

SPIRAL2 PROJECT: INTEGRATION OF THE ACCELERATOR PROCESSES, CONSTRUCTION OF THE BUILDINGS AND PROCESS CONNECTIONS

P. Anger, P. Bisson, O. Danna, X. Hulin, JM. Lagniel, S. Montaigne, F. Perocheau, E. Petit, L. Rounsard- GANIL Laboratory (Caen -France)

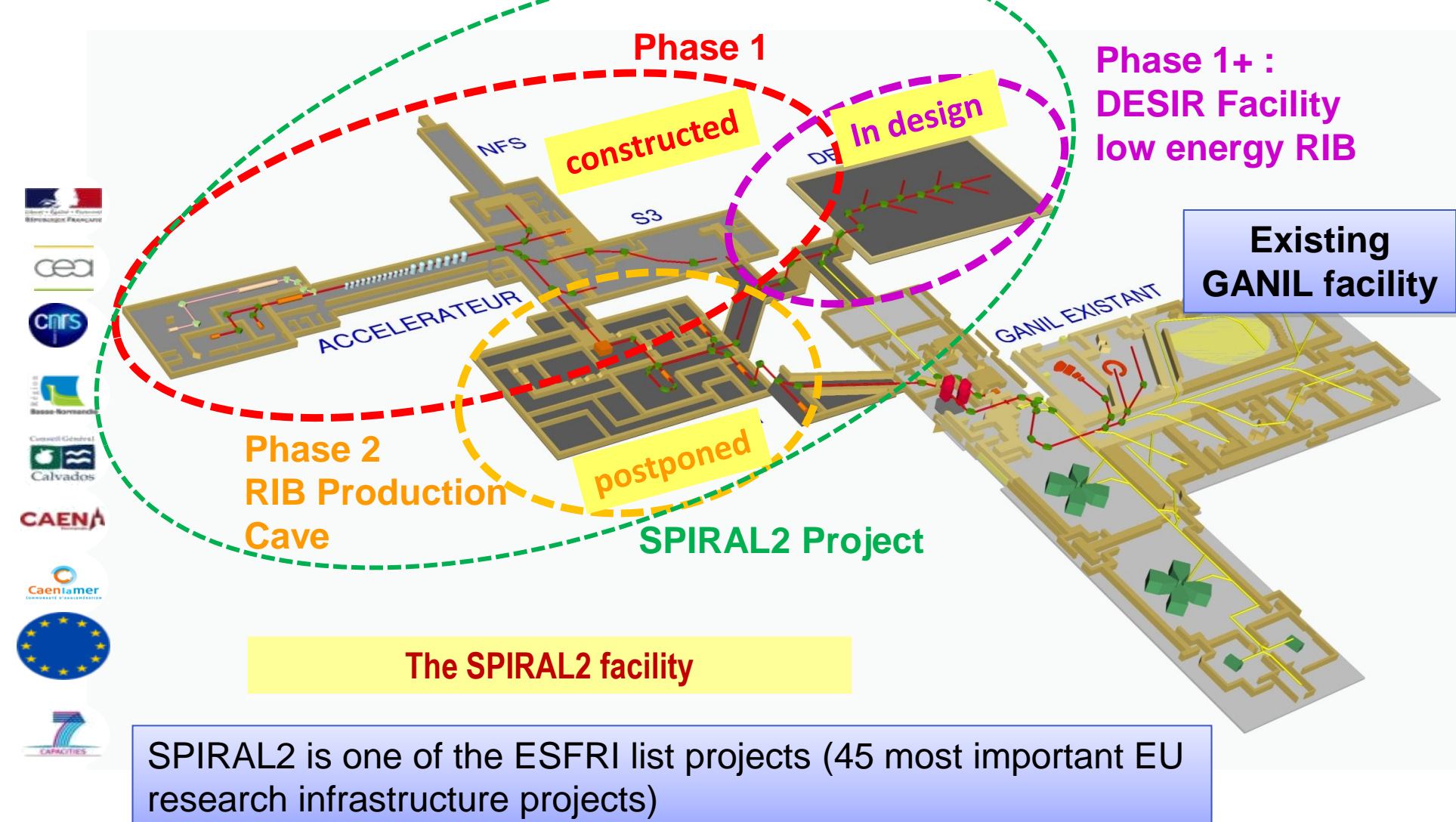
e-mail : anger@ganil.fr

Abstract:

The GANIL SPIRAL 2 Project is based on the construction of a superconducting ion CW LINAC (up to 5 mA - 40 MeV deuteron and 33 MeV proton beams, up to 1 mA - 14.5 MeV/u heavy ion beams) with two experimental areas named S3 ("Super Separator Spectrometer" for very heavy and super heavy element production) and NFS ("Neutron For Science"). The building studies as well as the accelerator and experimental equipment integration started in 2009. The ground breaking started at the end of 2010.

