

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

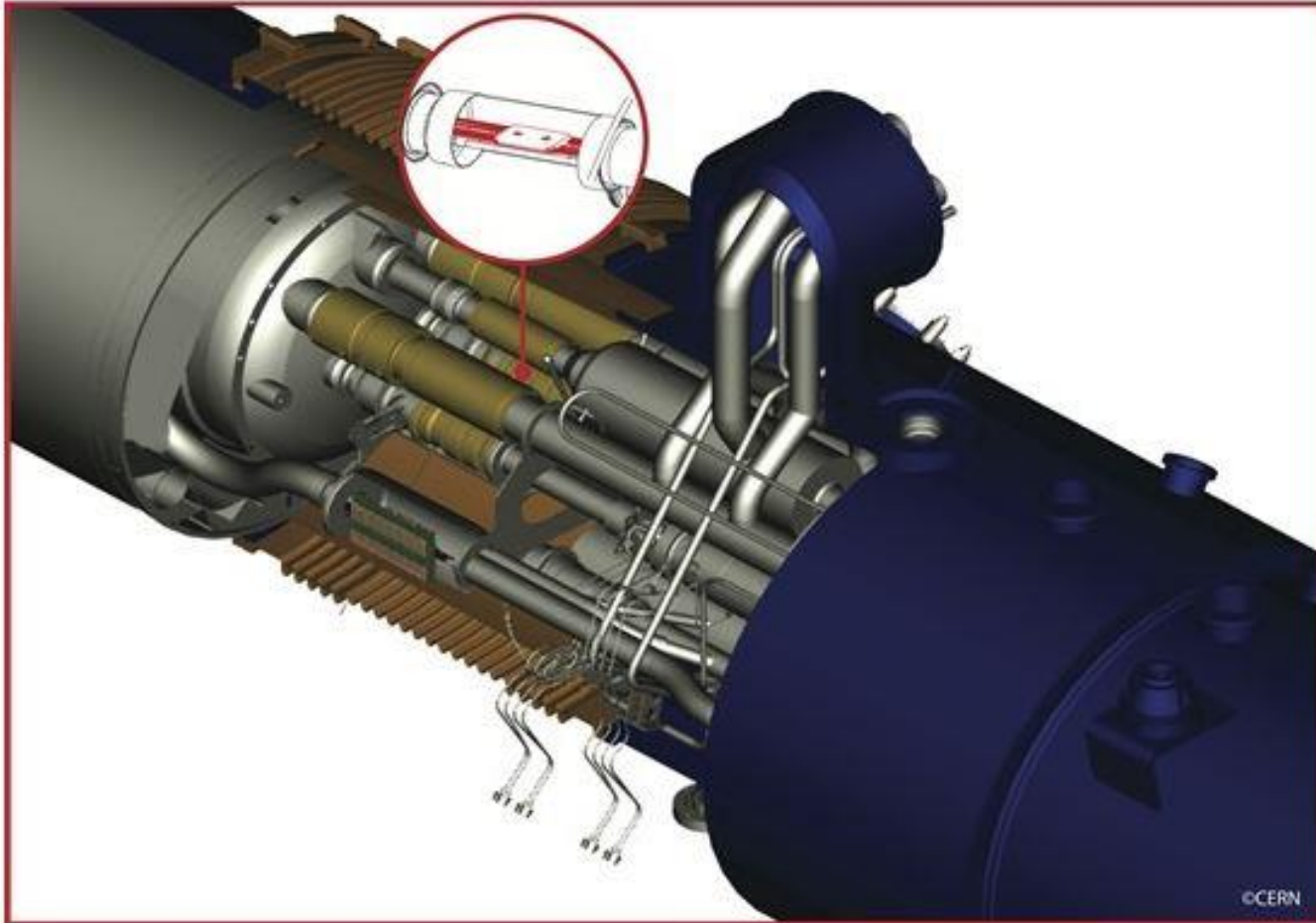
1000s km of cables

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!

...are being estimated in the electricity... of the piping... high...
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.”

Europe
XFEL

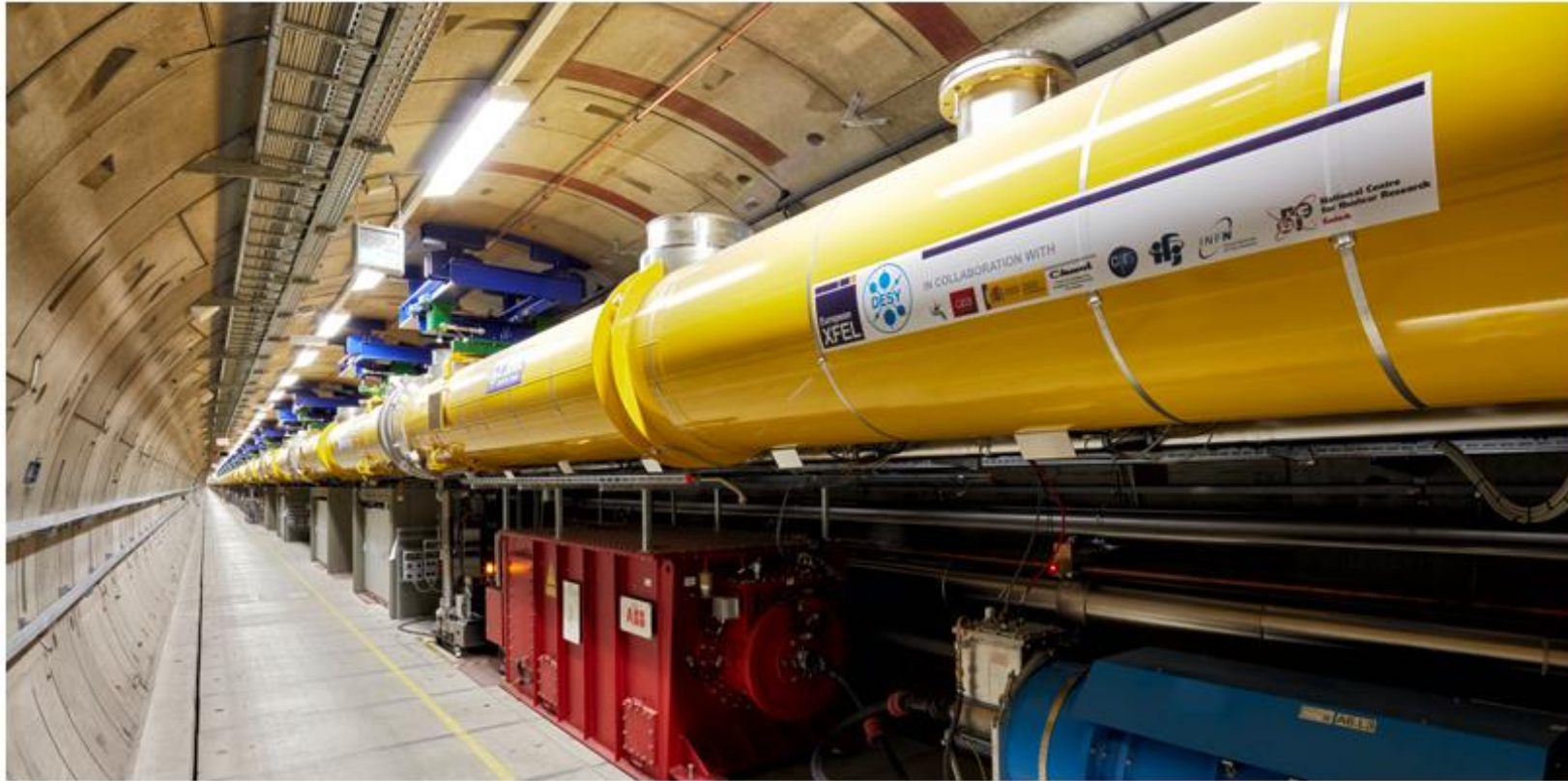
Overview

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.



the electrotechnical
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at

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

CNN 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 φιλι του νανόκοσμου. Μεταξύ άλλων.

