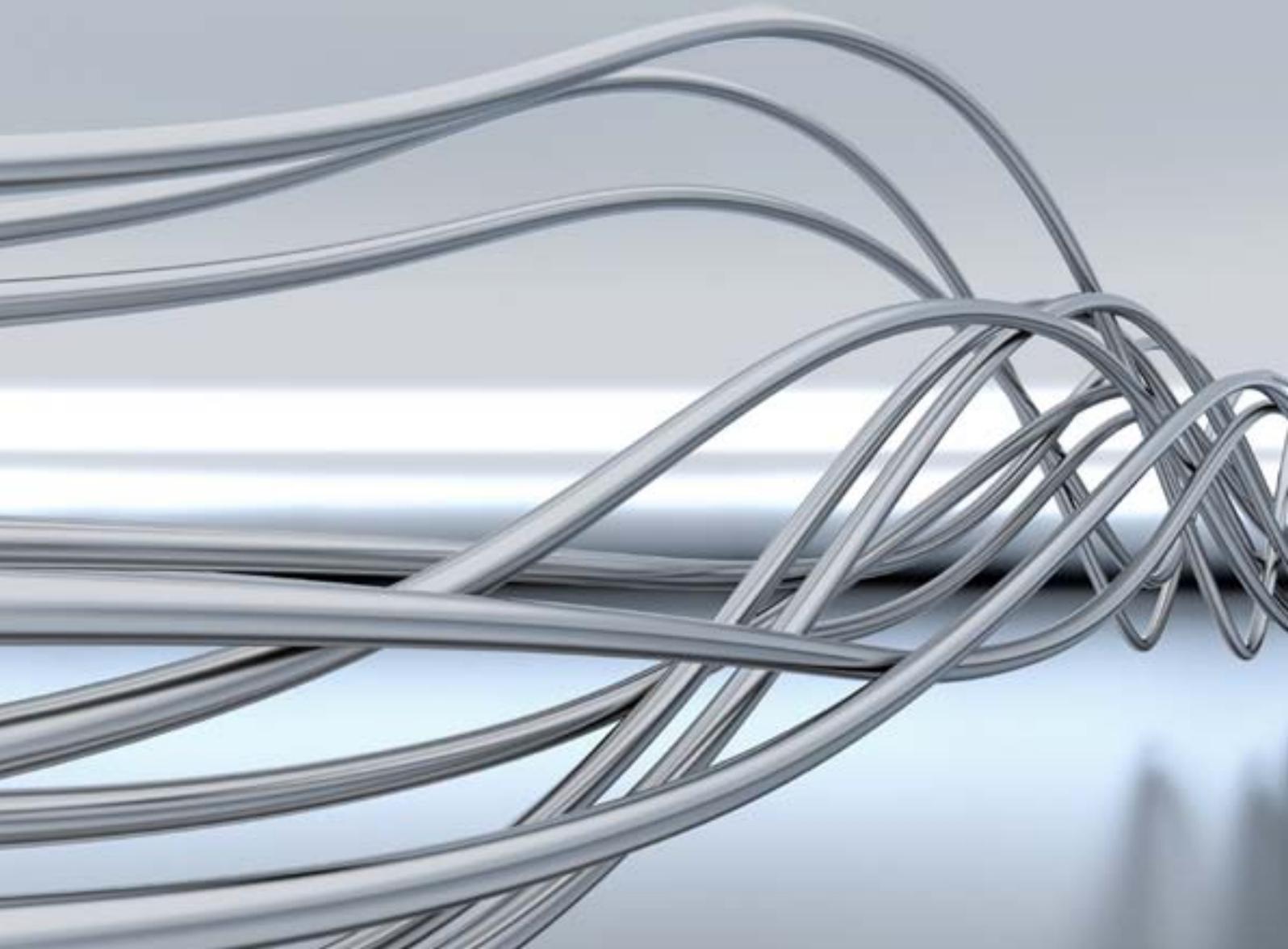# Data Centre

Design and Project Management

from concept to completion

Computer rooms are the heart of most businesses today. Yet I see so many that have been patched together, are in a risky location or have a very low standard of workmanship. These rooms are critical to your organisations operation. If the service in that room was to fail, your business may stop and you just cannot afford that.