The integration task of the different equipments into the buildings is managed by a trade-oriented integration unit gathering the accelerator integration team, the building prime contractor and a dedicated contracting assistant. All work packages are synthesized at the same time using 3D models. 3D tools are used to carry out integration, synthesis, process connections and the preparation of the future assembly. Since 2014, the buildings and process connections are received and the accelerator installation is well advanced. This contribution will describe these 3D tools, the building construction, the process connection status and our experience feedback.

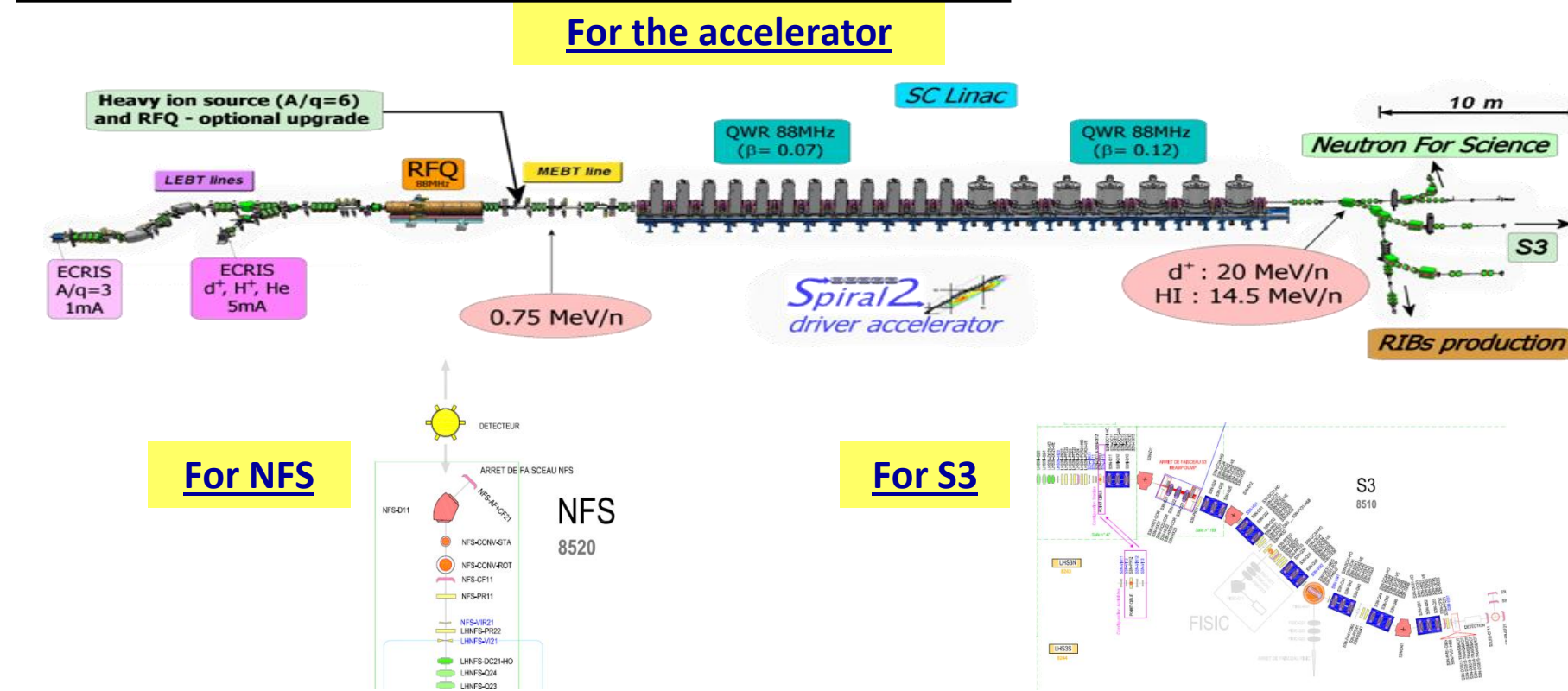
SPIRAL2 Project Phases:



SPIRAL2 Project Phase 1

Definition of the needs and preliminary design :

1) Baseline Configuration of the processes

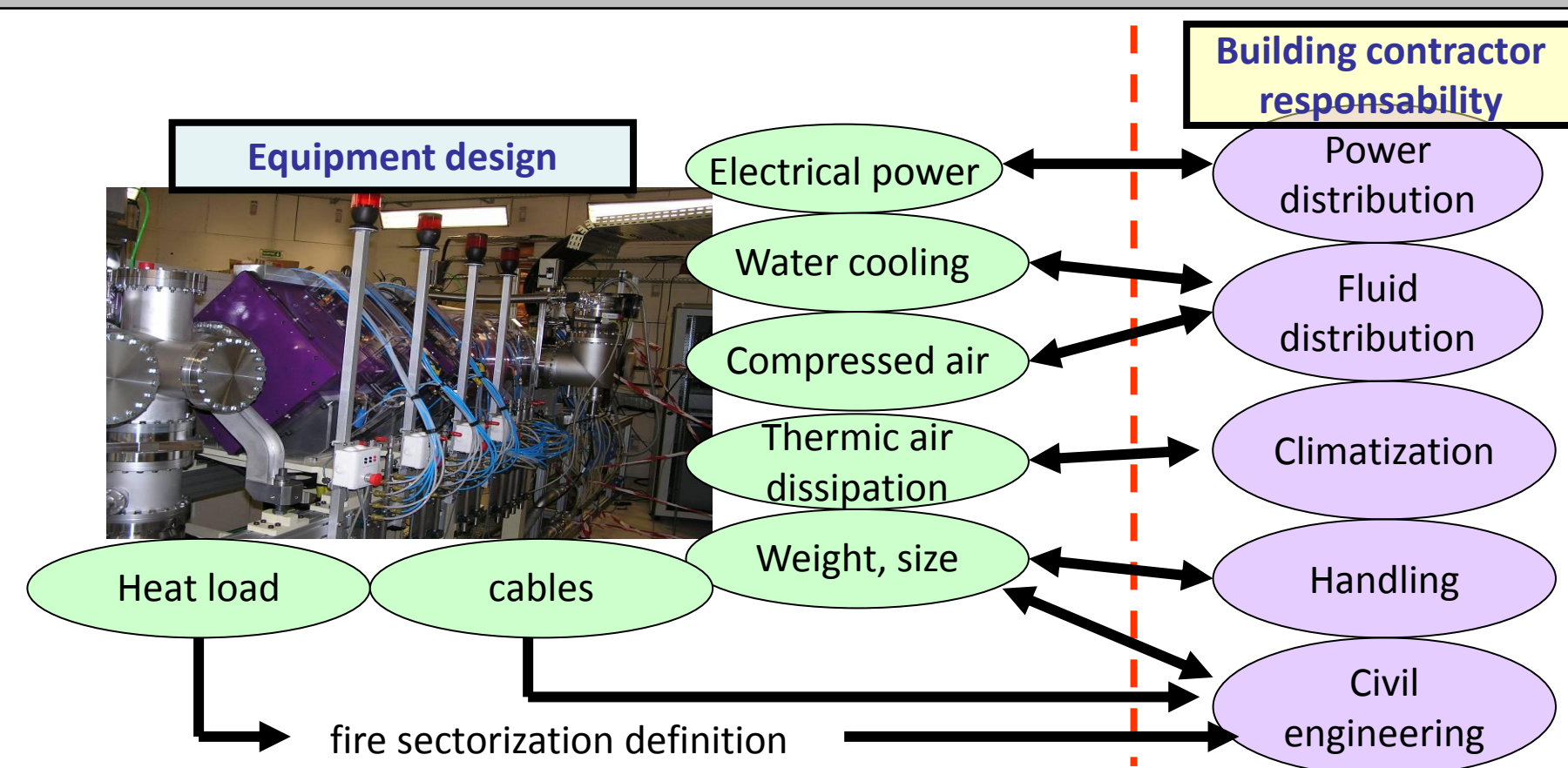


2) Implementation of the SPIRAL2 Product Breakdown Structure (PBS)