Information transparency



Interoperability



Industry 4.0



Integrated

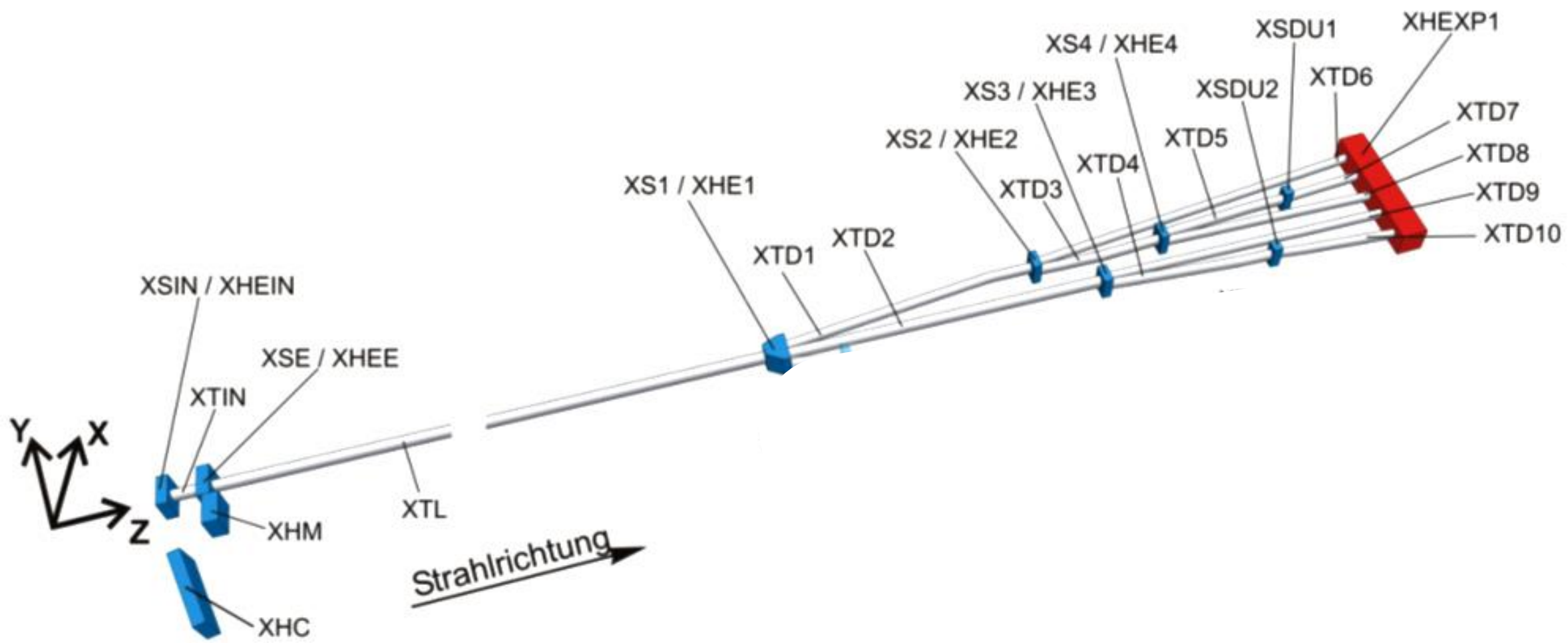


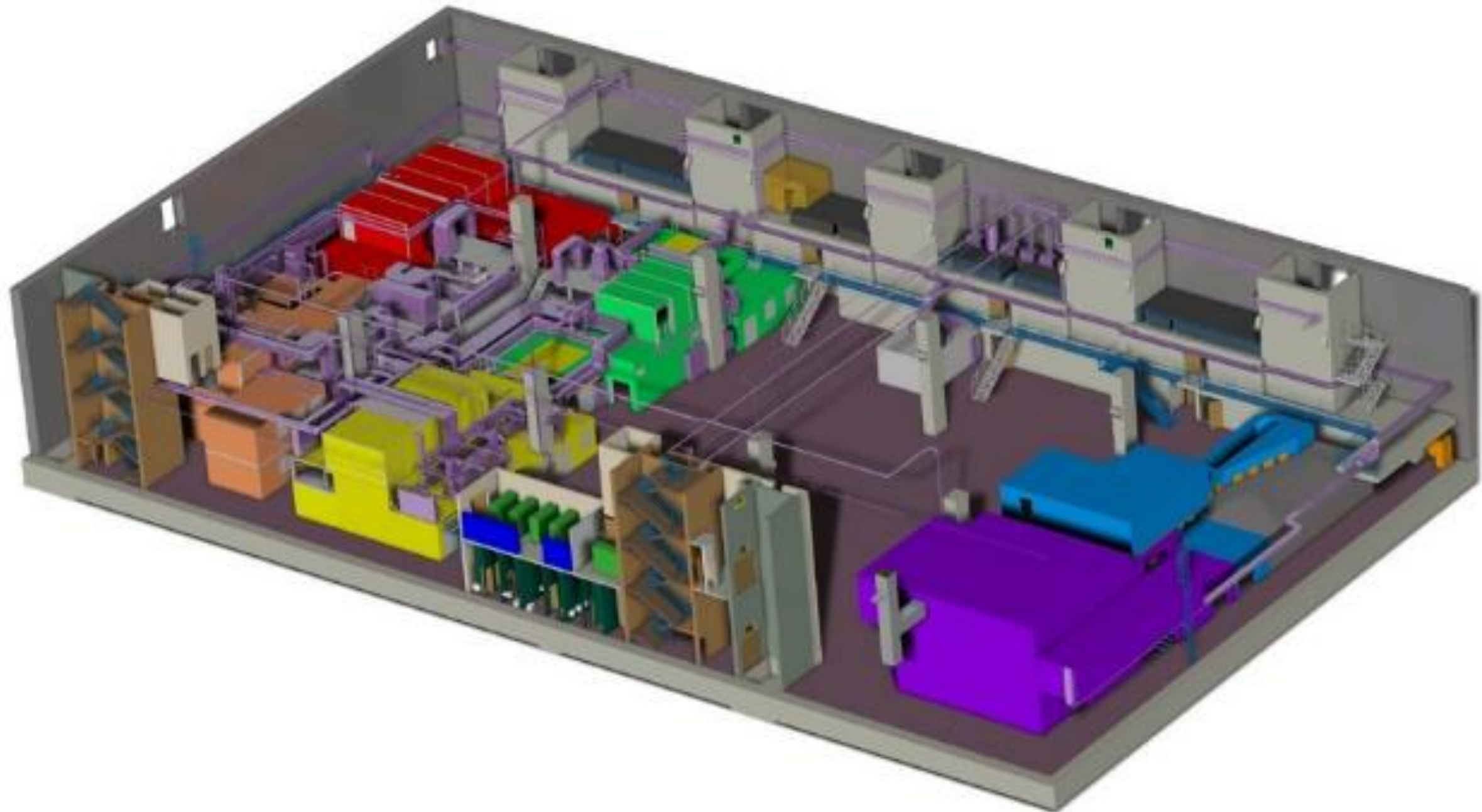
Technical assistance

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

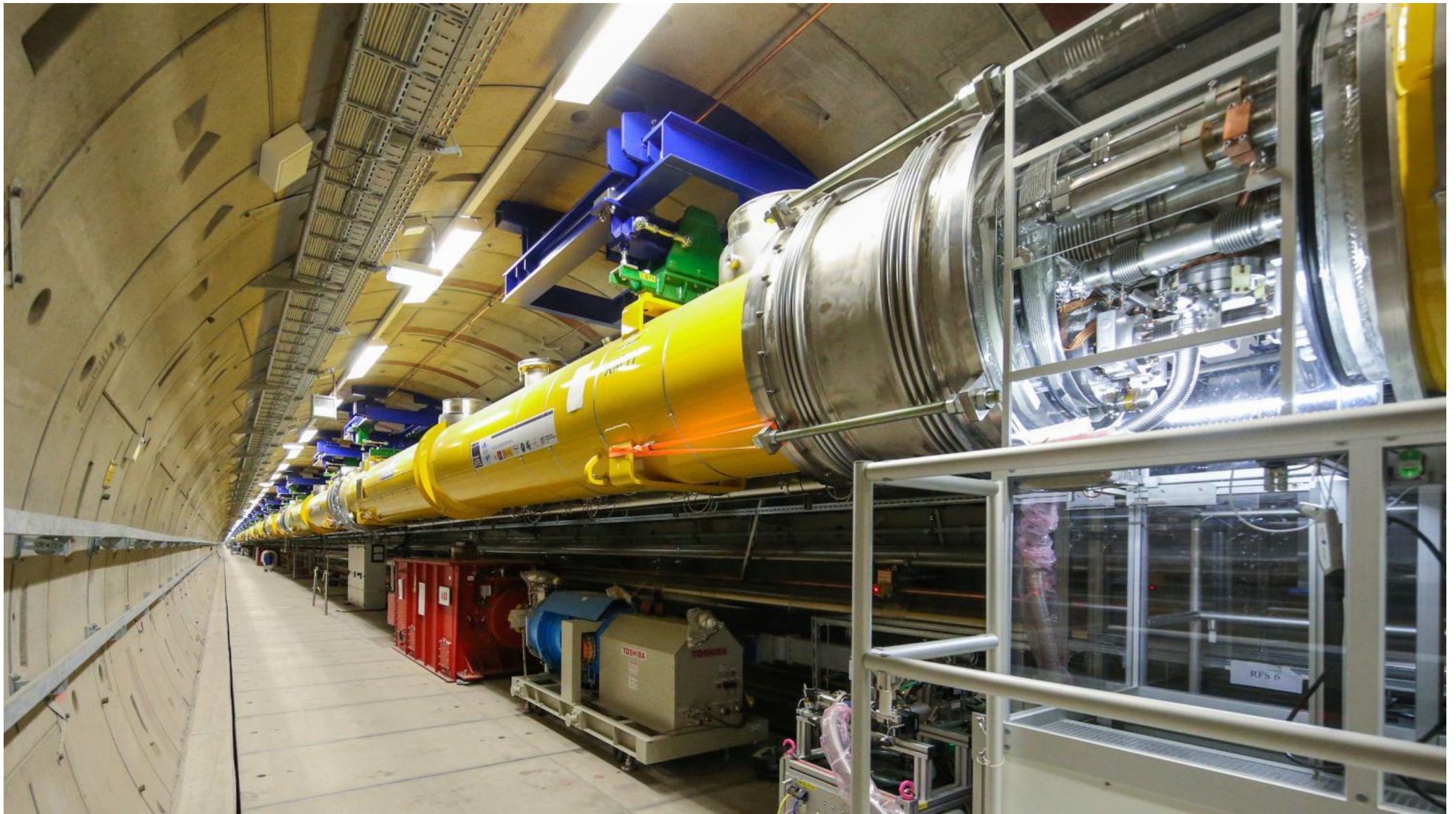
Triggering

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 (from)	Target (to)	Cable type	Conductors	Conductors used	Cross-section [mm]	Length [m]	Function text	Graphical page of cable diagram
=DTC.GIGE1-W1	=DTC.GIGE1+XHEXP1.SASE1.D05.GigE1+BX1-EBOX_BX1-KF1-X1	=Infra.FXE=GigE1.Infra.ETA+XHEXP1.SASE1.D05.feld+PP51-X1F	ETHERLINE® Cat6a + Cat7	8	1	0,32	11,11		==FXE&EMB/1
=DTC.GIGE1-W2	=Infra.FXE=GigE1.Infra.ETA+XHEXP1.SASE1.D05.feld+PP51-X1B	=Infra.FXE=GigE1.Infra.ETA+XHEXP1.SASE1.D21.RCK39+PP52-X2B	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,52		==FXE&EMB/2
=DTC.GIGE1-W3	=Infra.FXE=GigE1.Infra.ETA+XHEXP1.SASE1.D21.RCK39+PP52-X2F	=Infra.FXE=GigE1.Infra.TN.mTCA+XHEXP1.SASE1.D21.RCK39+mTCL34.Slo	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,73		==FXE&EMB/3
=DTC.GIGE1-W4	=DTC.GIGE1+XHEXP1.SASE1.D05.GigE1+BX1-BX1	=DTC.GIGE1+XHEXP1.SASE1.D05.GigE1+BX1-EBOX_BX1-KF1	ETHERLINE® Cat6a + Cat7	8	1	0,32			==FXE&EMB/4
=DTC.GIGE1-W5	=DTC.GIGE1+XHEXP1.SASE1.D05.GigE1+BX1-BX1-X2	=GigE1.Infra.CN+XHEXP1.SASE1.D05.Wall.BL+SP20-X4F	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,31		==FXE&EMB/5
=DTC.GIGE1-W6	=GigE1.Infra.CN+XHEXP1.SASE1.D05.Wall.BL+SP20-X4B	=Infra.FXE=GigE1.Infra.CN+XHEXP1.SASE1.D21.RCK39+PP26-X5B	ETHERLINE® Cat6a + Cat7	8	1	0,32	30,77		==FXE&EMB/6
=DTC.GIGE1-W7	=Infra.FXE=GigE1.Infra.CN+XHEXP1.SASE1.D21.RCK39+PP26-X5F	=Infra.FXE=GigE1.Infra.CN+XHEXP1.SASE1.D21.RCK39+MAS15-X6F	ETHERLINE® Cat6a + Cat7	8	1	0,32			==FXE&EMB/7
=DTC.GIGE1-W8	=DTC.GIGE1+XHEXP1.SASE1.D05+ImCamRelay-U1	=DTC.GIGE1+XHEXP1.SASE1.D05+Wall-XD1	ÖLFLEX® CLASSIC 110 H	3	3	1,5			==FXE&EMB/8
=DTC.GIGE1-W9	=DTC.GIGE1+XHEXP1.SASE1.D05+ImCamRelay-U1	=DTC.GIGE1+XHEXP1.SASE1.D05+Inv_Bedhoff_Crate-DO1	SystemCable	10	2	1,5			==FXE&EMB/9
		=DTC.CAM3+XHEXP1.SASE1.D05+BX1-DO1							
=DTC.GIGE1-W10		=DTC.GIGE1+XHEXP1.SASE1.D05.GigE1+BX1-BX1	SystemCable	10	2	1,5			==FXE&EMB/10
=DTC.GIGE2-W1	=DTC.GIGE2+XHEXP1.SASE1.D05.GigE2+BX2-EBOX_BX2-KF1-X1	=Infra.FXE=GigE2.Infra.ETA+XHEXP1.SASE1.D05.feld+PP51-X1F	ETHERLINE® Cat6a + Cat7	8	1	0,32	11,17		==FXE&EMB/11
=DTC.GIGE2-W2	=Infra.FXE=GigE2.Infra.ETA+XHEXP1.SASE1.D05.feld+PP51-X1B	=Infra.FXE=GigE2.Infra.ETA+XHEXP1.SASE1.D21.RCK39+PP52-X2B	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,52		==FXE&EMB/12
=DTC.GIGE2-W3	=Infra.FXE=GigE2.Infra.ETA+XHEXP1.SASE1.D21.RCK39+PP52-X2F	=Infra.FXE=GigE2.Infra.TN.mTCA+XHEXP1.SASE1.D21.RCK39+mTCL34.Slo	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,73		==FXE&EMB/13
=DTC.GIGE2-W4	=DTC.GIGE2+XHEXP1.SASE1.D05.GigE2+BX2-BX2	=DTC.GIGE2+XHEXP1.SASE1.D05.GigE2+BX2-EBOX_BX2-KF1	ETHERLINE® Cat6a + Cat7	8	1	0,32			==FXE&EMB/14
=DTC.GIGE2-W5	=DTC.GIGE2+XHEXP1.SASE1.D05.GigE2+BX2-BX2-X2	=GigE2.Infra.CN+XHEXP1.SASE1.D05.Wall.BL+SP20-X4F	ETHERLINE® Cat6a + Cat7	8	1	0,32	37,91		==FXE&EMB/15
=DTC.GIGE2-W6	=GigE2.Infra.CN+XHEXP1.SASE1.D05.Wall.BL+SP20-X4B	=Infra.FXE=GigE2.Infra.CN+XHEXP1.SASE1.D21.RCK39+PP26-X5B	ETHERLINE® Cat6a + Cat7	8	1	0,32	30,77		==FXE&EMB/16
=DTC.GIGE2-W7	=Infra.FXE=GigE2.Infra.CN+XHEXP1.SASE1.D21.RCK39+PP26-X5F	=Infra.FXE=GigE2.Infra.CN+XHEXP1.SASE1.D21.RCK39+MAS15-X6F	ETHERLINE® Cat6a + Cat7	8	1	0,32			==FXE&EMB/17
=DTC.GIGE2-W8	=DTC.GIGE2+XHEXP1.SASE1.D05+ImCamRelay-U1	=DTC.GIGE2+XHEXP1.SASE1.D05+Wall-XD1	ÖLFLEX® CLASSIC 110 H	3	3	1,5			==FXE&EMB/18
=DTC.GIGE2-W9	=DTC.GIGE2+XHEXP1.SASE1.D05+ImCamRelay-U1	=DTC.GIGE2+XHEXP1.SASE1.D05+Inv_Bedhoff_Crate-DO1	SystemCable	10	2	1,5			==FXE&EMB/19
		=DTC.CAM3+XHEXP1.SASE1.D05+BX2-DO1							
=DTC.GIGE2-W10		=DTC.GIGE2+XHEXP1.SASE1.D05.GigE2+BX2-BX2	SystemCable	10	2	1,5			==FXE&EMB/20
=DTC.GIGE3-W1	=DTC.GIGE3+XHEXP1.SASE1.D05.GigE3+BX3-EBOX_BX3-KF1-X1	=Infra.FXE=GigE3.Infra.ETA+XHEXP1.SASE1.D05.feld+PP51-X1F	ETHERLINE® Cat6a + Cat7	8	1	0,32	3,48		==FXE&EMB/21
=DTC.GIGE3-W2	=Infra.FXE=GigE3.Infra.ETA+XHEXP1.SASE1.D05.feld+PP51-X1B	=Infra.FXE=GigE3.Infra.ETA+XHEXP1.SASE1.D21.RCK39+PP52-X2B	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,52		==FXE&EMB/22
=DTC.GIGE3-W3	=Infra.FXE=GigE3.Infra.ETA+XHEXP1.SASE1.D21.RCK39+PP52-X2F	=Infra.FXE=GigE3.Infra.TN.mTCA+XHEXP1.SASE1.D21.RCK39+mTCL34.Slo	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,73		==FXE&EMB/23
=DTC.GIGE3-W4	=DTC.GIGE3+XHEXP1.SASE1.D05.GigE3+BX3-BX3	=DTC.GIGE3+XHEXP1.SASE1.D05.GigE3+BX3-EBOX_BX3-KF1	ETHERLINE® Cat6a + Cat7	8	1	0,32			==FXE&EMB/24
=DTC.GIGE3-W5	=DTC.GIGE3+XHEXP1.SASE1.D05.GigE3+BX3-BX3-X2	=GigE3.Infra.CN+XHEXP1.SASE1.D05.Wall.BL+SP20-X4F	ETHERLINE® Cat6a + Cat7	8	1	0,32	30,22		==FXE&EMB/25
=DTC.GIGE3-W6	=GigE3.Infra.CN+XHEXP1.SASE1.D05.Wall.BL+SP20-X4B	=Infra.FXE=GigE3.Infra.CN+XHEXP1.SASE1.D21.RCK39+PP26-X5B	ETHERLINE® Cat6a + Cat7	8	1	0,32	30,77		==FXE&EMB/26
=DTC.GIGE3-W7	=Infra.FXE=GigE3.Infra.CN+XHEXP1.SASE1.D21.RCK39+PP26-X5F	=Infra.FXE=GigE3.Infra.CN+XHEXP1.SASE1.D21.RCK39+MAS15-X6F	ETHERLINE® Cat6a + Cat7	8	1	0,32			==FXE&EMB/27
=DTC.GIGE3-W8	=DTC.GIGE3+XHEXP1.SASE1.D05+ImCamRelay-U1	=DTC.GIGE3+XHEXP1.SASE1.D05+Wall-XD1	ÖLFLEX® CLASSIC 110 H	3	3	1,5			==FXE&EMB/28
=DTC.GIGE3-W9	=DTC.GIGE3+XHEXP1.SASE1.D05+ImCamRelay-U1	=DTC.GIGE3+XHEXP1.SASE1.D05+Inv_Bedhoff_Crate-DO1	SystemCable	10	2	1,5			==FXE&EMB/29
		=DTC.CAM3+XHEXP1.SASE1.D05+BX3-DO1							
=DTC.GIGE3-W10		=DTC.GIGE3+XHEXP1.SASE1.D05.GigE3+BX3-BX3	SystemCable	10	2	1,5			==FXE&EMB/30
=DTC.GIGE4-W1	=DTC.GIGE4+XHEXP1.SASE1.D05.GigE4+BX4-EBOX_BX4-KF1-X1	=Infra.FXE=GigE4.Infra.ETA+XHEXP1.SASE1.D05.feld+PP51-X1F	ETHERLINE® Cat6a + Cat7	8	1	0,32	27,83		==FXE&EMB/31
=DTC.GIGE4-W2	=Infra.FXE=GigE4.Infra.ETA+XHEXP1.SASE1.D05.feld+PP51-X1B	=Infra.FXE=GigE4.Infra.ETA+XHEXP1.SASE1.D21.RCK39+PP52-X2B	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,52		==FXE&EMB/32
=DTC.GIGE4-W3	=Infra.FXE=GigE4.Infra.ETA+XHEXP1.SASE1.D21.RCK39+PP52-X2F	=Infra.FXE=GigE4.Infra.TN.mTCA+XHEXP1.SASE1.D21.RCK39+mTCL34.Slo	ETHERLINE® Cat6a + Cat7	8	1	0,32	21,73		==FXE&EMB/33
=DTC.GIGE4-W4	=DTC.GIGE4+XHEXP1.SASE1.D05.GigE4+BX4-BX4	=DTC.GIGE4+XHEXP1.SASE1.D05.GigE4+BX4-EBOX_BX4-KF1	ETHERLINE® Cat6a + Cat7	8	1	0,32			==FXE&EMB/34
=DTC.GIGE4-W5	=DTC.GIGE4+XHEXP1.SASE1.D05.GigE4+BX4-BX4-X2	=GigE4.Infra.CN+XHEXP1.SASE1.D05.Wall.BL+SP20-X4F	ETHERLINE® Cat6a + Cat7	8	1	0,32	37,53		==FXE&EMB/35
=DTC.GIGE4-W6	=GigE4.Infra.CN+XHEXP1.SASE1.D05.Wall.BL+SP20-X4B	=Infra.FXE=GigE4.Infra.CN+XHEXP1.SASE1.D21.RCK39+PP26-X5B	ETHERLINE® Cat6a + Cat7	8	1	0,32	30,77		==FXE&EMB/36
=DTC.GIGE4-W7	=Infra.FXE=GigE4.Infra.CN+XHEXP1.SASE1.D21.RCK39+PP26-X5F	=Infra.FXE=GigE4.Infra.CN+XHEXP1.SASE1.D21.RCK39+MAS15-X6F	ETHERLINE® Cat6a + Cat7	8	1	0,32			==FXE&EMB/37
=DTC.GIGE4-W8	=DTC.GIGE4+XHEXP1.SASE1.D05+ImCamRelay-U1	=DTC.GIGE4+XHEXP1.SASE1.D05+Wall-XD1	ÖLFLEX® CLASSIC 110 H	3	3	1,5			==FXE&EMB/38
=DTC.GIGE4-W9	=DTC.GIGE4+XHEXP1.SASE1.D05+ImCamRelay-U1	=DTC.GIGE4+XHEXP1.SASE1.D05+Inv_Bedhoff_Crate-DO1	SystemCable	10	2	1,5			==FXE&EMB/39
		=DTC.CAM3+XHEXP1.SASE1.D05+BX4-DO1							
=DTC.GIGE4-W10		=DTC.GIGE4+XHEXP1.SASE1.D05.GigE4+BX4-BX4	SystemCable	10	2	1,5			==FXE&EMB/40

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.feld+PP51-X1F	ETHERLINE® Cat6a + Cat.7	8	1	0,32	11.11
=DTC.GIGE1-W2	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D05.feld+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.feld+PP51-X1F
=DTC.GIGE1-W2	==Infra.FXE=GigE1.Infra.ETA++XHEXP1.SASE1.D05.feld+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:

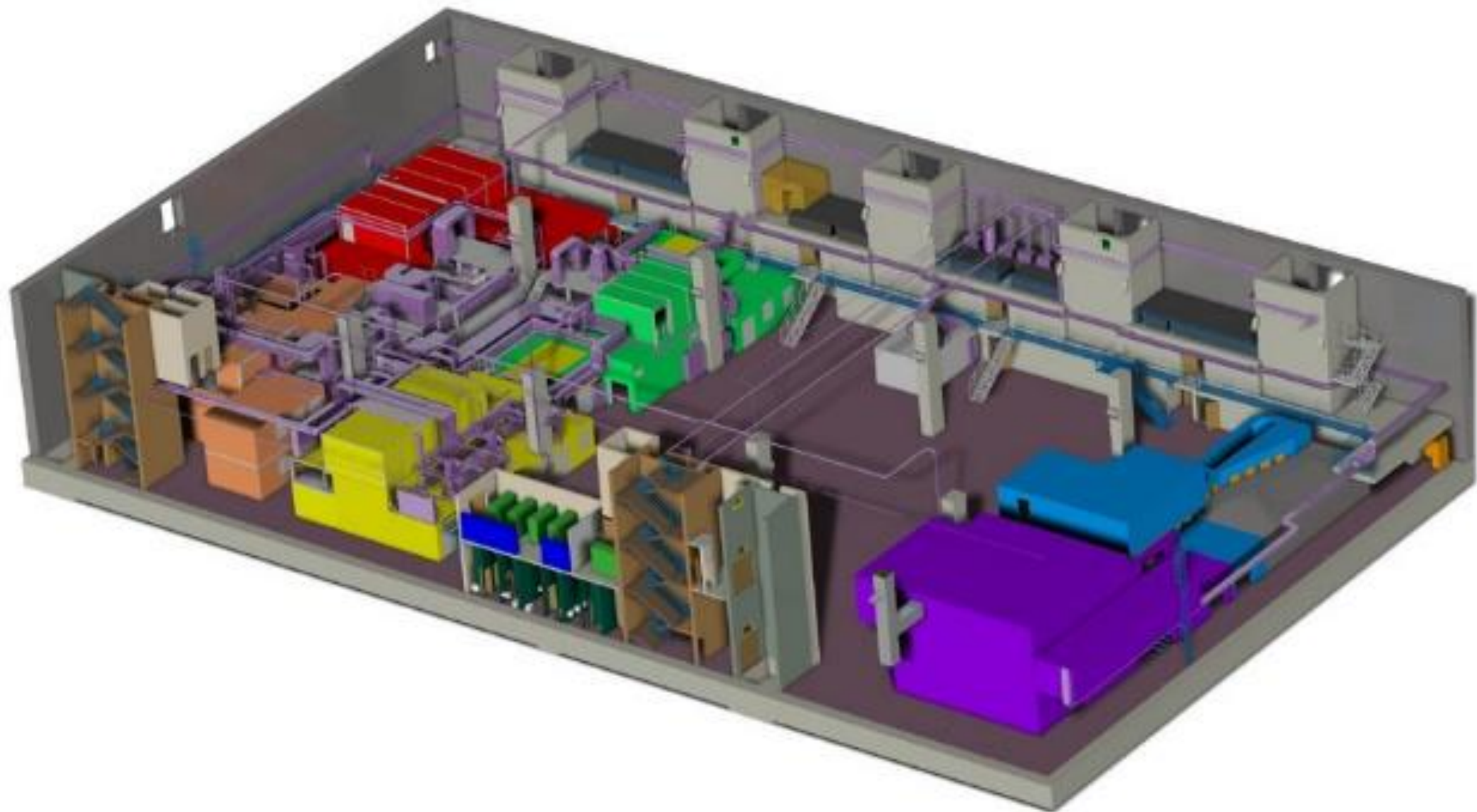
- **Cables**
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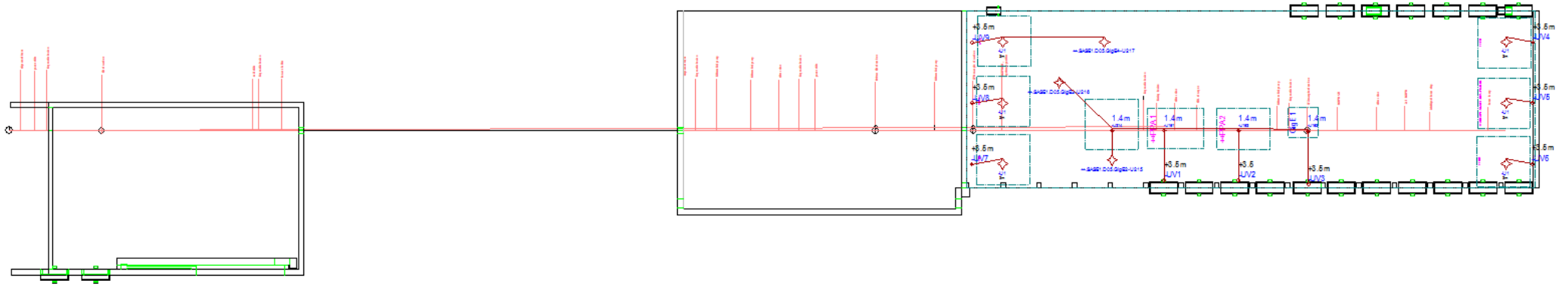
Installation instructions for:

- **Cables**
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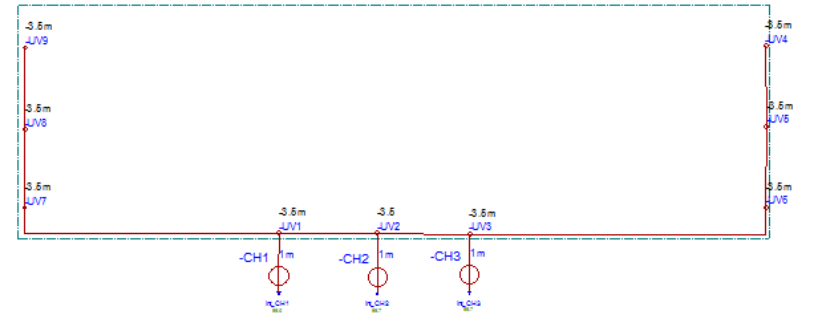




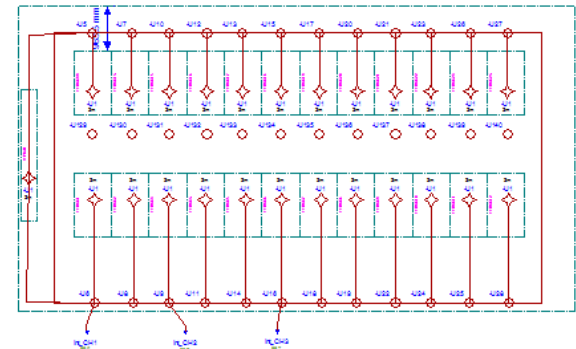
++D05.field
Ground Floor - Zero Point Level



++D05.field
Ground Floor - Cable Trays Level

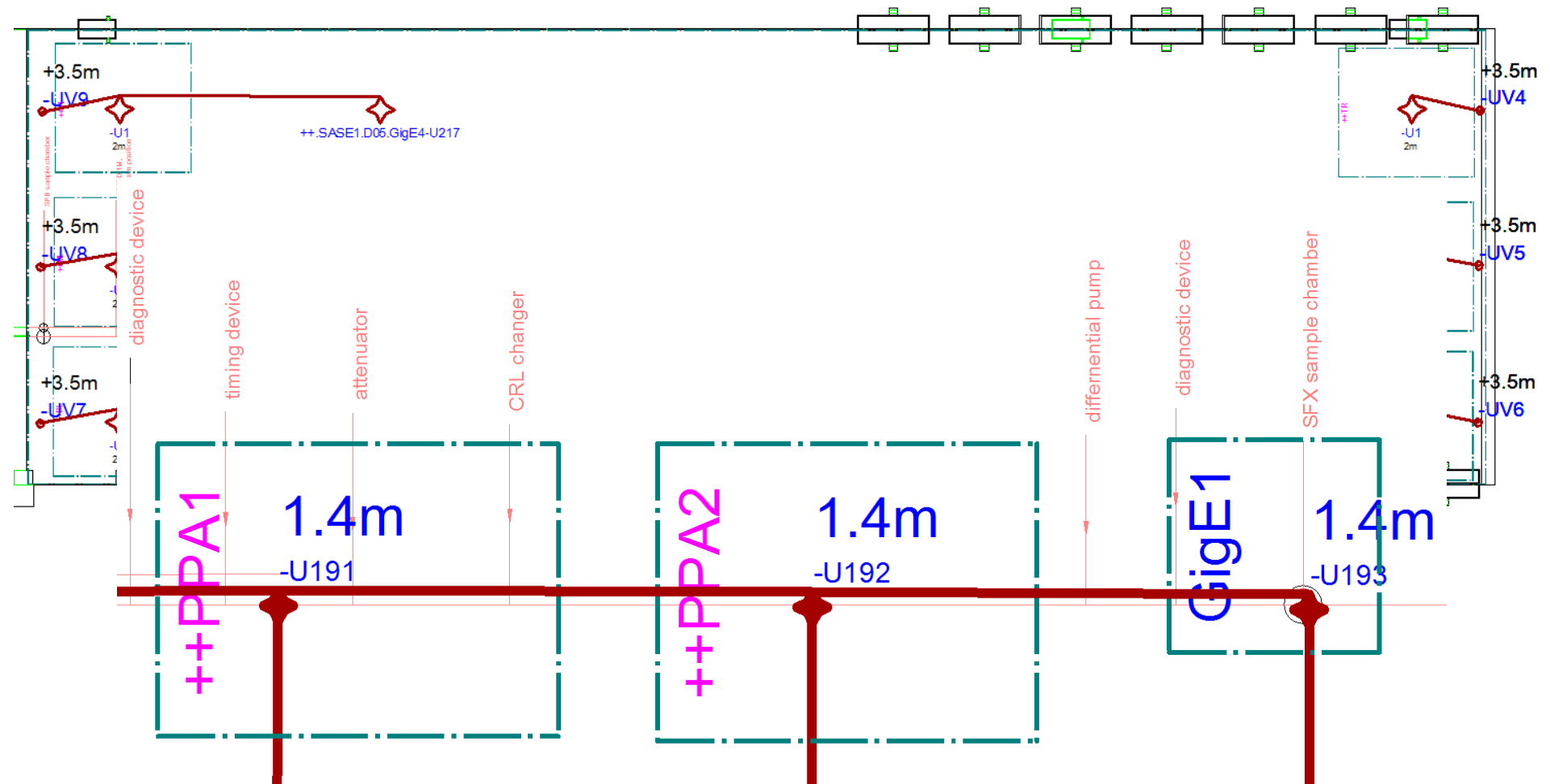


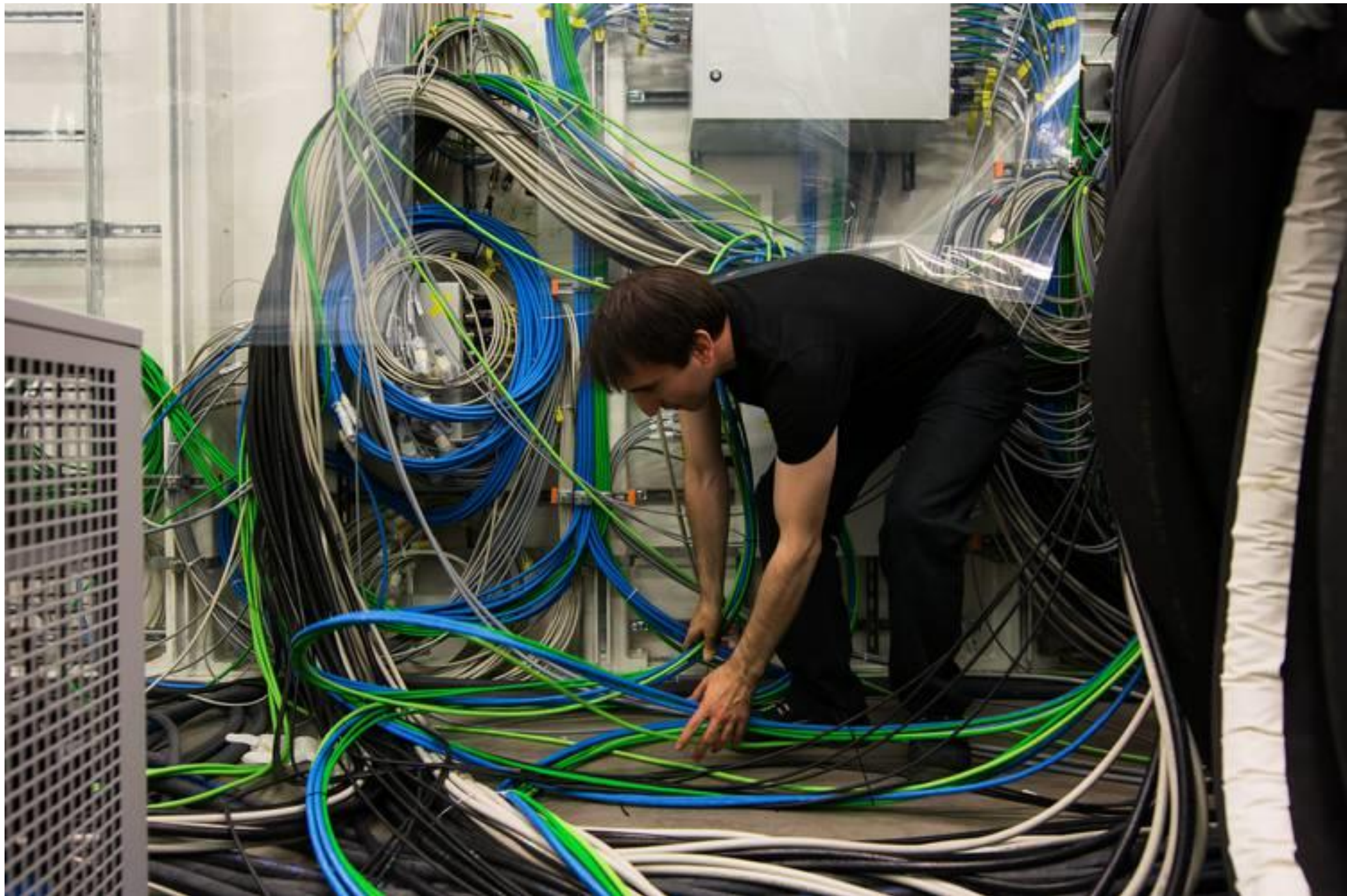
++D21
Rackroom Floor - Double Floor Level