I have over 30 years' experience in operational management of IT systems including managing high resilience computer installations and one of the lessons I learnt very early on is that these rooms have to be designed well, have a good standard of workmanship and be correctly maintained.

Key to this is to do your research, planning and design before any documents are sent out to vendors and construction companies. Also I cannot stress enough that if you are doing a building fit out then the placement of the server room is something that should be thought out very early on, even before the offices are designed. This will save you a lot of money.

There are many important matters in a server room that IT personnel know is needed but is not always appreciated by construction and design engineers. Important issues such as heat and power capacity and load planning for the room as well as making provisions for future trends both in hardware and business requirements need to be considered. You then have to think about the new equipment and trends that are happening, such as InRow cooling, do we provide the services from above or below the racks, do we need a false floor, what about electrical design, how do we stop surges creating major power outages etc. Thrown into this are terms such as "green" data centres and the list becomes quite confusing. My team are essentially IT personnel with many years of experience and we know the implications of these terms and trends. We communicate with your IT personnel, your Management and also the building design and civil engineers so that all parties can meet and understand each other's requirements.

When you are shown a product such as false flooring, a fire suppressant system or a Power Distribution Unit (PDU), how do you know if it is a good product? Is it well supported in your country? What are the on-going costs and is it priced correctly? We at Standby keep a very close watch on the various products and know the questions to be asked.

In this brochure we show the process we follow and then show a case study of a server room project that we designed and managed from start to finish. The challenge for this room was that it was a live room for a bank and we were building the new room in the same space. I think when you look at the case study you will see that the final result was excellent.

If you have an existing server room but are not sure if it has risks and issues, then in the last pages of this booklet we outline a service that we provide that carries out risk assessments of your server room.

I would welcome the opportunity to discuss the topics in this booklet further.

Sam Mulholland MIITP, CBCP
Managing Director
Standby Consulting

Computer room design and construction is a specialised job. Therefore it is essential to utilise professional people who have the right skills, experience and technical knowledge in this specialist field.

Standby Consulting has a team of consultants who have completed a number of computer room design and construction projects for clients in Bahrain, UAE and New Zealand. These projects range from single computer rooms for small organisation to larger installations across multiple sites, including the finance, health and education industries.

Your server room is the heart of your business. Data and information is the life blood of modern businesses today. A poorly designed server room will lead to on-going costs and failures.

Standby's consultancy services include:

- Advice on design, layout and room construction
- Site selection and risk assessment
- Assistance with documenting RFP specification requirements and supplier selection
- Calculations for heat and loading requirements
- Cooling
- UPS
- Fire protection
- False flooring
- Site security
- Project management.

Benefits of using Standby

- We reduce our client's workloads by providing IT representatives experienced in computer room building to attend site meetings and liaise with suppliers and contractors.
- Standby will add value because we have worked on other computer room projects.
- We follow Internationally accepted standards and procedures for computer room construction, design and infrastructure.
- Risk assessments are a core focus of our business. We regularly see the good and bad aspects of computer room construction.
- We are experienced in writing computer room specification documents.
- We set standards for contractors and suppliers.
- Standby will work closely with your IT Department to ensure the functionality of the room meets your requirements.
- We act for the client as their representative. We take no inducements or commissions from vendors or suppliers.

- Since its establishment in 1997, Standby has carried out risk reviews on approximately 40 data centres. Consequently we have the experience to distinguish between the good and bad solutions presented.
- Essentially we are IT people so we focus on the IT infrastructure and the importance of risk reduction and resilience for IT systems.
- The Standby team consist of consultants who are experienced in hardware installation, capacity planning and the infrastructure required for the operation of the computer room.
- Understanding the IT needs of the client is paramount to creating the initial design of the server room. This is an intensive process carried out in close liaison with the client's IT personnel. The subsequent benefits are invaluable resulting in the lessened likelihood of variations changes with the knock on effect of not only saving time and money and also enhancing the performance capabilities of the data centre.

Work carried out in the Middle East:

- American Express
- Bahrain Polytechnic
- BNP Paribas
- Bahrain Financial Exchange
- Kuwait Finance House
- Bahrain Finance Company

Work carried out in New Zealand:

- University of Auckland
- Victoria University
- University of Otago.

