



GridPP

UK Computing for Particle Physics

An Update on the new Computer Building at RAL

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Science & Technology
Facilities Council

- Reminder
- Where are we?
- Process
- Consultants and Contractors
- Acceptance
- Oops

- Tier running out of space, power, cooling
 - Need a new building
- The original spec for the new building:
 - ~300 racks + 3-4 tape silos (SL8500-type)
 - ~2.5MW power,
 - based on latest dual- and quad-core chip specs at the time
 - CHP system
 - Space to expand later if new building not big enough
 - Modular so easier to expand
 - **Flexibility...**

- The building is complete and was handed over to STFC on 27th March
- Delays in, construction, fitting out, acceptance
- Go ahead to occupy the building: 27th April
- Still remedial work to be done in offices and machine room
 - Electrical contractors everywhere
 - Cleaning machine room again (and again (and again ...))
 - UPS connections in machine room
- Office moves have begun
- Installation of new computer hardware has begun

Read up on “Murphy’s Law”:

“What can go wrong, will go wrong”

or...

“What can be misinterpreted, is likely to be misinterpreted”

or...

“What your eye doesn’t see will be done in the most ‘incorrect’ way possible” - (for any definition of ‘incorrect’ of your choice)

And at all times, be optimistic, or you may not survive

- It is a steep learning curve
 - Many things that seem strange to 'computer types'
- You are alone in knowing what you want
 - never assume anyone else has the same view of the completed project as you do
- Don't have a tight deadline to hit - you will live to regret it!
 - Once a contractor is knows this he is likely to make you pay to meet the delivery timetable
- Don't put your building on a critical path
 - Tier1 expansion would not possible without the new building and the new building would not be provided without the Tier1 expansion
 - Inevitable that timescale was tight

- Don't use a "Design & Build" contract
 - 'Design and Build' is where the contractor designs and then builds to the spec - even if you hand them a complete design
 - you will get the minimum the contractor can get away with which will be a far short of what you wanted
 - Often changes will be made on-the-fly so you never get to approve the change - more like a "Build & Design" contract

- Make sure you understand the design process - what are the key documents?
 - “Client Requirements” and “Room Data Sheets” are supposed to be part of the key documents but make sure they are followed
- Make sure you are on the circulation list or have access to the plans for all aspects of the building
 - This is the only way you will find out what they are building for you!
 - Beware that for “Design & Build” the “as built” plans often differ from the original design plans

- Information loss down the specification-design-build chain is horrendous
 - Constantly check that essential items have not been dropped or modified
 - Especially be aware of “cost reviews” - this is when things disappear and if you are not involved in the review you probably won't find out until its too late!
- Don't make major changes part way through
 - This is a recipe to print money for the contractors and will add major delays to the project timetable
- Check and recheck drawings and insist errors and omissions are fixed immediately - don't wait for it to be 'fixed later'
 - Because it won't be fixed, or
 - It will cost you money to get it fixed later

- If you can afford it, use specialist contractors and consultants whose main work is to build HPC data centres
 - A general consultant and contractor may claim to have designed and built a machine room but they usually don't have a clue what they are doing
- Technical buildings need specialist subcontractors who will be brought in by the main contractor, particularly for the mechanical and electrical (M&E) aspects
 - This will generate an arms-length relationship where you never get to talk to the experts who matter and information gets lost in translation through the main contractor
- Don't assume the consultants you brought in to advise will ensure you get what you need
 - probably only give you what you asked for
 - rarely make suggestions as to what you might need or ask 'have you thought of this?'

- A request for a “future proof” design will usually fall on deaf ears
 - you must know what is required for this or have access to experts who can review what you are being offered
- Building contractors are very good at twisting the rules, codes and specifications to their benefit
 - Any increase in costs or added delay will always be due to something you have done or changed, and hence you will have to bear the cost
- There appears to be little co-ordination between the mechanical and electrical side of the design process
 - For example: a door (mechanical) which has access controls (electrical) may not work as you intended because the two sides did not co-ordinate their design and left the door handle on so anyone could open it!