Cable Trays Planning

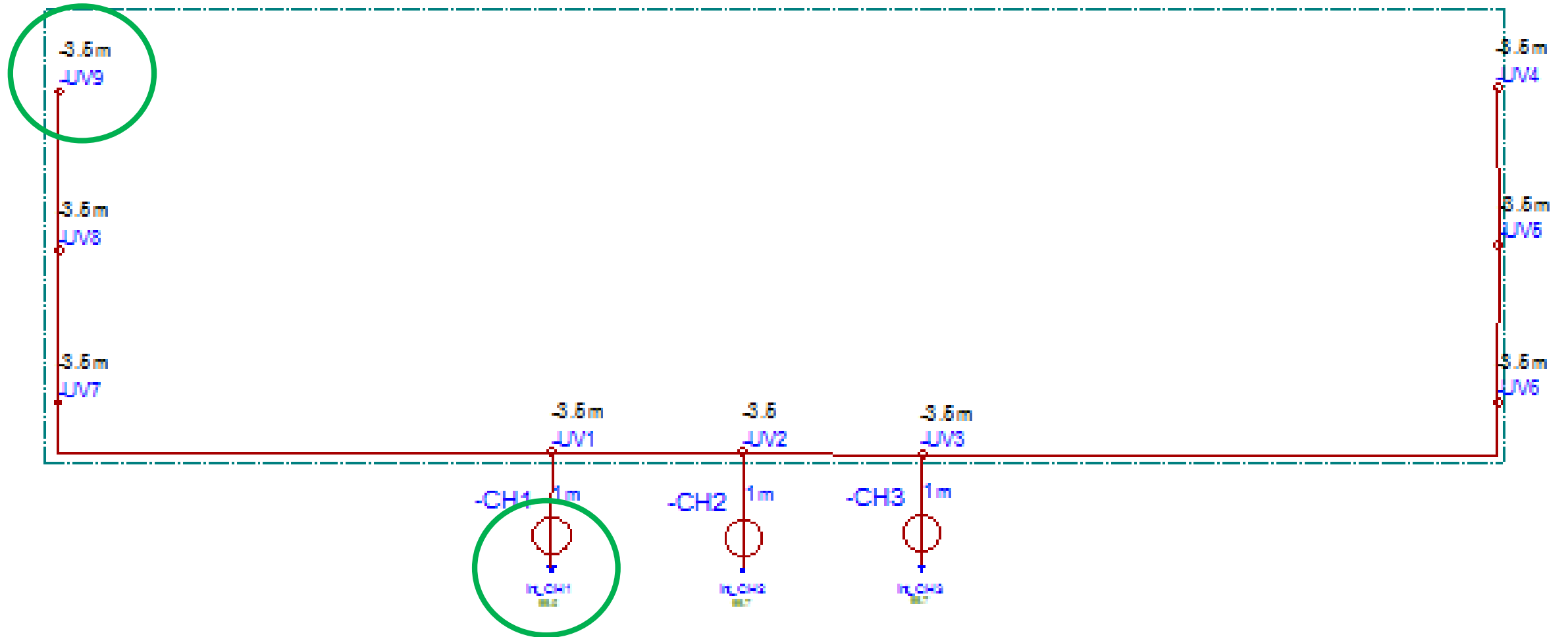
Ground Floor - Zero Point Level





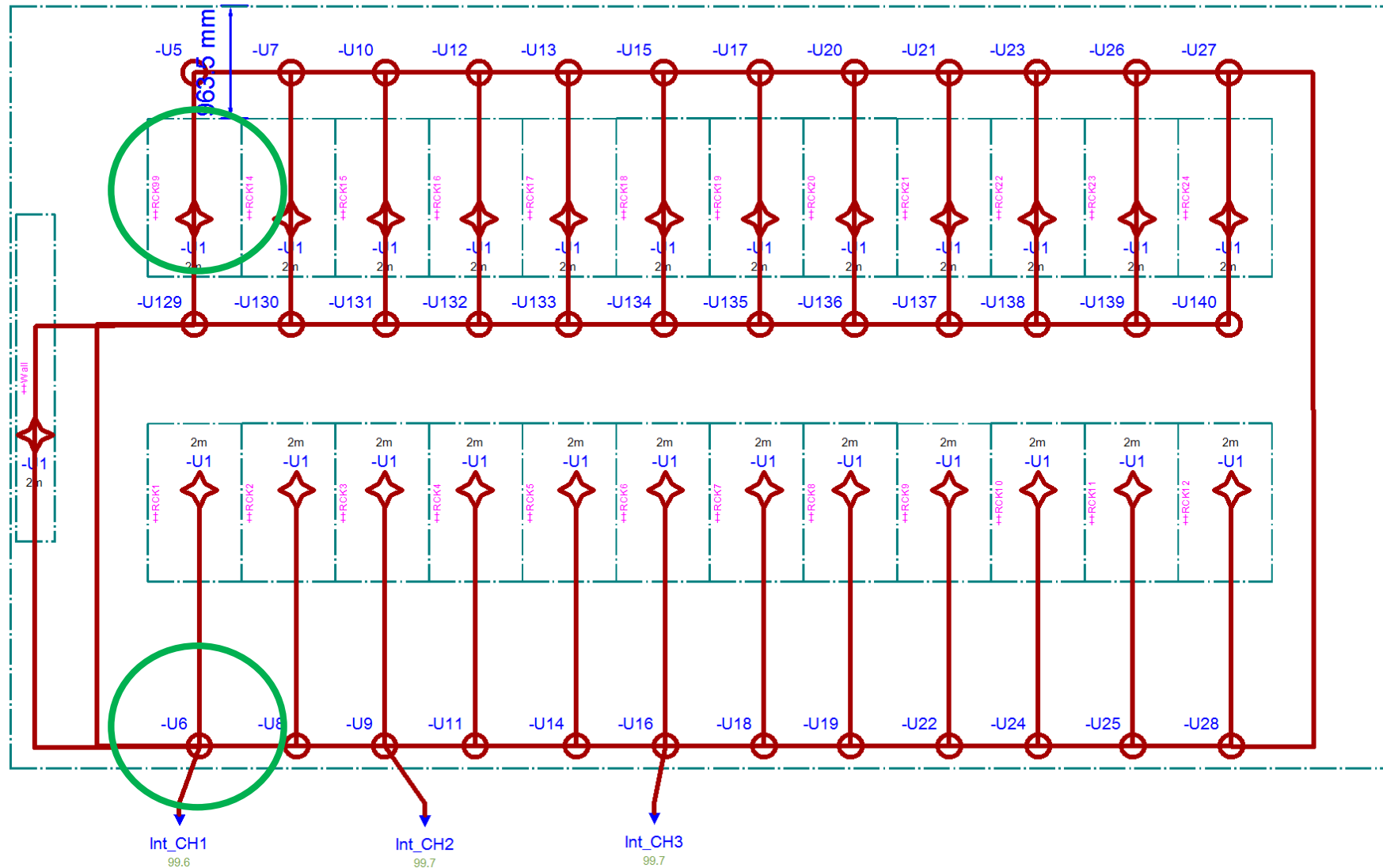
Cable Trays Planning

Ground Floor - Cable Trays Level

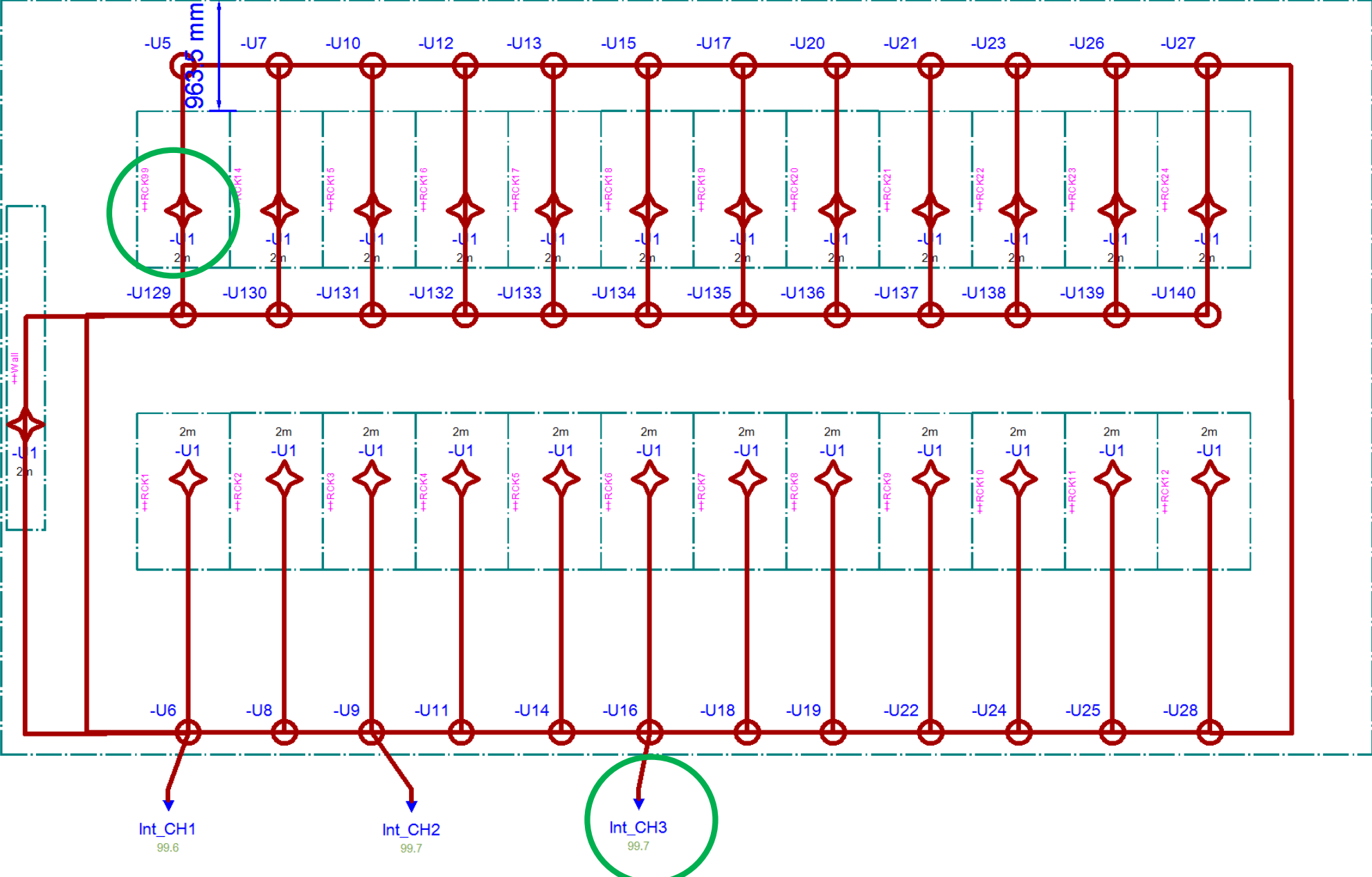


“Rack-room” Planning

Rackroom Floor - Double Floor Level



Rackroom Floor - Double Floor Level



Cable Trays Content Management

++XHEXP1.SASE1

++D05.field
Ground Floor - Zero Point Level

++D05.field
Ground Floor - Cable Trays Level

++D21
Rackroom Floor - Double Floor Level

Cables / connections

Row	Length <31003>	DT (identifying) <20005>	Source <31019>	Target <31020>
1	26.25 m	==FXE=DTC.GIGE1-W1	==FXE=DTC.GIGE1++XHEXP1.SASE1.D05.GigE1+BX1-EBOX_BX1-KF1:ETA	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D05.field.TL+PP51-XG51:In
2	28.04 m	==FXE=DTC.GIGE1-W2	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D21.RCK99+PP52-XG52:Out	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D05.field.TL+PP51-XG51:Out
3	27.43 m	==FXE=DTC.GIGE2-W1	==FXE=DTC.GIGE2++XHEXP1.SASE1.D05.GigE2+BX2-EBOX_BX2-KF1:ETA	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D05.field.TL+PP51-XG51:In
4	28.04 m	==FXE=DTC.GIGE2-W2	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D21.RCK99+PP52-XG52:Out	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D05.field.TL+PP51-XG51:Out
5	27.04 m	==FXE=DTC.GIGE3-W1	==FXE=DTC.GIGE3++XHEXP1.SASE1.D05.GigE3+BX3-EBOX_BX3-KF1:ETA	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D05.field.TL+PP51-XG51:In
6	28.04 m	==FXE=DTC.GIGE3-W2	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D21.RCK99+PP52-XG52:Out	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D05.field.TL+PP51-XG51:Out
7	28.04 m	==FXE=DTC.GIGE4-W2	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D21.RCK99+PP52-XG52:Out	==Infra.FXE=Infra.ETA++XHEXP1.SASE1.D05.field.TL+PP51-XG51:Out

Dynamic Data Completion – IEC Norm

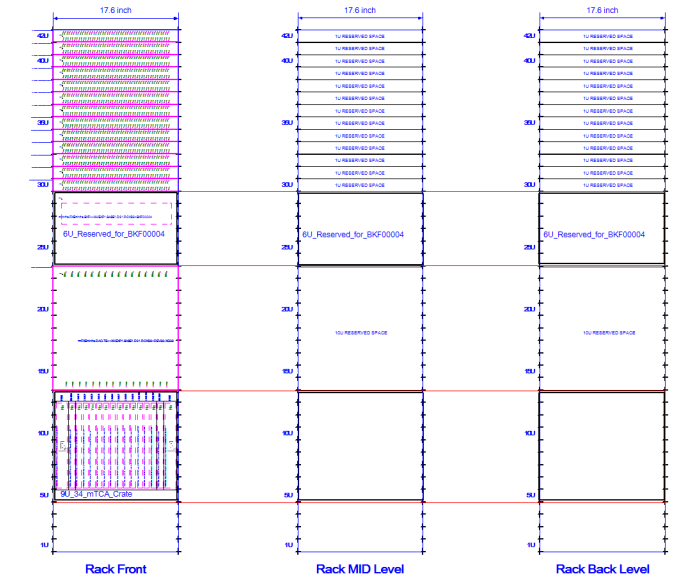
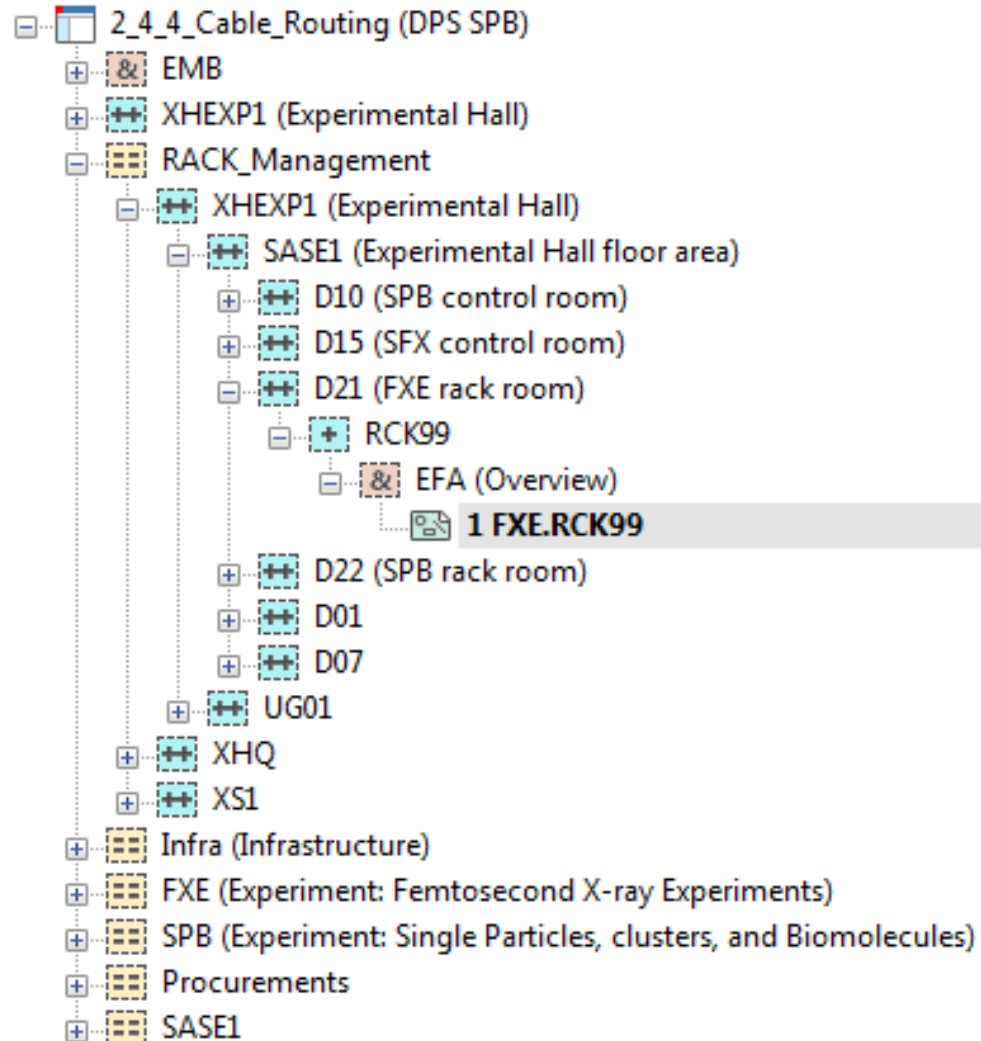
Example: Power Socket