- Mixed with geographical structure (for ex : by beam line section) and with technical structure (by trade for ex : electricity supply)
- 6 levels
- Representation of the project organization, the budget, the documentary structure...
- provide codification for equipments and for plans

Code PBS	Arborescence Products	Niv 1	Niv 2	Niv 3	Niv 4	Niv 5
8000	SPIRAL II - REALISATION					
8200	ACCELERATEURS					
8210	Injecteur (Protons, Deutons & ions qA=1/3)					
8211	Source ECR (ions qA=1/3)					
8212	Source ECR (Deutons/Protons)					
8213	LBET (ions qA=1/3)					
8213.1	Protons					
8213.1.1	Solénoides					
8213.1.2	Quadrupoles					
8213.1.3						
8213.1.4						
8213.1.5						
8213.1.6						
8213.1.7						
8213.1.8						
8213.1.9						
8213.1.10						
8213.1.11						
8213.1.12						
8213.1.13						
8213.1.14						
8213.1.15						
8213.1.16						
8213.1.17						
8213.1.18						
8213.1.19						
8213.1.20						
8213.1.21						
8213.1.22						
8213.1.23						
8213.1.24						
8213.1.25						
8213.1.26						
8213.1.27						
8213.1.28						
8213.1.29						
8213.1.30						
8213.1.31						
8213.1.32						
8213.1.33						
8213.1.34						
8213.1.35						
8213.1.36						
8213.1.37						
8213.1.38						
8213.1.39						
8213.1.40						
8213.1.41						
8213.1.42						
8213.1.43						
8213.1.44						
8213.1.45						
8213.1.46						
8213.1.47						
8213.1.48						
8213.1.49						
8213.1.50						
8213.1.51						
8213.1.52						
8213.1.53						
8213.1.54						
8213.1.55						
8213.1.56						
8213.1.57						
8213.1.58						
8213.1.59						
8213.1.60						
8213.1.61						
8213.1.62						
8213.1.63						
8213.1.64						
8213.1.65						
8213.1.66						
8213.1.67						
8213.1.68						
8213.1.69						
8213.1.70						
8213.1.71						
8213.1.72						
8213.1.73						
8213.1.74						
8213.1.75						
8213.1.76						
8213.1.77						
8213.1.78						
8213.1.79						
8213.1.80						
8213.1.81						
8213.1.82						
8213.1.83						
8213.1.84						
8213.1.85						
8213.1.86						
8213.1.87						
8213.1.88						
8213.1.89						
8213.1.90						
8213.1.91						
8213.1.92						
8213.1.93						
8213.1.94						
8213.1.95						
8213.1.96						
8213.1.97						
8213.1.98						
8213.1.99						
8213.2						
8213.3						
8213.4						
8213.5						
8213.6						
8213.7						
8213.8						
8213.9						
8213.10						
8213.11						
8213.12						
8213.13						
8213.14						
8213.15						
8213.16						
8213.17						
8213.18						
8213.19						
8213.20						
8213.21						
8213.22						
8213.23						
8213.24						
8213.25						
8213.26						
8213.27						
8213.28						
8213.29						
8213.30						
8213.31						
8213.32						
8213.33						
8213.34						
8213.35						
8213.36						
8213.37						
8213.38						
8213.39						
8213.40						
8213.41						
8213.42						
8213.43						
8213.44						
8213.45						
8213.46						
8213.47						
8213.48						
8213.49						
8213.50						
8213.51						
8213.52						
8213.53						
8213.54						
8213.55						
8213.56						
8213.57						
8213.58						
8213.59						
8213.60						
8213.61						
8213.62						
8213.63						
8213.64						
8213.65						
8213.66						
8213.67						
8213.68						
8213.69						
8213.70						
8213.71						
8213.72						
8213.73						
8213.74						
8213.75						
8213.76						
8213.77						
8213.78						
8213.79						
8213.80						
8213.81						
8213.82						
8213.83						
8213.84						
8213.85						
8213.86						
8213.87						
8213.88						
8213.89						
8213.90						
8213.91						
8213.92						
8213.93						
8213.94						
8213.95						
8213.96						
8213.97						
8213.98						
8213.99						