Process

Client desires a new or refurbished server room

Employ a consultant to work on the concept

- Location
- Conceptual drawings
- Indicative budget
- Circulate to client for acceptance

Develop specification document

- Server room specification
- Civil works list
- Data cabling
- Flooring
- Fire detection and suppressors
- Power requirements
- Heat loads
- Detail drawings
- Approval by client

Contract assignment process

- Develop documents
- Circulate documents
- Answer queries
- Evaluate responses
- Make recommendations to client
- Select contractor(s)
- Develop contract documents
- Signing of contract

Construction phase

- Site meetings
- Monitor project
- Deal with issues/changes
- Variations approval and control

Site commissioning

- Snag lists and finalisation
- Site commissioning
- As built documentation
- Manual and maintenance of equipment
- Site handover

Case Study

Identified Issues

- The server room had been established into an area that was designed specifically to function as general office space. Consequently, the server room lacked essential key design requirements necessary to support server room functionality
- Positioned against the exterior glass windows, the walls of the server room had been covered up with artificial gib walls, however without insulation, the heat generated from exterior windows cause the heat levels inside the server room to increase severely
- The server room was located directly underneath an area of the building where rain water pipes crossed the ceiling area above the servers
- Overtime, expansion demands caused the server room to be constructed in an ad hoc manner that ultimately resulted in serious deficiencies with cooling, issues with cabling performance, fire protection and suppression.

Client Requirements

- A server room with a capacity provision for twenty cabinets
- Address all key design and risk factors associated with the current operations and server room area
- Improve security, fire detection and suppression systems
- Address power issues
- Improve data cabling standards with capacity for anticipated data storage and usage growth
- Address cool air leakage issues
- A server room that has the capacity for expansion for up to five years
- Acquire a well-designed, highly sophisticated and high-tech IT operations and server room that matched internationally recognised standards
- To perform this work having only two planned IT outages and with no data loss.

Proposed Design

- Relocating the server room into the centre of the building, this stabilises heating levels, minimise the risk of potential water damage and improves all aspects of security
- One hour fire rating walls installed throughout proposed area
- Concrete block wall, from floor slab to ceiling slab, to provide essential fire protection and air sealing within the server room area
- Removal of any risk of water entering the area from above and at floor level
- Raised floor level to improve air flow underneath computer cabinets which improves cooling
- Install two methods of entry and exit; a main access door and an emergency exit door, both with one hour fire rating insulation
- Suitable lighting sufficient for specific purposes through entire area
- Necessary modifications to existing fire suppression systems to support proposed layout
- Overall costs to be acceptable and recycling of existing equipment where possible
- Improve redundancy of cooling
- Design office areas for support personnel.

Concept Design

- Working closely with the client, various concept designs were discussed and reviewed using drawings to assist in finalising and signing off on a design
- Detailed work lists for civil works and support services were distributed to interested parties for consideration
- The detailed level of information assisted contractors in being able to provide competitive pricing as they had a clear understanding of the work required
- Risk assessment of the project was carried out and risk reduction measures were put in place
- A final design document was produced for the client so that both the Technology personnel and Management understood the work that was going to be performed, the cost and agreement of the final design.

Floorplan

Good initial design will keep your costs down. Specification documents that are accurate will enable responders to price the job accurately and will keep variation to a minimum.
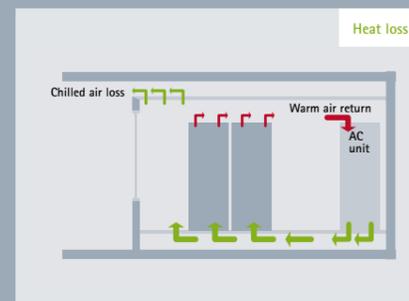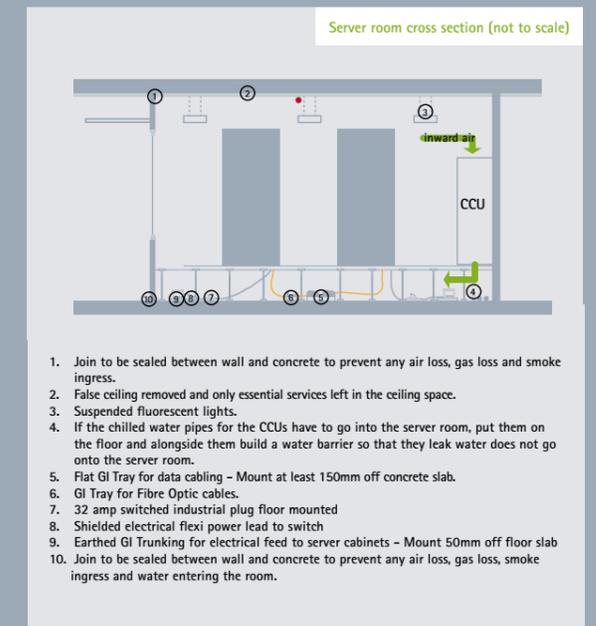
Waterpipes crossing the ceiling area