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

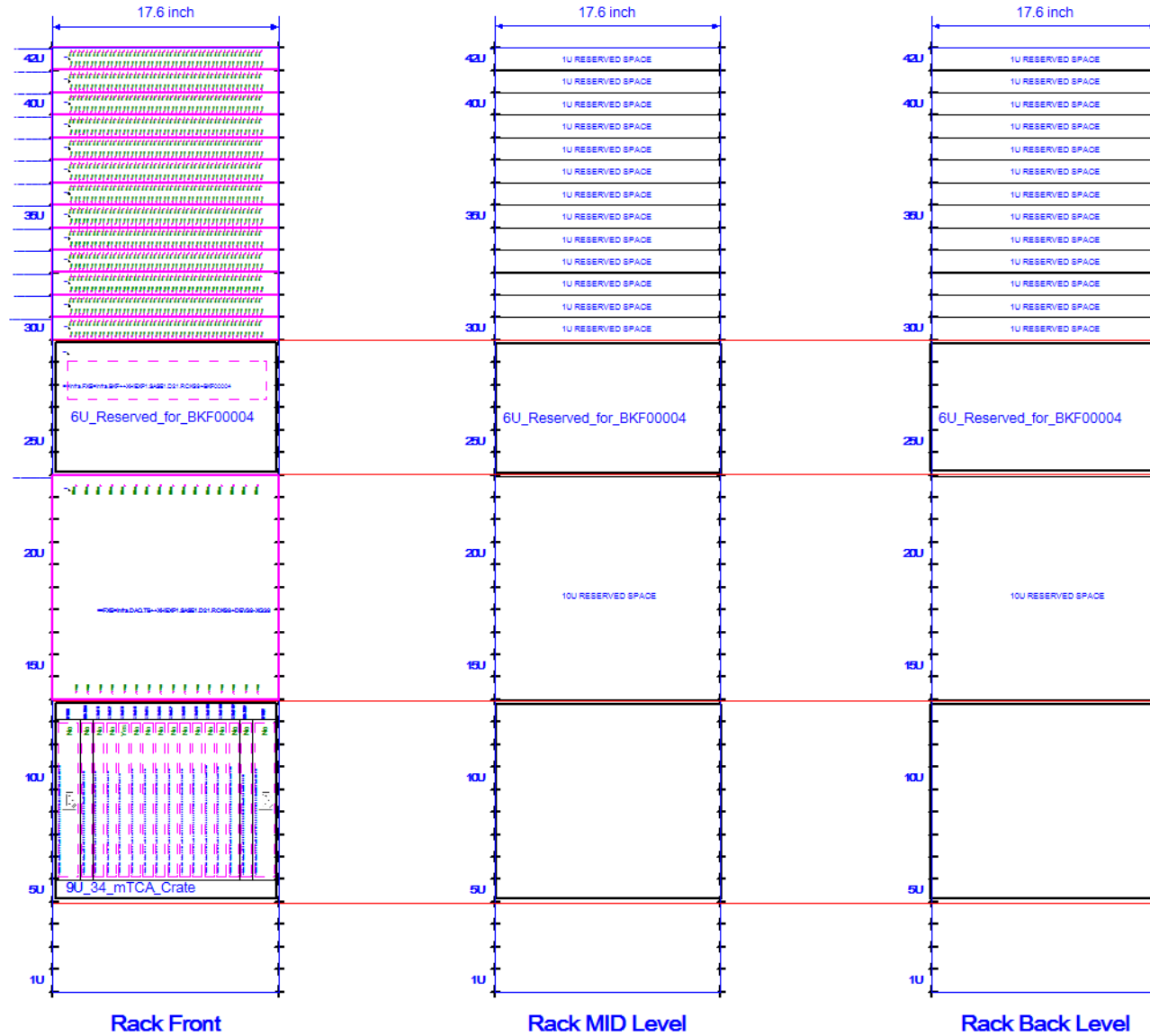
IEC Norm example:

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

Rack Content Management – Rack Views



Rack Content Management – Rack Views



Framework Definition

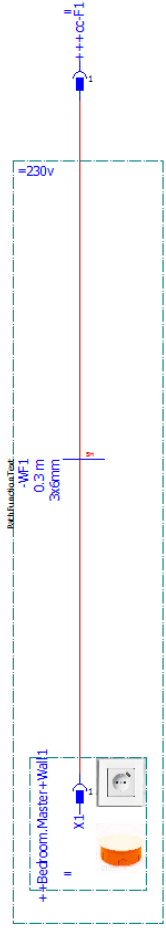
“A combination of software utilities able to “automatically”
produce BOMs, cable lists, Connection diagrams etc”

Custom Solution to overcome **limitations**

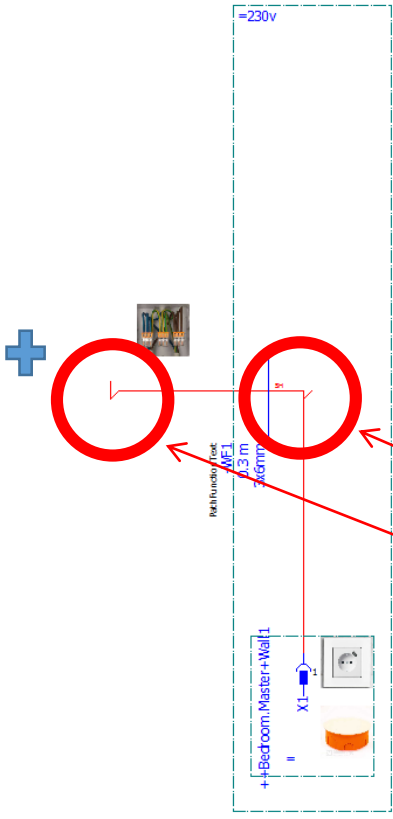
Complexity:

