wiring

- Installation Instruction

Reports:

Topology: Routed cables / connections

F36_001

• BOMs / Part Lists

• Cable Laying Instructions

• Connection Instructions

• Connectors Pin Assignment / Confectioning Instructions

• Terminal Connections

• Rack Content Summary

• Cable Lengths

• ...

Designation	Part number	Type number	Length [m]	Source	Routing track	Target
==Distr=220V-WF5	NYA 3x1.5mm2		11.22	==Distr=220V++OG1.HCR-F6	-U140; ++OG1.HCR-U6; ++OG1.Kitchen-U29; ++OG1.Kitchen-U28 ++OG1.Kitchen.Wall1-U2; -U150	==Distr=220V++OG1.Kitchen.Wall1-X1
==Distr=220V-WF5	NYA 3x1.5mm2		10.06	==Distr=220V++OG1.HCR-F7	-U141; ++OG1.HCR-U6; ++OG1.Kitchen-U29; ++OG1.Bedroom.Single1-U11 ++OG1.Bedroom.Single1-U10; ++OG1.Bedroom.Single1-U9; -U139	==Distr=220V++OG1.Bathroom.Wall1-X5
==Distr=220V-WF5	NYA 3x1.5mm2			==Distr=220V++OG1.HCR-F8	-U142; ++OG1.HCR-U6; ++OG1.Corridor-U9; ++OG1.Corridor-U4 ++OG1.Corridor-U5; ++OG1.Corridor-U6; ++OG1.Bedroom.Double1.Wall1-U2 -U153	==Distr=220V++OG1.Bedroom.Double1.Wall1-X6
==Distr=220V-WF7	NYA 3x2.5mm2		15.35	==Distr=220V++OG1.Bedroom.Double1.Wall1-X6	-U153; ++OG1.Bedroom.Double1.Wall1-U2; -U99 ++OG1.Bedroom.Double1.Wall2-U2; -U155	==Distr=220V++OG1.Bedroom.Double1.Wall2-X7
==Distr=220V-WF7	NYA 3x2.5mm2			==Distr=220V++OG1.Bedroom.Double1.Wall1-X8	-U154; ++OG1.Bedroom.Double1.Wall1-U2; -U99 ++OG1.Bedroom.Double1.Wall2-U2; -U155	==Distr=220V++OG1.Bedroom.Double1.Wall2-X7
==Kitchen=220V-WF1	NYA 3x6mm2		18.29	==Kitchen=220V++OG1.Kitchen.Hobs.Wall1-X1	-U158; ++OG1.Kitchen.Hobs.Wall1-U2; ++OG1.Kitchen-U33; ++OG1.Kitchen-U26 ++OG1.Kitchen-U25; ++OG1.Kitchen-U23; ++OG1.Kitchen-U22	==Kitchen=Infra++OG1.HCR-F3
==Kitchen=220V-WF2	NYA 3x2.5mm2		18.44	==Kitchen=220V++OG1.Kitchen.Oven.Wall1-X2	-U159; ++OG1.Kitchen.Oven.Wall1-U3; ++OG1.Kitchen-U33; ++OG1.Kitchen-U26 ++OG1.Kitchen-U24; ++OG1.Kitchen-U23; ++OG1.Kitchen-U22 ++OG1.Kitchen-U29; ++OG1.HCR-U6; -U147	==Kitchen=Infra++OG1.HCR-F4
==Kitchen=220V-WF3	NYA 3x2.5mm2			==Kitchen=220V++OG1.Kitchen.Wall1-X3	-U151; ++OG1.Kitchen.Wall1-U2; ++OG1.Kitchen-U28; ++OG1.Kitchen-U29 ++OG1.HCR-U6; -U148	==Kitchen=Infra++OG1.HCR-F5
==Kitchen=220V-WF4	NYA 3x2.5mm2		13.73	==Kitchen=220V++OG1.Kitchen.Wall1-X3	-U151; ++OG1.Kitchen.Wall1-U2; ++OG1.Kitchen-U28; ++OG1.Kitchen-U22 ++OG1.Kitchen-U23; ++OG1.Kitchen.Wall2-U2; -U152	==Kitchen=220V++OG1.Kitchen.Wall2-X4
==Kitchen=220V-WF4	NYA 3x2.5mm2			==Kitchen=220V++OG1.Kitchen.Wall2-X4	-U152; ++OG1.Kitchen.Wall2-U2; ++OG1.Kitchen-U31; -U149	==Kitchen=220V++OG1.Kitchen.Wall3-X5
==SAFETY=Alarm-W70002			19.16	==NET=Alarm++OG1.Bedroom.Double1+Door-XG	-U156; ++OG1.Bedroom.Double1-U5; ++OG1.Bedroom.Double1-U4; -U99 ++OG1.Corridor-U6; ++OG1.Corridor-U5; ++OG1.Corridor-U4; ++OG1.Corridor-U9 ++OG1.HCR-U6; -U144	==SAFETY=Alarm++OG1.HCR+OG1.IC60-XG5
==SAFETY=Alarm-W70003			19.16	==NET=Alarm++OG1.Bedroom.Double1+Balcony-XG	-U157; ++OG1.Bedroom.Double1-U5; ++OG1.Bedroom.Double1-U4; -U99 ++OG1.Corridor-U6; ++OG1.Corridor-U5; ++OG1.Corridor-U4; ++OG1.Corridor-U9 ++OG1.HCR-U6; -U145	==SAFETY=Alarm++OG1.HCR+OG1.IC60-XG6

Opportunity

Conceptual Design – Fast Budget Preparation

Prerequisites

- Draft Floor Plans (top & side view)
- Desired (Scientific) Equipment

Project phase

- Prepare quote for future project based on actual data
 - +/- 20% - Concept Proposal
 - Based on Conceptual Floor Plan
 - Based on Conceptual Equipment
 - Cable Routing Paths
 - Cable Lengths
 - Summarised potential parts (list)
 - +/- 5% - Detailed Plan
 - Based on Current/Actual Floor Plan
 - Based on Agreed Developed Equipment
 - Cable Routing Paths with Cable Run-Ways size/weight/Capacity estimate
 - Cable Lengths
 - Summarised actual parts (list)

Unify Everything

Concept -> Pre-Planning ->
-> Design -> Commissioning

...get ready for “Datacenter 4.0”

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Thank you

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