3) Getting all the required conventional facilities for each equipment



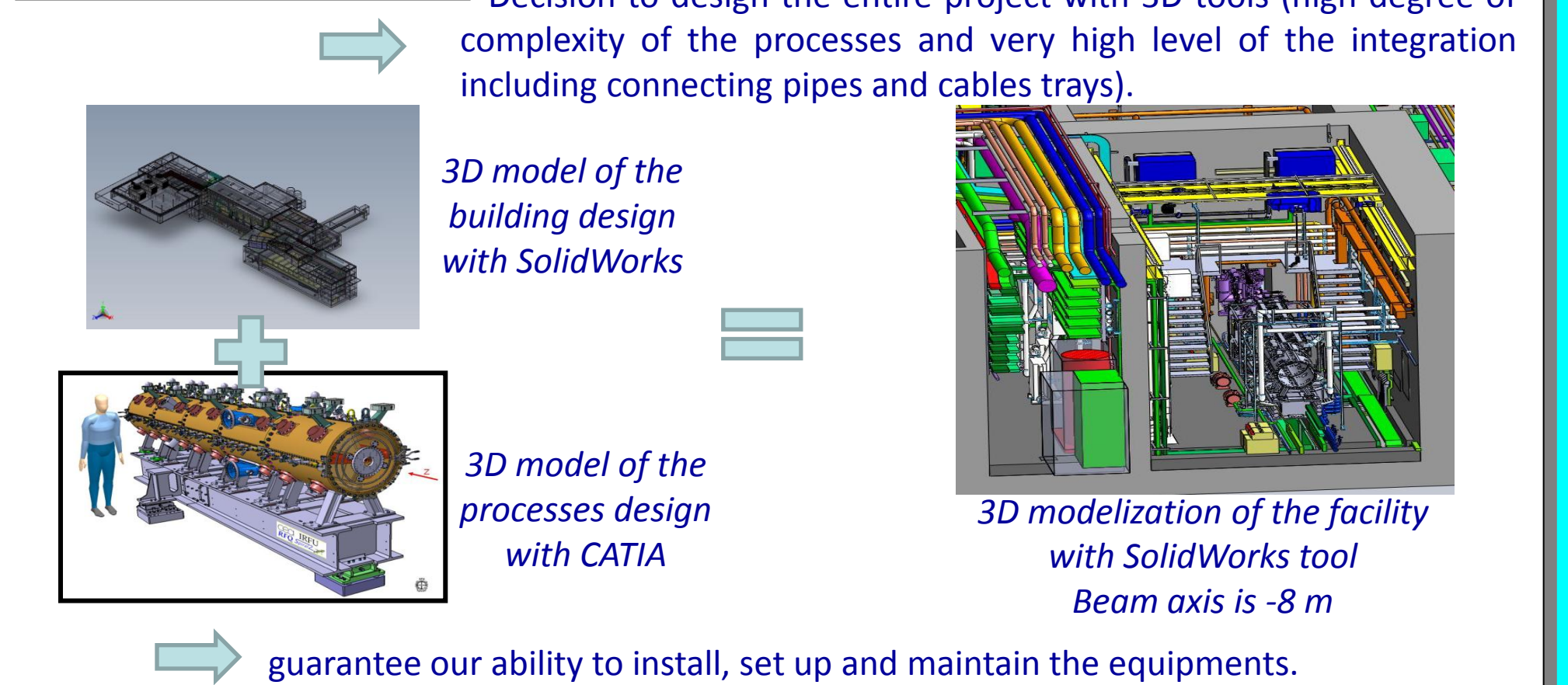
4) Data collection with EXCEL files elaborated from PBS

The screenshot shows an Excel spreadsheet with multiple columns containing technical data and references, organized into sections corresponding to different parts of the project.

5) Generation of synthesis data in order to define building

The table lists 'Interfaces for each room and for each work package'. It includes columns for room names, work packages, and specific interface details, providing a structured overview of the building's internal connections.