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

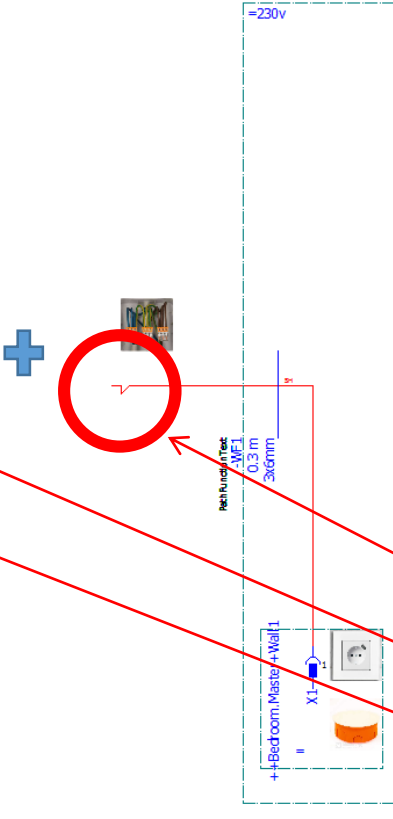
Functions Concept



Single Function



Single Function

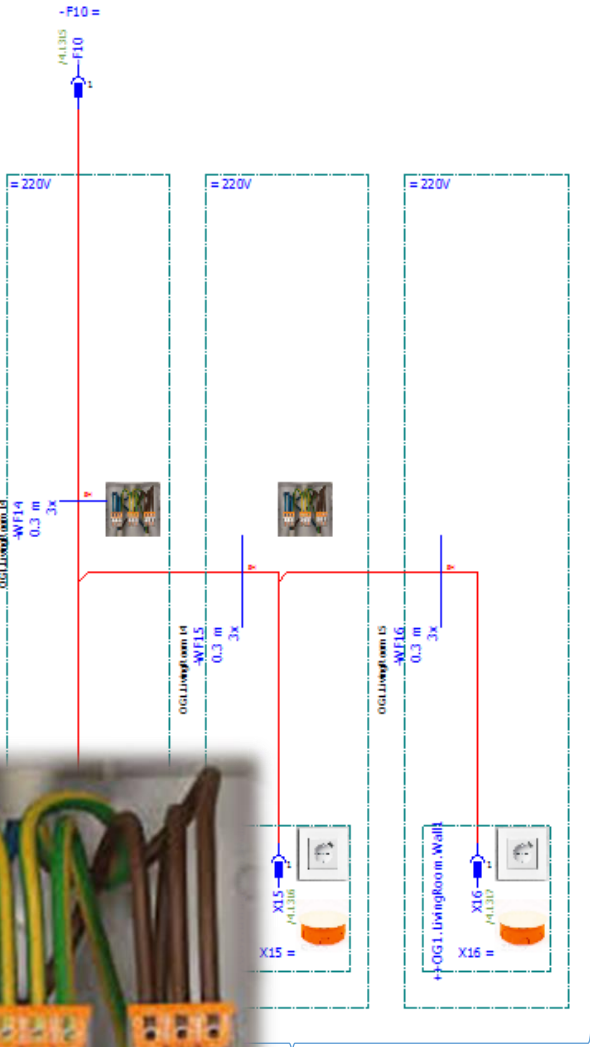


Single Function

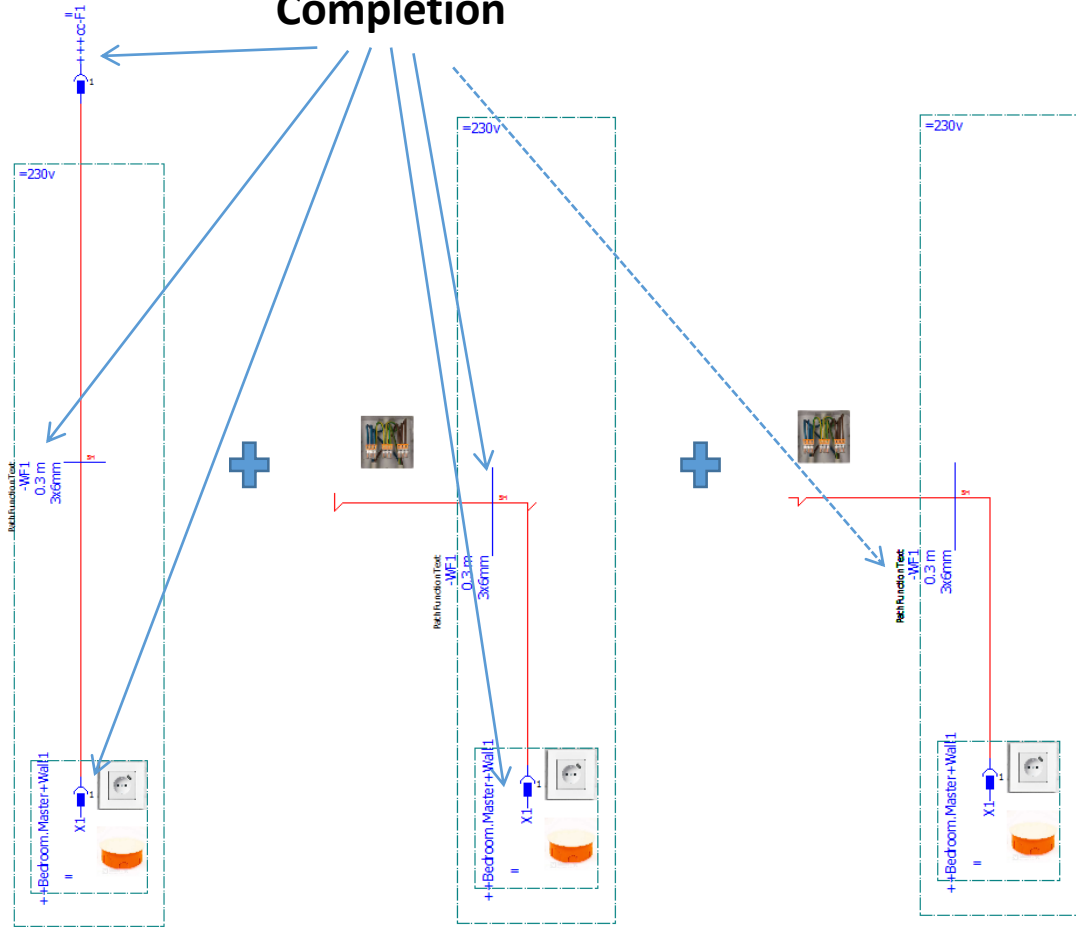
Processing



Function



Dynamic Data Completion



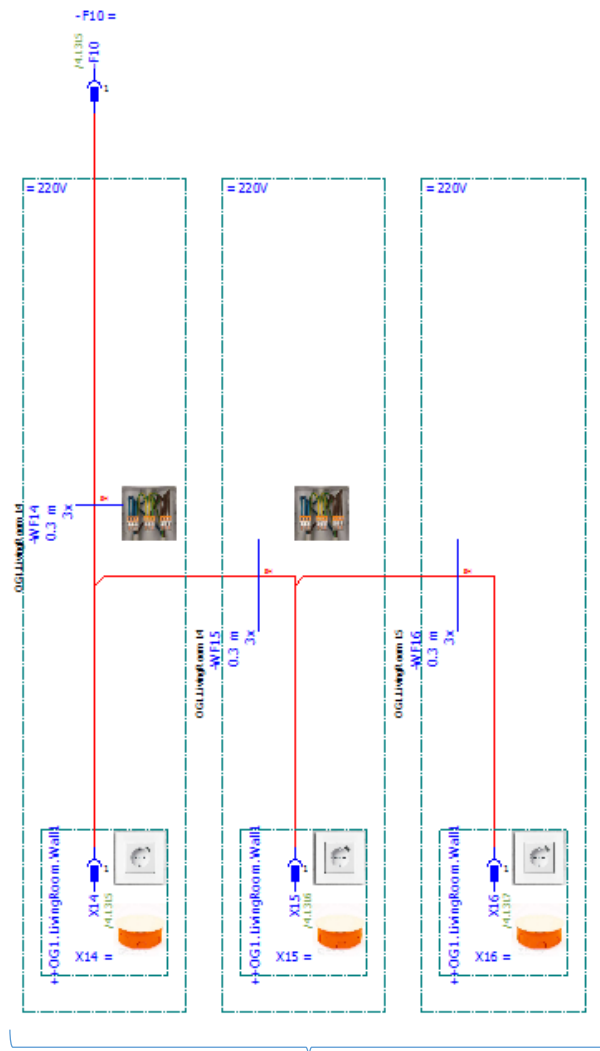
Single
Function

Single
Function

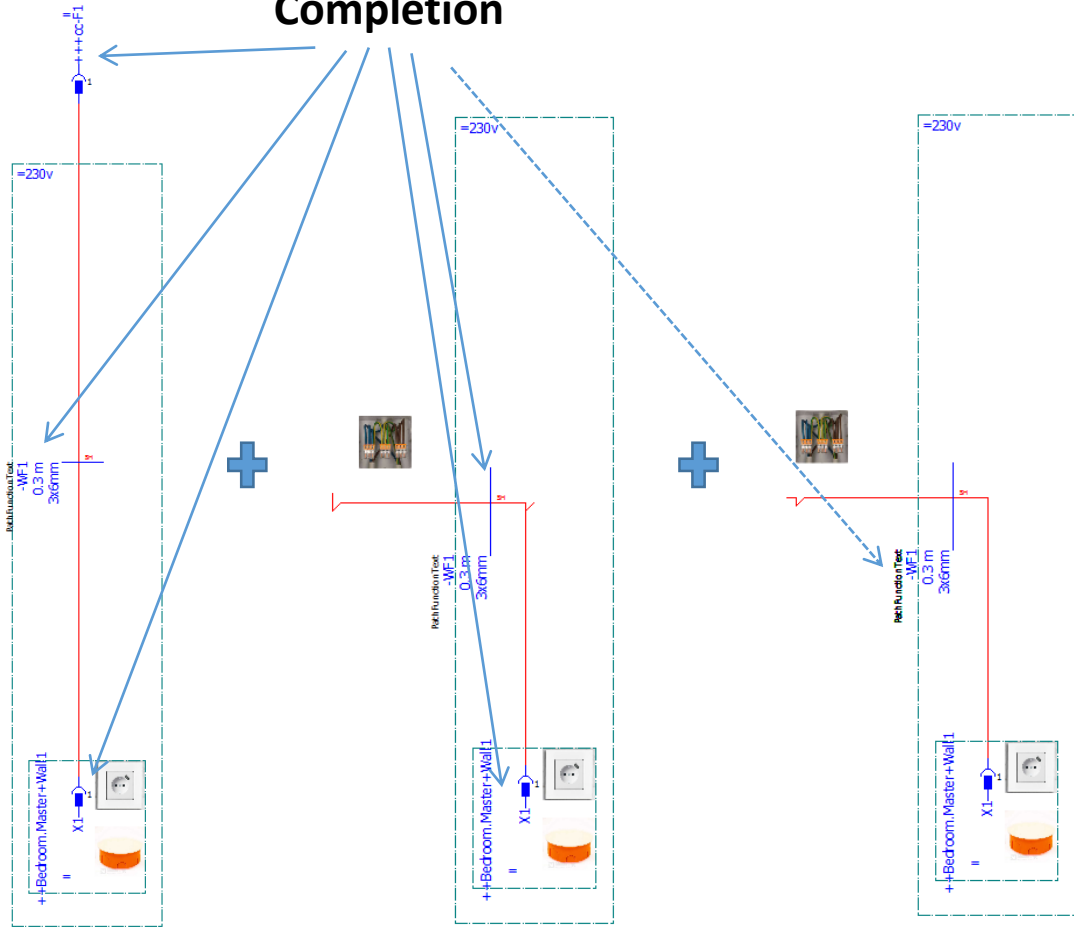
Single
Function

Function

Processing



Dynamic Data Completion

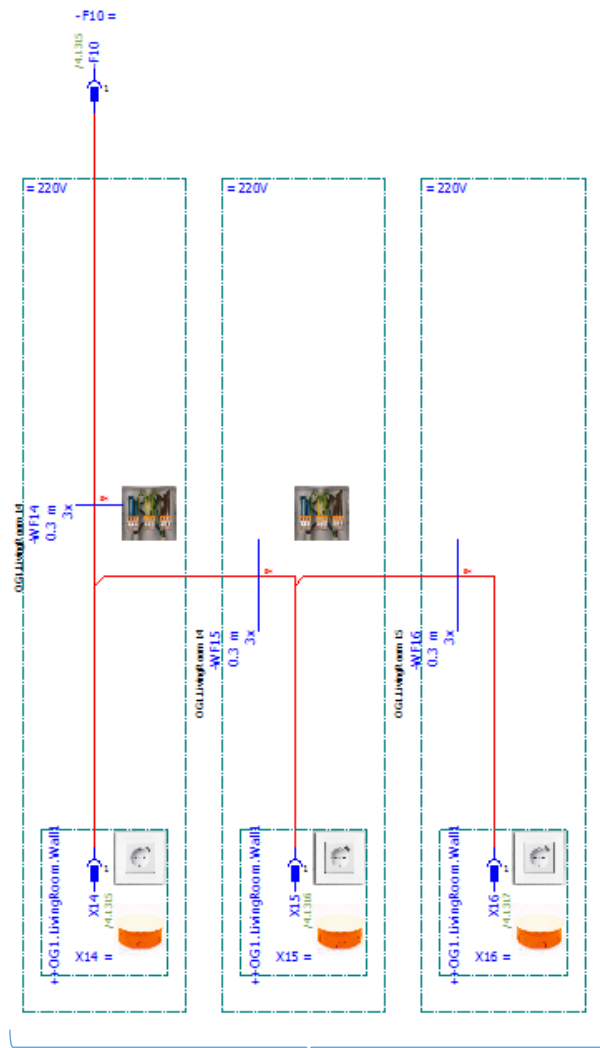


Single Function

Single Function

Single Function

Processing

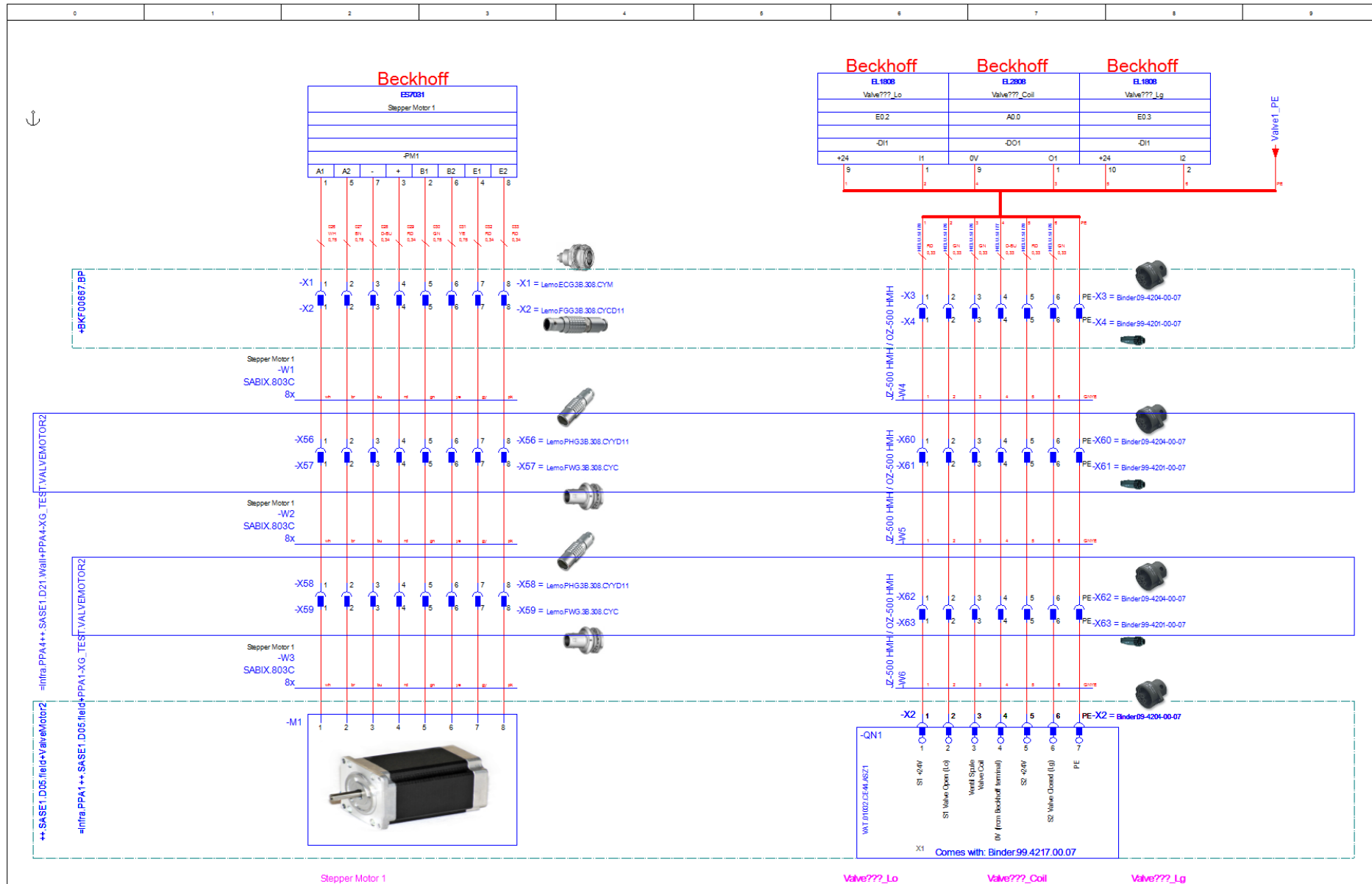


Function

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

The image shows a CAD software interface with a grid background. Three Beckhoff components are visible: a Stepper Motor 1 (ES7081) and three Valve???. components (EL1808, EL2808, EL1808). The Stepper Motor 1 is connected to a terminal block with pins A1, A2, -, +, B1, B2, E1, E2. The Valve???. components are connected to a terminal block with pins +24, I1, 0V, O1, +24, I2. A red line connects the +24 pin of the Valve???. components to the +24 pin of the Stepper Motor 1.

The 'Properties (components): Placeholder object' dialog box is open, showing the 'Variables Definition' section. The 'Name' field is empty. The 'Assignment' tab is selected, and the 'Values' column is empty. The 'Category' is set to 'All categories'. The 'Variable' column contains the following definitions:

Row	Variable
5	
6	==<COMPONENT_==>=<COMPONENT_==>+<COMPONENT++>.field+<COMPONENT++>
7	
8	+<+>.BP
9	
10	
11	==<==>=Infra.PPA<RACKROOM_AGGREGATED_PP_No>+<Rackroom++>.<RACKROOM_AGGREGATED_PP_Wall_or_RCK_with_No>+PPA<RACKROOM_AGGREGATED_PP_No>-XG.<COMPONENT_==>
12	
13	==<==>=Infra.PPA<EXP_HUTCH_AGGREGATED_PP_No>+<ExpHutch++>.field+PPA<EXP_HUTCH_AGGREGATED_PP_No>-XG.<COMPONENT_==>

The 'Preview' section shows a small schematic diagram of the components and their connections. The 'OK', 'Cancel', and 'Apply' buttons are visible at the bottom of the dialog box.

At the bottom of the image, there are labels for the components: 'Stepper Motor 1', 'Valve???.Lo', 'Valve???.Coil', and 'Valve???.Lg'. There are also some technical specifications and a note: 'X1 Comes with: Binder 99.4217.00.07'.

Master Project Integration

What variables are needed?

The image displays a software interface with two main panels. The left panel, titled 'Assignment Values', contains a list of variables under the heading 'Variable'. The right panel shows a wiring diagram with two vertical bus structures connected to various components.

Variable List:

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

Wiring Diagram:

The diagram illustrates two vertical bus structures (left and right) connected to various components. The left bus is connected to a motor (represented by a circular symbol with a gear) and a component labeled 'EXP_HUTCH_AGGREGATED_PP_No'. The right bus is connected to a component labeled 'RACKROOM_AGGREGATED_PP_No'. Red lines represent the connections between the buses and the components. Blue lines represent the bus structures. The diagram is enclosed in a dashed green border.

TYPICAL EEC	Functional assignment	Higher-level function	Installation site	Mounting location	Higher-level function number	Document type	User-defined Page name	Representation Type	Unit	Page_Description_SteppertMotor_Multiline_Page	BKF Crate installed in RCKs	Crate Size in U	==	+	Exp1utch++	Rackroom++	COMPONENT_==	COMPONENT_+	COMPONENT_+	COMPONENT_+	RACKROOM_AGGREGATED_pp_No	RACKROOM_AGGREGATED_pp_Wall_or_RCK_3th_No	EXP_HUTCH_AGGREGATED_pp_No	24V_Wago_Terminal_Distribution_Point_No	0V_Wago_Terminal_Distribution_Point_No	0V_Wago_Terminal_Distribution_Point_No
GROUPFUNCTION_EXPERIMENT_XMKF_Infra.BKF_2_couplers_for_Projects_Integration	FXE	Infra.BKF00099	XHEXP1.SA SE1.D21.RCK99	BKF00099			0																			
GROUPFUNCTION_EXPERIMENT_XMKF_Projects_Integration_kowde2v23	FXE	OPT.SLIT1	XHEXP1.SA SE1.D21.RCK99	BKF09999			0				RCK99	6	FXE	BKF09999	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	OPT.SLIT1	XHEXP1.SA SE1.D05	SLIT1						
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF\XHEXP1.SA SEK0Y1RCKZ1\BKF09999_EFA	FXE	Infra.BKF00665	XHEXP1.SA SE1.D21.RCK99	BKF00665	EFA		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF\XHEXP1.SA SEK0Y1RCKZ1\BKF09999_EFS	FXE	Infra.BKF00665	XHEXP1.SA SE1.D21.RCK99	BKF00665	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XVAC\VAL VEM\XHEXP1.SA SEX0Y1RCKZ1\BKF09999_EFA	FXE	TEST.VALVEMOTOR1	XHEXP1.SA SE1.D21.RCK99	BKF00665	EFA		0																			
GROUPFUNCTION_EXPERIMENT_XVAC\VAL VEM\XHEXP1.SA SEX0Y1RCKZ1\BKF09999_EFS	FXE	TEST.VALVEMOTOR1	XHEXP1.SA SE1.D21.RCK99	BKF00665	EFS		0			VALVE_MOTOR1	RCK99	6	FXE	BKF00665	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	TEST.VALVEMOTOR1	XHEXP1.SA SE1.D05	ValveMotor1	4	Wall	1	1	1	1
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF\XHEXP1.SA SEK0Y1RCKZ1\BKF09999_EFA	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFA		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF\XHEXP1.SA SEK0Y1RCKZ1\BKF09999_EFS	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFS		0																			
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GROUPFUNCTION_EXPERIMENT_XVAC\VAL VEM\XHEXP1.SA SEX0Y1RCKZ1\BKF09999_EFS	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFS		0			VALVEMOTOR2	RCK99	6	FXE	BKF00667	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D05	ValveMotor2	4	Wall	1			
GROUPFUNCTION_INFRA\24VDC\RCKPSU_EFS	FXE	Infra.24VDC	XHEXP1.SA SE1.D21.RCK99	RCKPSU	EFS		0																			
GROUPFUNCTION_INFRA\BKF\BKF_EFS	FXE	Infra.BKF00666	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFS		0																	3	3	3
GROUPFUNCTION_INFRA\BKF\BKF_EFA	FXE	Infra.BKF00666	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFA		0																			
GROUPFUNCTION_INFRA\BKF\BKF_EFA11	FXE	Infra.BKF00666	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFA11		0																			
ETL MAKROS TO BE ADDED																										
GROUPFUNCTION_EXPERIMENT_XVALVEMOTOR\TEST\VALVEMOTOR_EFS	FXE	TEST.VALVEMOTOR3	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XVALVEMOTOR\TEST\VALVEMOTOR_EFA	FXE	TEST.VALVEMOTOR3	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFA		0			VALVEMOTOR3	RCK99	6	FXE	BKF00666	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	TEST.VALVEMOTOR3	XHEXP1.SA SE1.D05	ValveMotor3	4	Wall	1			
GROUPFUNCTION_INFRA\BKF\BKF_EFS	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFS		0																		2	2
GROUPFUNCTION_INFRA\BKF\BKF_EFA	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFA		0																			
GROUPFUNCTION_INFRA\BKF\BKF_EFA11	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFA11		0																			
ETL MAKROS TO BE ADDED																										
GROUPFUNCTION_EXPERIMENT_XVALVEMOTOR\TEST\VALVEMOTOR_EFS	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XVALVEMOTOR\TEST\VALVEMOTOR_EFA	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFA		0			VALVEMOTOR2	RCK99	6	FXE	BKF00667	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D05	ValveMotor3	4	Wall	1			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_ETL			XHEXP1.SA SE1.D21.RCK99	BKF00004	ETL		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_BP_ETL			XHEXP1.SA SE1.D21.RCK99	BKF00004.BP	ETL		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFA11	FXE	Infra.BKF00004	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFA11		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFS	FXE	Infra.BKF00004	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFA01	FXE	Infra.BKF00004	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFA01		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_24VDC_EFS	FXE	Infra.24VDC	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XMKFSLIT4_EFA01	FXE	OPT.SLIT4	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFA01		0																			
GROUPFUNCTION_EXPERIMENT_XMKFSLIT4_EFS	FXE	OPT.SLIT4	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFS		0			SLIT4	RCK99	6	FXE	BKF00004	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	OPT.SLIT4	XHEXP1.SA SE1.D05	Slit4	4	Wall	2			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_ETL			XHEXP1.SA SE1.D21.RCK99	BKF00005	ETL		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_BP_ETL			XHEXP1.SA SE1.D21.RCK99	BKF00005.BP	ETL		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFA11	FXE	Infra.BKF00005	XHEXP1.SA SE1.D21.RCK99	BKF00005	EFA11		0																			
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GROUPFUNCTION_EXPERIMENT_XMKF_Projects_Integration	FXE	OPT.SLIT3	#N/A				0			#N/A	6	FXE	0	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	OPT.SLIT3	XHEXP1.SA SE1.D05	SLIT3							

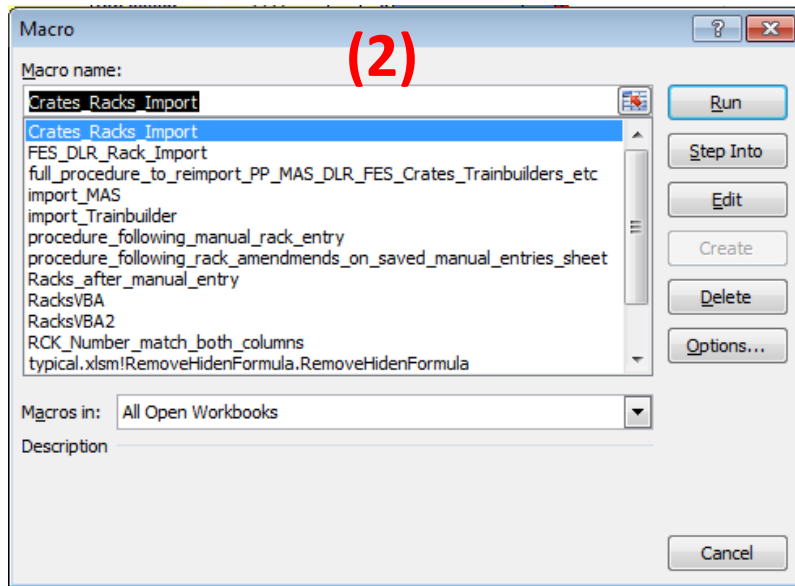
Custom Solution Implemented

BKF00665	EFA	0		VALVE_MOTOR1	RCK99	6 FXE	BKF00665	XHEXP1.SASE1.D05	XHEXP1.
BKF00667	EFA	0							
BKF00667	EFS	0							
BKF00667	EFA	0							
BKF00667	EFS	0		VALVEMOTOR2					
RCKPSU	EFS	0							
BKF00666	EFS	0							
BKF00666	FFA	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])`



(3)