- The “professionals” don’t like amateurs telling them how to design the building - they believe they know best
 - Insist on being involved in as much of the design process as possible or at least have a veto on the outcome at various stages and agreement that your feedback will be incorporated
 - Getting them to make changes you have requested may be on uphill struggle and will always be resisted on the grounds of increase costs!
 - Don’t be afraid to challenge them when you don’t understand ‘why?’
- Make sure you have the ability to confirm to the contractors that what they propose is actually meets the spec
 - There may be unforeseen circumstances of ill-informed decisions and short-cuts by the contractors
 - Obstructions to air flows by chilled water pipes not being in a trench
 - CRAC units taking additional floor space
 - Floor tile arrangement

- Building designers do not like empty walls
 - Don't assume the 'clear' wall you were going to use for something will be left that way - someone will mount something (anything!) on it:
 - electrical switch gear, fire suppression gas tanks, cooling ducts
- There is a major conflict between Health and Safety and the requirement for computer room security
 - Make sure you have someone on your side who understands the subtleties of the H&S regulations so they make sure you are secure as well as safe

- Make sure you have enough capacity in your power and data infrastructures
 - Easy to added extra power and data sockets later on but if you don't have the capacity in the infrastructure it will be very expensive and disruptive to add it when the building is in use
- Be specific about computer room power requirements for 'now' and the future
 - 32A, 63A, single phase, three phase, UPS, spare ways, power conditioning, surge protection etc
- A "builders clean" will leave the building filthy
 - Dust and rubble and waste everywhere
 - A navy and a yard brush is no good
 - Need a specialist contactor in afterwards to clean up the machine rooms, possibly more than once
- **CHECK EVERYTHING, AT EVERY STAGE**

- Beware information loss from the general to the specific
 - Specifications such as 'an average' of data and power sockets per square metre of office floor will probably be ignored as they will allocate such based on the number of people in a "normal" office environment: and yours is not normal.
 - And make sure you specify for every room, including the meeting rooms
- Heat output from lots of IT kit in an office affects the cooling requirement
 - Ditto from lots of laptops in a meeting room. The "standard" specifications don't appear to take this into account
- Architects have no idea how to design kitchens to be used by a large number of people
 - They will fill the blank wall you had reserved for cupboards with an electrical cupboard so the space cannot be used!

- Make sure the specification fully covers what you want and the acceptance tests can demonstrate that the 'as-built' building is what you want
 - Particularly for computer room air conditioning
 - you may have enough chilled water capacity but if the air flow is too low it wont cool the computer racks
 - Does the cooling system meet the required specification?
- Check the electrical work
 - Post-test modifications
- Ensure you understand and have checked all such calculations yourself - be careful if you have to relay on "experts" as you may well have taken them out of the zone of their experience

- Requirement for sound proofing of offices made the fire bells inaudible
 - all offices had to be retro-fitted with individual sounders
 - and then they didn't meet the site requirement to sound like bells rather than something else!
- Fire bells almost inaudible in machine room due to noise from aircon CRACs
 - extra bells fitted
- Security doors with magnetic locks that obstruct the doorway at head height for someone 2m tall - ouch!
 - 'But it complies with the building regulations'
 - Which is no consolation when you bump into it

- Combined Heat and Power
 - Gas-fired power unit to provide electricity and heating and cooling(!)
 - On original spec, BUT...
 - ... not economically viable due to changes in gas and electricity cost
 - And as a result
 - insufficient initial chilling capacity for full utilisation of the building
 - No 'All building' UPS - not a big issue

- We have a shiny new computer room in which to put equipment
 - It has UPS for critical systems and plenty of power
 - There's space for the next few years for projected requirements
 - We can expand the chiller capacity
 - We can expand the building

- Thanks:
 - Graham Robinson, Pete Oliver, John Gordon

Pictures ->







- Questions....?