6) preliminary design

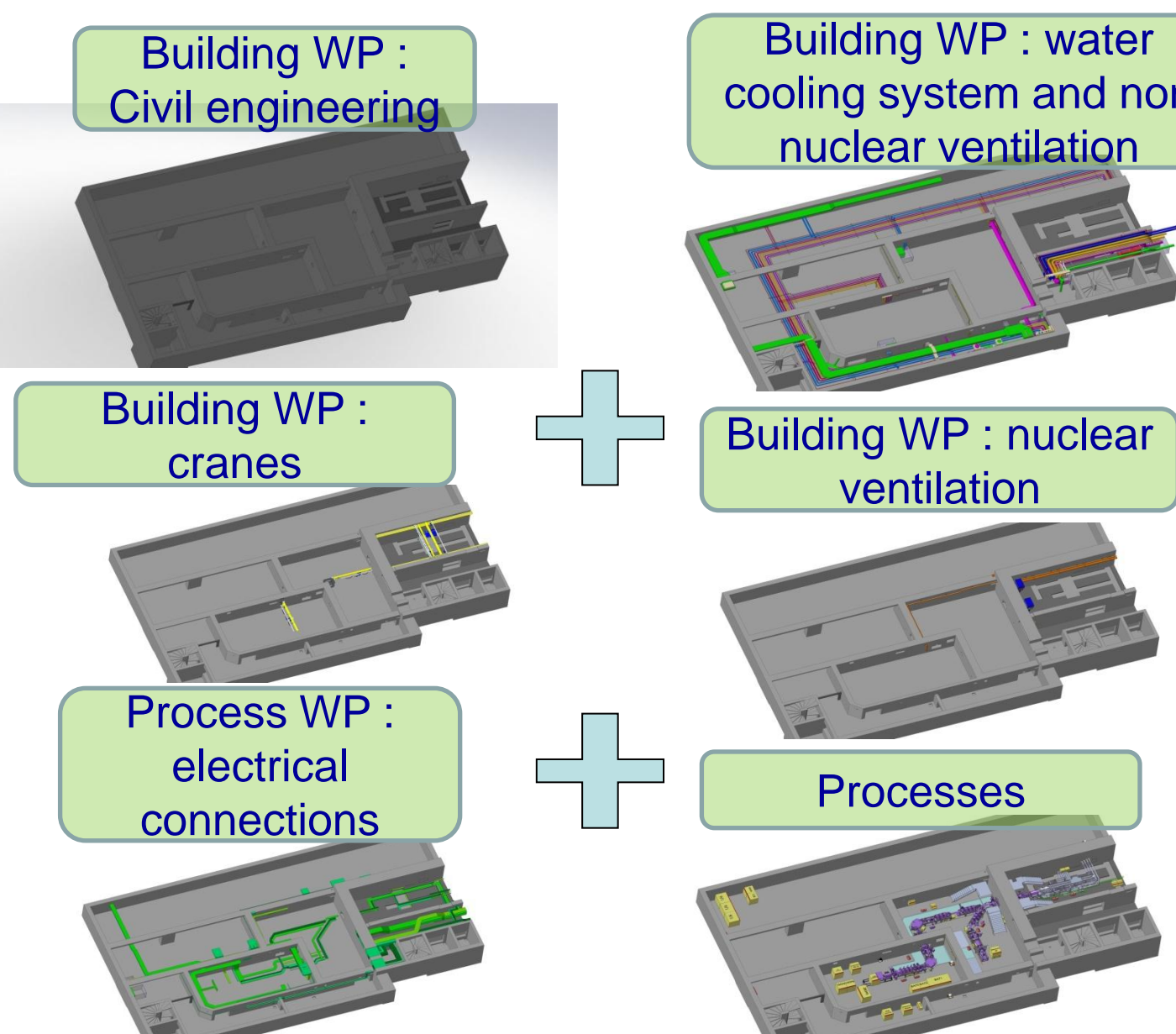


Implementation studies :

3D synthesis operation :

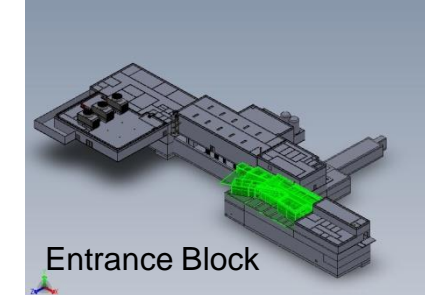
The integration and synthesis process consisted in:
➤ Positioning equipments into the building and providing these equipments with all services and connections necessary for their functioning.
➤ Ensuring the spatial coherence for all equipment in respect of the architectural constraints and technical capacities, for both exploitation and maintenance

3D models for the injector block level -2 :



Organisation :