Specs Database

Network Equipment

Lights

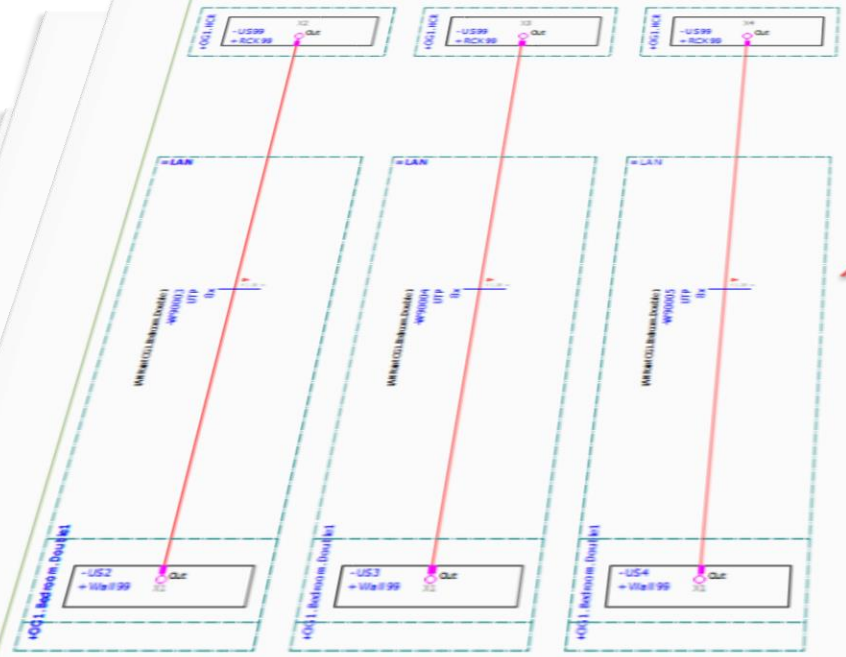
Cameras

Projects

Functional equipment	Reference or function	Location	Mounting location	Reference or function number	Document type	User defined	Page name	Specification type	Variant	Part function text	Signal level function	Source location	Source wall/str location	IO or source	Source PP or Switch Part Number	Target location	Target wall/str location	Target socket Panel Number	Target socket Panel Part Number	Cable number	Part Cable
IP_CAM Point	OG0.Lobby	OG0.Lobby		090.HCR	Switch99	EFS	1	Multi-line <1>	A	IP_CAM Point OG0.Lobby	LAN	OG0.HCR	RCK99 XIG 99	4	OG0.Lobby	TOP 34	1	98001		UTP Cable CAT	
IP_CAM Point	OG1.Lobby	OG1.Lobby		091.HCR	Switch99	EFS	2	Multi-line <1>	A	IP_CAM Point OG1.Lobby	LAN	OG1.HCR	RCK99 XIG 99	19	OG1.Lobby	TOP 35	1	98002		UTP Cable CAT	
IP_CAM Point	OG1.Hallway2	OG1.Hallway2		091.HCR	Switch99	EFS	3	Multi-line <1>	A	IP_CAM Point OG1.Hallway2	LAN	OG1.HCR	RCK99 XIG 99	20	OG1.Hallway2	TOP 36	1	98003		UTP Cable CAT	
IP_CAM Point	OG1.Hallway2	OG1.Hallway2		091.HCR	Switch99	EFS	3	Multi-line <1>	A	IP_CAM Point OG1.Hallway2	LAN	OG1.HCR	RCK99 XIG 99	21	OG1.Hallway2	TOP 37	1	98004		UTP Cable CAT	
IP_CAM Point	OG1.LivingRoom	OG1.LivingRoom		091.HCR	Switch99	EFS	4	Multi-line <1>	A	IP_CAM Point OG1.LivingRoom	LAN	OG1.HCR	RCK99 XIG 99	22	OG1.LivingRoom	TOP 38	1	98005		UTP Cable CAT	
IP_CAM Point	OG1.DinnerArea	OG1.DinnerArea		091.HCR	Switch99	EFS	5	Multi-line <1>	A	IP_CAM Point OG1.DinnerArea	LAN	OG1.HCR	RCK99 XIG 99	23	OG1.DinnerArea	TOP 39	1	98006		UTP Cable CAT	
IP_CAM Point	OG1.Kitchen	OG1.Kitchen		091.HCR	Switch99	EFS	6	Multi-line <1>	A	IP_CAM Point OG1.Kitchen	LAN	OG1.HCR	RCK99 XIG 99	24	OG1.Kitchen	TOP 40	1	98007		UTP Cable CAT	
IP_CAM Point	OG1.OfficeRoom	OG1.OfficeRoom		091.HCR	Switch99	EFS	9	Multi-line <1>	A	IP_CAM Point OG1.OfficeRoom	LAN	OG1.HCR	RCK99 XIG 99	25	OG1.OfficeRoom	TOP 41	1	98008		UTP Cable CAT	
IP_CAM Point	OG1.Hallway1	OG1.Hallway1		091.HCR	Switch99	EFS	10	Multi-line <1>	A	IP_CAM Point OG1.Hallway1	LAN	OG1.HCR	RCK99 XIG 99	26	OG1.Hallway1	TOP 42	1	98009		UTP Cable CAT	

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



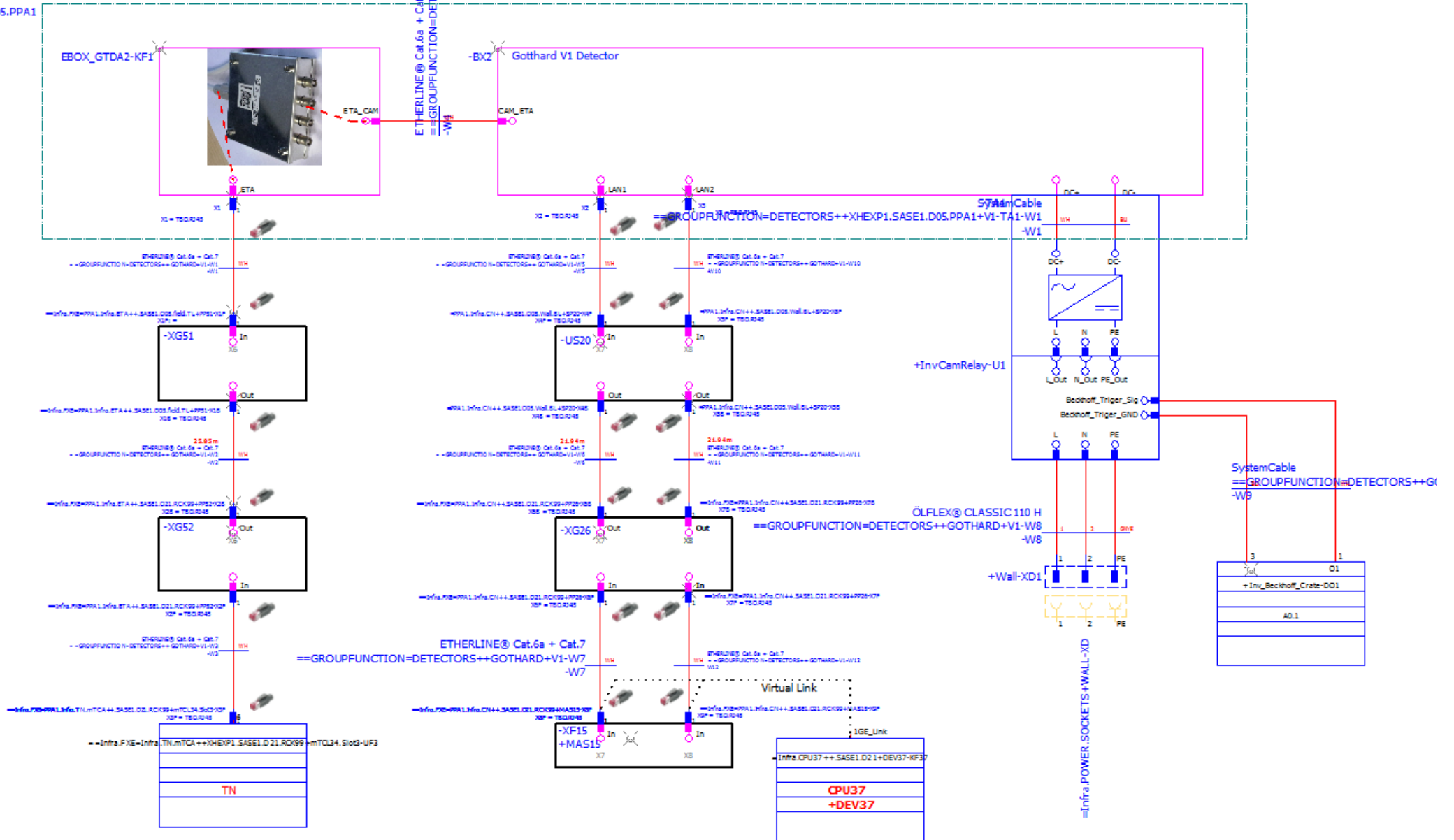
LAN / IT NETWORKS
STAR TOPOLOGY
Including IT equipment's
ports Assignment

LAN Point OG1.Bedroom.Double1 LAN Point OG1.Bedroom.Double1 LAN Point OG1.Bedroom.Double1

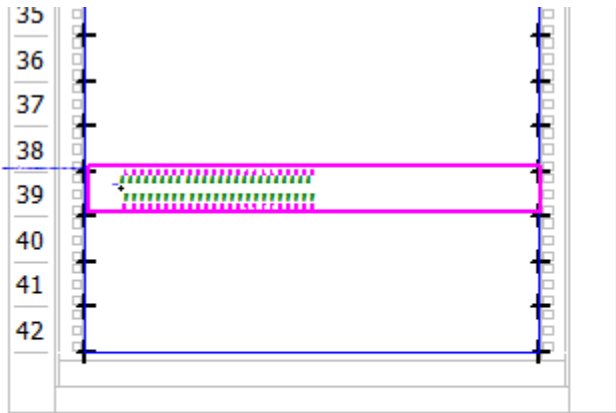
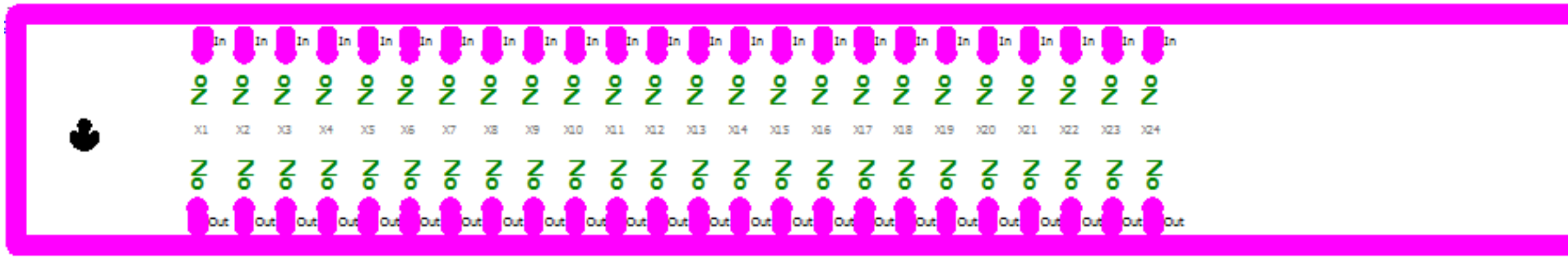
		Date	05/02/18	Dr. Antonio V. Lalecos	LePlan	STAR TOPOLOGY LAN CABLING	<input type="checkbox"/> List <input type="checkbox"/> Success	
		By	JAEOLUIS				NoDem001 Page 3	
		For		LePlan DEHO Detached House Electrical/Telecom Plan			Page 14/18	
Redrafted	Date	Name	Original	Replacement of	Revised by		Page 14/18	

Redrafted	Date	Name	Original	Replacement of	Revised by		Page 14/18	
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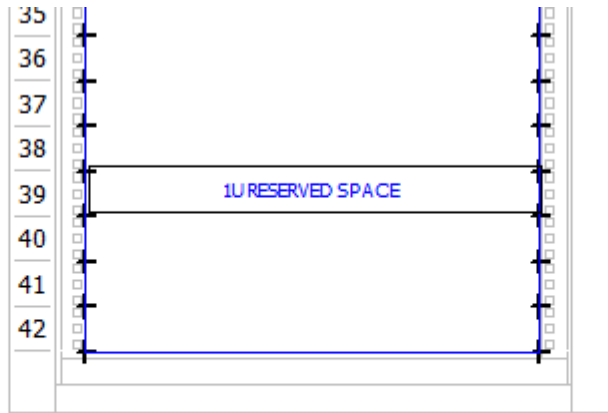
+XHEXP1.SASE1.D05.PPA1



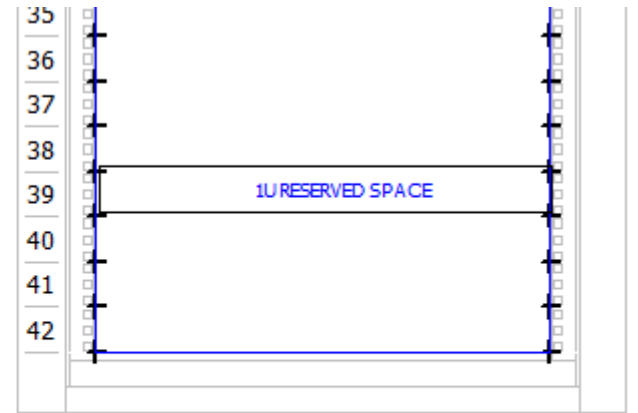
TYPICAL EEC	Functional assignment	Higher-level function	Installation site	Mounting location	Higher-level function number	Document type	User-defined Page name	Representation Type	Unit	Page_Description_SteppertMotor_Multiline_Page	BKF Crate installed in RCKs	Crate Size in U	==	+	Exp1utch++	Rackroom++	COMPONENT_==	COMPONENT_+	COMPONENT_+	COMPONENT_+	RACKROOM_AGGREGATED_PP_No	RACKROOM_AGGREGATED_PP_Wall_or_RCK_3th_No	EXP_HUTCH_AGGREGATED_PP_No	24V_Wago_Terminal_Distribution_Point_No	0V_Wago_Terminal_Distribution_Point_No	0V_Wago_Terminal_Distribution_Point_No
GROUPFUNCTION_EXPERIMENT_XMKF_Infra.BKF_2_couplers_for_Projects_Integration	FXE	Infra.BKF00099	XHEXP1.SA SE1.D21.RCK99	BKF00099			0																			
GROUPFUNCTION_EXPERIMENT_XMKF_Projects_Integration_kowde2v23	FXE	OPT.SLIT1	XHEXP1.SA SE1.D21.RCK99	BKF09999			0				RCK99	6	FXE	BKF09999	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	OPT.SLIT1	XHEXP1.SA SE1.D05	SLIT1						
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF\XHEXP1.SA SEK0Y1\RC KZ1\BKF09999_EFA	FXE	Infra.BKF00665	XHEXP1.SA SE1.D21.RCK99	BKF00665	EFA		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF\XHEXP1.SA SEK0Y1\RC KZ1\BKF09999_EFS	FXE	Infra.BKF00665	XHEXP1.SA SE1.D21.RCK99	BKF00665	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XVAC\VAL VEM\XHEXP1.SA SEX0Y1\RC KZ1\BKF09999_EFA	FXE	TEST.VALVEMOTOR1	XHEXP1.SA SE1.D21.RCK99	BKF00665	EFA		0																			
GROUPFUNCTION_EXPERIMENT_XVAC\VAL VEM\XHEXP1.SA SEX0Y1\RC KZ1\BKF09999_EFS	FXE	TEST.VALVEMOTOR1	XHEXP1.SA SE1.D21.RCK99	BKF00665	EFS		0			VALVE_MOTOR1	RCK99	6	FXE	BKF00665	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	TEST.VALVEMOTOR1	XHEXP1.SA SE1.D05	ValveMotor1	4	Wall	1	1	1	1
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF\XHEXP1.SA SEK0Y1\RC KZ1\BKF09999_EFA	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFA		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF\XHEXP1.SA SEK0Y1\RC KZ1\BKF09999_EFS	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XVAC\VAL VEM\XHEXP1.SA SEX0Y1\RC KZ1\BKF09999_EFA	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFA		0																			
GROUPFUNCTION_EXPERIMENT_XVAC\VAL VEM\XHEXP1.SA SEX0Y1\RC KZ1\BKF09999_EFS	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFS		0			VALVEMOTOR2	RCK99	6	FXE	BKF00667	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D05	ValveMotor2	4	Wall	1			
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GROUPFUNCTION_INFRA\BKF\BKF_EFS	FXE	Infra.BKF00666	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFS		0																			
GROUPFUNCTION_INFRA\BKF\BKF_EFA	FXE	Infra.BKF00666	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFA		0																			
GROUPFUNCTION_INFRA\BKF\BKF_EFA11	FXE	Infra.BKF00666	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFA11		0																			
ETL MAKROS TO BE ADDED																										
GROUPFUNCTION_EXPERIMENT_XVALVEMOTOR\TEST\VALVEMOTOR_EFS	FXE	TEST.VALVEMOTOR3	XHEXP1.SA SE1.D21.RCK99	BKF00666	EFS		0																			
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GROUPFUNCTION_INFRA\BKF\BKF_EFS	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFS		0																			
GROUPFUNCTION_INFRA\BKF\BKF_EFA	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFA		0																			
GROUPFUNCTION_INFRA\BKF\BKF_EFA11	FXE	Infra.BKF00667	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFA11		0																			
ETL MAKROS TO BE ADDED																										
GROUPFUNCTION_EXPERIMENT_XVALVEMOTOR\TEST\VALVEMOTOR_EFS	FXE	TEST.VALVEMOTOR2	XHEXP1.SA SE1.D21.RCK99	BKF00667	EFS		0																			
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GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_BP_ETL			XHEXP1.SA SE1.D21.RCK99	BKF00004.BP	ETL		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFA11	FXE	Infra.BKF00004	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFA11		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFS	FXE	Infra.BKF00004	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFA01	FXE	Infra.BKF00004	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFA01		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_24VDC_EFS	FXE	Infra.24VDC	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XOPT\SLIT4_EFA01	FXE	OPT.SLIT4	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFA01		0																			
GROUPFUNCTION_EXPERIMENT_XOPT\SLIT4_EFS	FXE	OPT.SLIT4	XHEXP1.SA SE1.D21.RCK99	BKF00004	EFS		0			SLIT4	RCK99	6	FXE	BKF00004	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	OPT.SLIT4	XHEXP1.SA SE1.D05	Slit4	4	Wall	2			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_ETL			XHEXP1.SA SE1.D21.RCK99	BKF00005	ETL		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_BP_ETL			XHEXP1.SA SE1.D21.RCK99	BKF00005.BP	ETL		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFA11	FXE	Infra.BKF00005	XHEXP1.SA SE1.D21.RCK99	BKF00005	EFA11		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFS	FXE	Infra.BKF00005	XHEXP1.SA SE1.D21.RCK99	BKF00005	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_EFA01	FXE	Infra.BKF00005	XHEXP1.SA SE1.D21.RCK99	BKF00005	EFA01		0																			
GROUPFUNCTION_EXPERIMENT_XMKFRAIBKF_24VDC_EFS	FXE	Infra.24VDC	XHEXP1.SA SE1.D21.RCK99	BKF00005	EFS		0																			
GROUPFUNCTION_EXPERIMENT_XOPT\SLIT5_EFA01	FXE	OPT.SLIT5	XHEXP1.SA SE1.D21.RCK99	BKF00005	EFA01		0																			
GROUPFUNCTION_EXPERIMENT_XOPT\SLIT5_EFS	FXE	OPT.SLIT5	XHEXP1.SA SE1.D21.RCK99	BKF00005	EFS		0			SLIT5	RCK99	6	FXE	BKF00005	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	OPT.SLIT5	XHEXP1.SA SE1.D05	Slit4	4	Wall	2			
GROUPFUNCTION_EXPERIMENT_XMKF_Infra.BKF_2_couplers_for_Projects_Integration	FXE	Infra.	#N/A				0																			
GROUPFUNCTION_EXPERIMENT_XMKF_Projects_Integration	FXE	OPT.SLIT2	#N/A				0			#N/A	6	FXE	0	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	OPT.SLIT2	XHEXP1.SA SE1.D05	SLIT2							
GROUPFUNCTION_EXPERIMENT_XMKF_Projects_Integration	FXE	OPT.SLIT3	#N/A				0			#N/A	6	FXE	0	XHEXP1.SA SE1.D05	XHEXP1.SA SE1.D21	FXE	OPT.SLIT3	XHEXP1.SA SE1.D05	SLIT3							



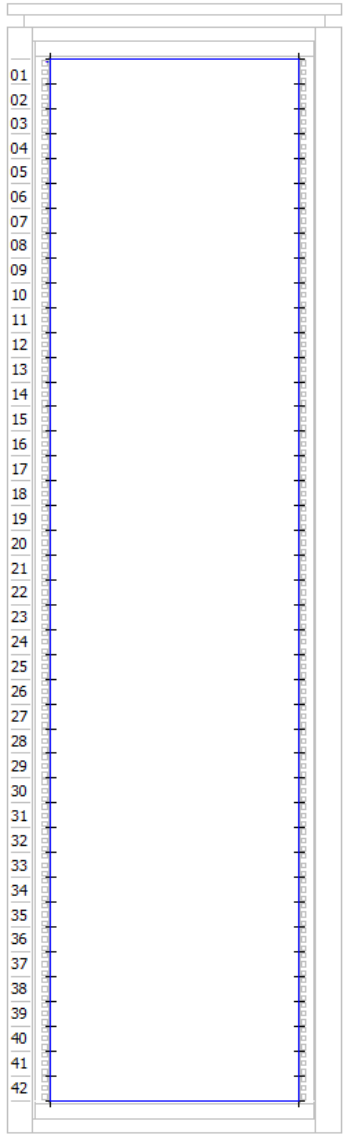
Rack Front



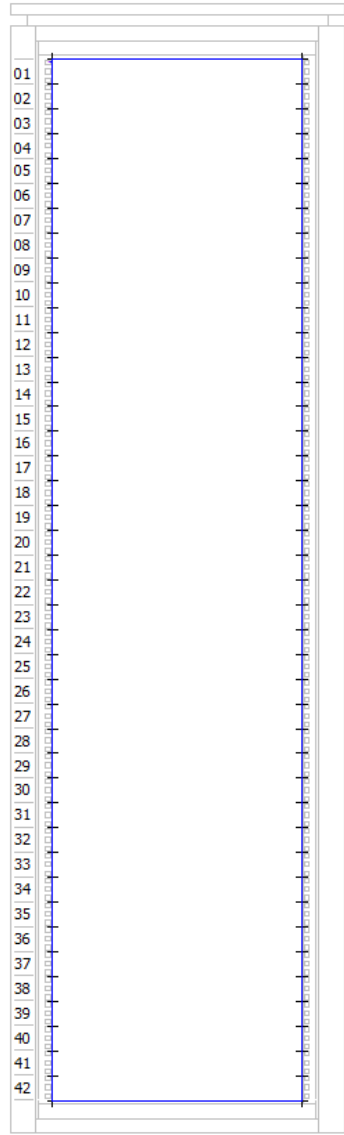
Rack MID Level



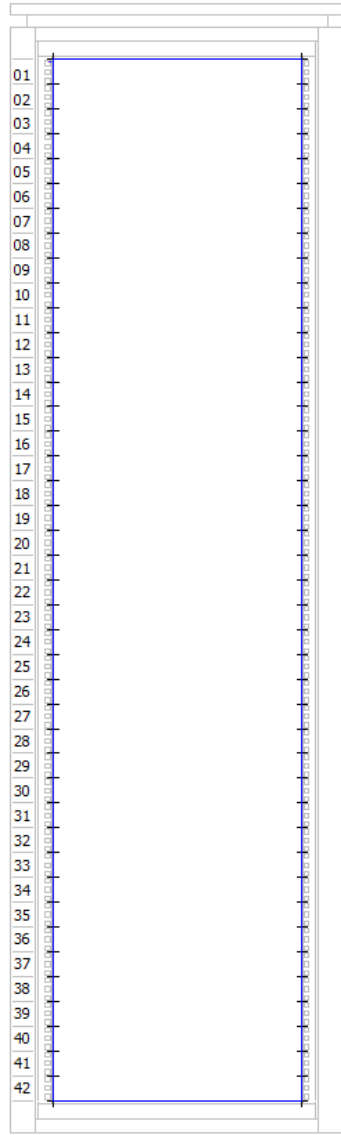
Rack Back Level



Rack Front



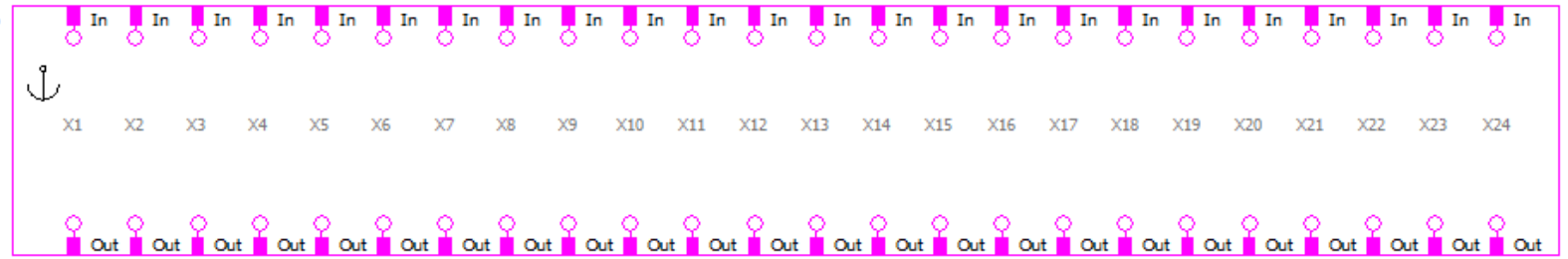
Rack MID Level



Rack Back Level



-XG?



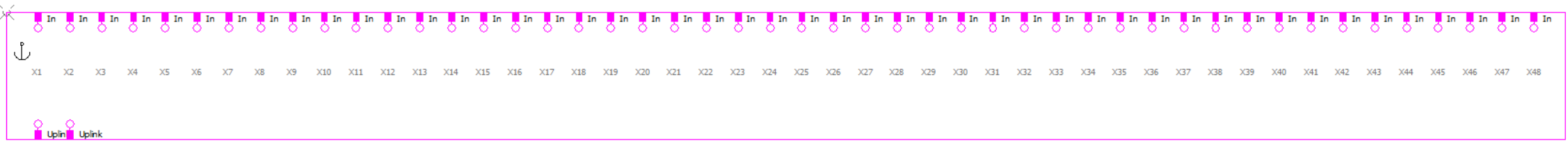
48 ports Network Switch

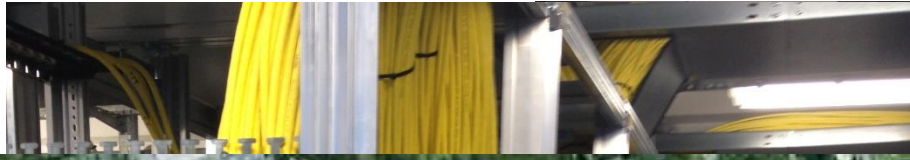


24 ports Patch Panel



==NET=LAN+DCC+RCK1-SWITCH1





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)

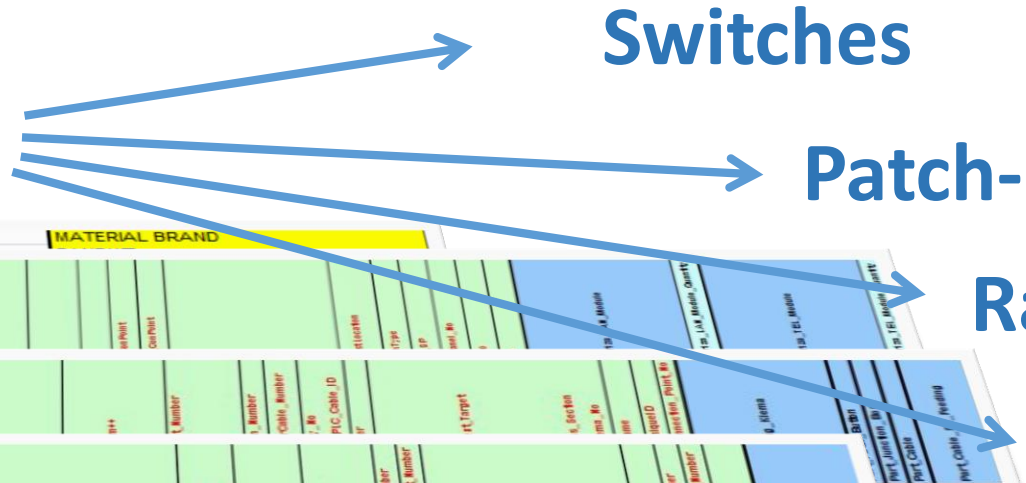
Import Networks Infrastructure

Switches

Patch-Panels

Racks

“Projects”



Total Decks										MATERIAL BRAND													
Equipment	Location	Room No	Deck	Port No	Port Type	Port Name	Port ID	Port Label	Port Status	Port Description	Port Type	Port Label	Port Status	Port Description	Port Type	Port Label	Port Status	Port Description	Port Type	Port Label	Port Status	Port Description	
01 Lobby	EP_PLANROUTING	SAFETY_IP_CAM	OG0.HCR	Switch99	EFS	1	IP_CAM Point OG0.Lobby	LAN	OG0.HCR	RCK99	XIG	99	4	OG0.Lobby	TOP	34	1	98001	UTP Cable CAT				
01 Lobby	EP_PLANROUTING	SAFETY_IP_CAM	OG1.HCR	Switch99	EFS	2	IP_CAM Point OG1.Lobby	LAN	OG1.HCR	RCK99	XIG	99	19	OG1.Lobby	TOP	35	1	98002	UTP Cable CAT				
01 Hallway/2	EP_PLANROUTING	SAFETY_IP_CAM	OG1.HCR	Switch99	EFS	3	IP_CAM Point OG1.Hallway/2	LAN	OG1.HCR	RCK99	XIG	99	20	OG1.Hallway/2	TOP	36	1	98003	UTP Cable CAT				
01 Hallway/2	EP_PLANROUTING	SAFETY_IP_CAM	OG1.HCR	Switch99	EFS	3	IP_CAM Point OG1.Hallway/2	LAN	OG1.HCR	RCK99	XIG	99	21	OG1.Hallway/2	TOP	37	1	98004	UTP Cable CAT				
01 LivingRoom	EP_PLANROUTING	SAFETY_IP_CAM	OG1.HCR	Switch99	EFS	4	IP_CAM Point OG1.LivingRoom	LAN	OG1.HCR	RCK99	XIG	99	22	OG1.LivingRoom	TOP	38	1	98005	UTP Cable CAT				
01 DinnerArea	EP_PLANROUTING	SAFETY_IP_CAM	OG1.HCR	Switch99	EFS	5	IP_CAM Point OG1.DinnerArea	LAN	OG1.HCR	RCK99	XIG	99	23	OG1.DinnerArea	TOP	39	1	98006	UTP Cable CAT				
01 Kitchen	EP_PLANROUTING	SAFETY_IP_CAM	OG1.HCR	Switch99	EFS	6	IP_CAM Point OG1.Kitchen	LAN	OG1.HCR	RCK99	XIG	99	24	OG1.Kitchen	TOP	40	1	98007	UTP Cable CAT				
01 OfficeRoom	EP_PLANROUTING	SAFETY_IP_CAM	OG1.HCR	Switch99	EFS	9	IP_CAM Point OG1.OfficeRoom	LAN	OG1.HCR	RCK99	XIG	99	25	OG1.OfficeRoom	TOP	41	1	98008	UTP Cable CAT				
01 Hallway/1	EP_PLANROUTING	SAFETY_IP_CAM	OG1.HCR	Switch99	EFS	10	IP_CAM Point OG1.Hallway/1	LAN	OG1.HCR	RCK99	XIG	99	26	OG1.Hallway/1	TOP	42	1	98009	UTP Cable CAT				

Moving from planning to building...

- Parts List

- Wiring

- Installation Instruction

Reports:

Topology: Routed cables / connections

F36_001

Designation	Part number	Type number	Length [m]	Source	Routing track	Target
==Distr=220V-WF1	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-WF6	NYA 3x2.5mm2		10.06	==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-WF8	NYA 3x2.5mm2		15.35	==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 ++OG1.Kitchen-U21; ++OG1.Kitchen-U20; ++OG1.Kitchen-U19; ++OG1.Kitchen-U18	==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		18.44	==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-WF5	NYA 3x2.5mm2		13.73	==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-XG1	-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-XG2	-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

• BOMs / Part Lists

• Cable Laying Instructions

• Connection Instructions

• Connectors Pin Assignment / Confectioning Instructions

• Terminal Connections

• Rack Content Summary

• Cable Lengths

• ...

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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