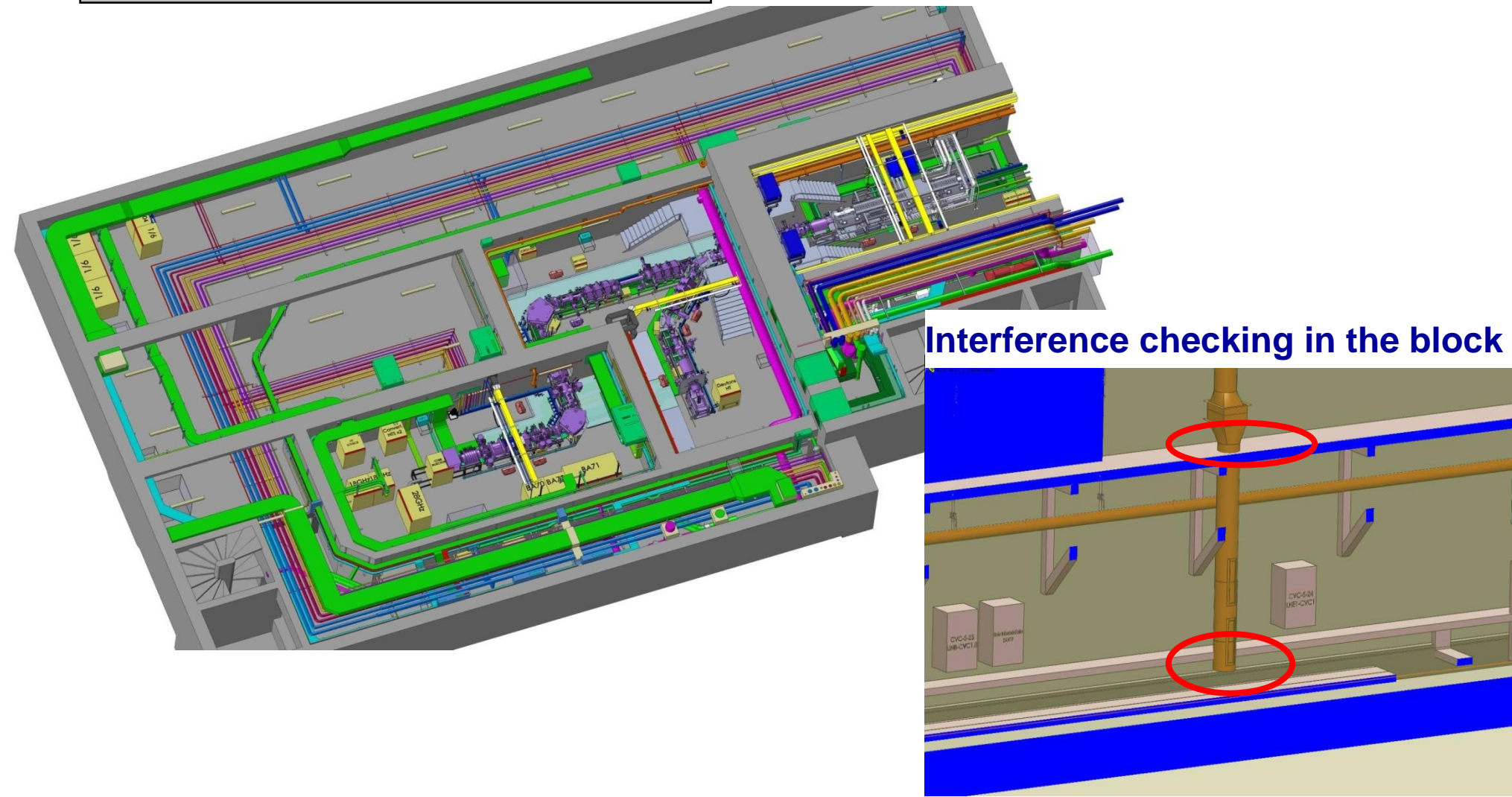
For each firm : same software, same graphics rules and same modelization structure (by building level and by block)



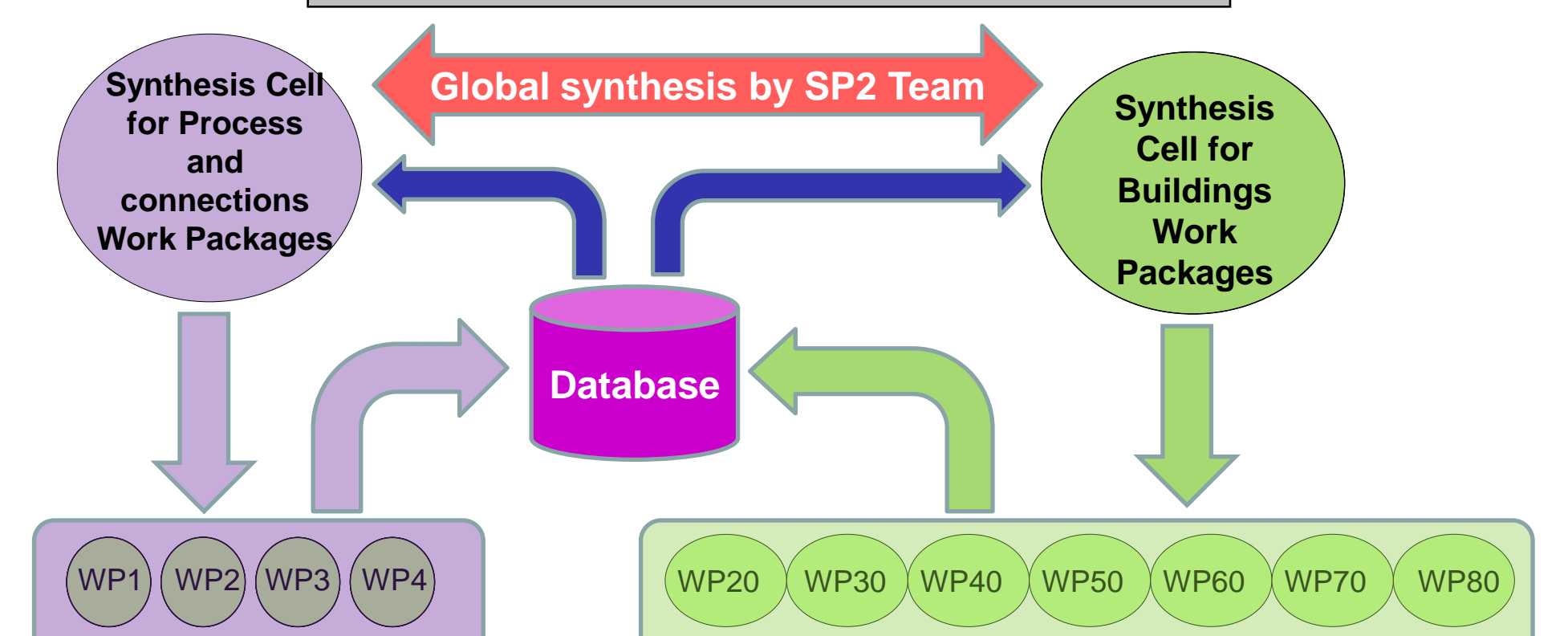
The synthesis process was carried out synchronizing nine companies, the building prime contractor, the assistant and the SPIRAL 2 project team, day after day over a twelve months period (March 2011 to March 2012)

it was a challenge!

Compilation of all 3D models :

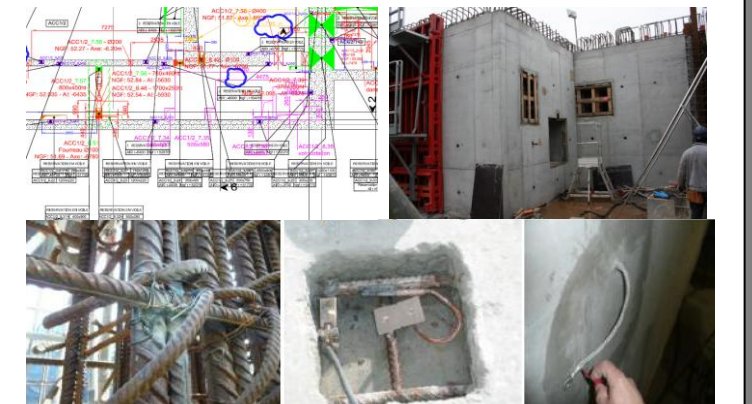


Organization of 3D synthesis operation :



The synthesis process has provided :

- A 3D high definition global integration without spatial interference
- The size and position of more than 1,000 reservations (reinforcement needed to realize the concrete floors and walls)
- The position of ground pin connections (good electromagnetic compatibility → high beam quality)



Building construction :