Data, electrical and AC pipes going through the same hole

Under floor cabling

Heat loss
Chilled air loss
Warm air return
AC unit

Proposed design for passageway

Proposed area for IT support staff

Server room cross section (not to scale)
Inward air
CCU

1. Join to be sealed between wall and concrete to prevent any air loss, gas loss and smoke ingress.
2. False ceiling removed and only essential services left in the ceiling space.
3. Suspended fluorescent lights.
4. If the chilled water pipes for the CCUs have to go into the server room, put them on the floor and alongside them build a water barrier so that they leak water does not go onto the server room.
5. Flat GI Tray for data cabling – Mount at least 150mm off concrete slab.
6. GI Tray for Fibre Optic cables.
7. 32 amp switched industrial plug floor mounted
8. Shielded electrical flexi power lead to switch
9. Earthed GI Trunking for electrical feed to server cabinets – Mount 50mm off floor slab
10. Join to be sealed between wall and concrete to prevent any air loss, gas loss, smoke ingress and water entering the room.

Case Study (CONTINUED)

Construction

Construction was completed in two phases:

- Phase One was the demolition of existing offices, and construction of the new server room. The data cabling, power and cooling were installed. The live equipment was moved across and commissioned
- Phase Two saw the old server room area demolished and converted into the new IT support area along with a new IT Operations room. The new operations and IT support area was connected to the new IT infrastructure.

Project Management

In work of this nature, close supervision is important. Standby works closely with contractors and the client to address any unexpected changes.

- A project manager was on site every day to answer questions and provide guidance on design changes and issues, controlling and tracking project progress, conducting regular site meetings with client and contractors, monitoring variations and payment schedules
- Throughout construction, extra precautions were necessary to ensure that live computer systems were not compromised. Some areas of the server room had to be decommissioned and moved during the construction phase. This was achieved by all three parties working closely together with good communications and understanding of their role.

Managerial and technical support offices

Completed server room

Entrance

Computer operations area

Completed server room

Demolition and rebuild in progress.

Construction

CAT6A Data cabling runway

Rack assembly

230 volt power sockets

Temporary wall between old (live) server room and new one

The Result

The final result addressed all of the risk issues:

- Fire rated for one hour
- Complete gas fire suppression
- Cooling leakage addressed, and an estimated saving of 40% in cooling requirements
- A water and smoke damage tight server room
- Excellent design and installation of power, and data circuits with the use of CAT6A and Fibre Optics
- Good design and visual image.

The site was commissioned on time and received ISO 27001 certification.

Data Centre Risk Assessment

Not sure if your computer room is as good as you may think? Then have a Data Centre Risk Assessment carried out.

It is very important that your server room is kept safe, secure, and at low risk of a disastrous event.

Organisations benefit greatly from our risk assessments. The strength of what Standby provides is our independent view; a fresh look your server room and its infrastructure. There have been many incidents where the exposure of a risk highlighted by our review would have cost client organisations tens of thousands of dollars should it occur.

Many of our clients comment to us that they had not recognised the risk or the potential issues that we have on occasions highlighted to them.

Standby carries out risk assessments using a formal checklist to ensure we cover as many matters as possible. We document each risk identified, outline the exposure with it and make recommendations. In many cases we can give an estimation as to the cost of implementing the recommendation At the end of the process, we produce a report with this material in it along with tables classifying the risk as a high, medium and low priority.
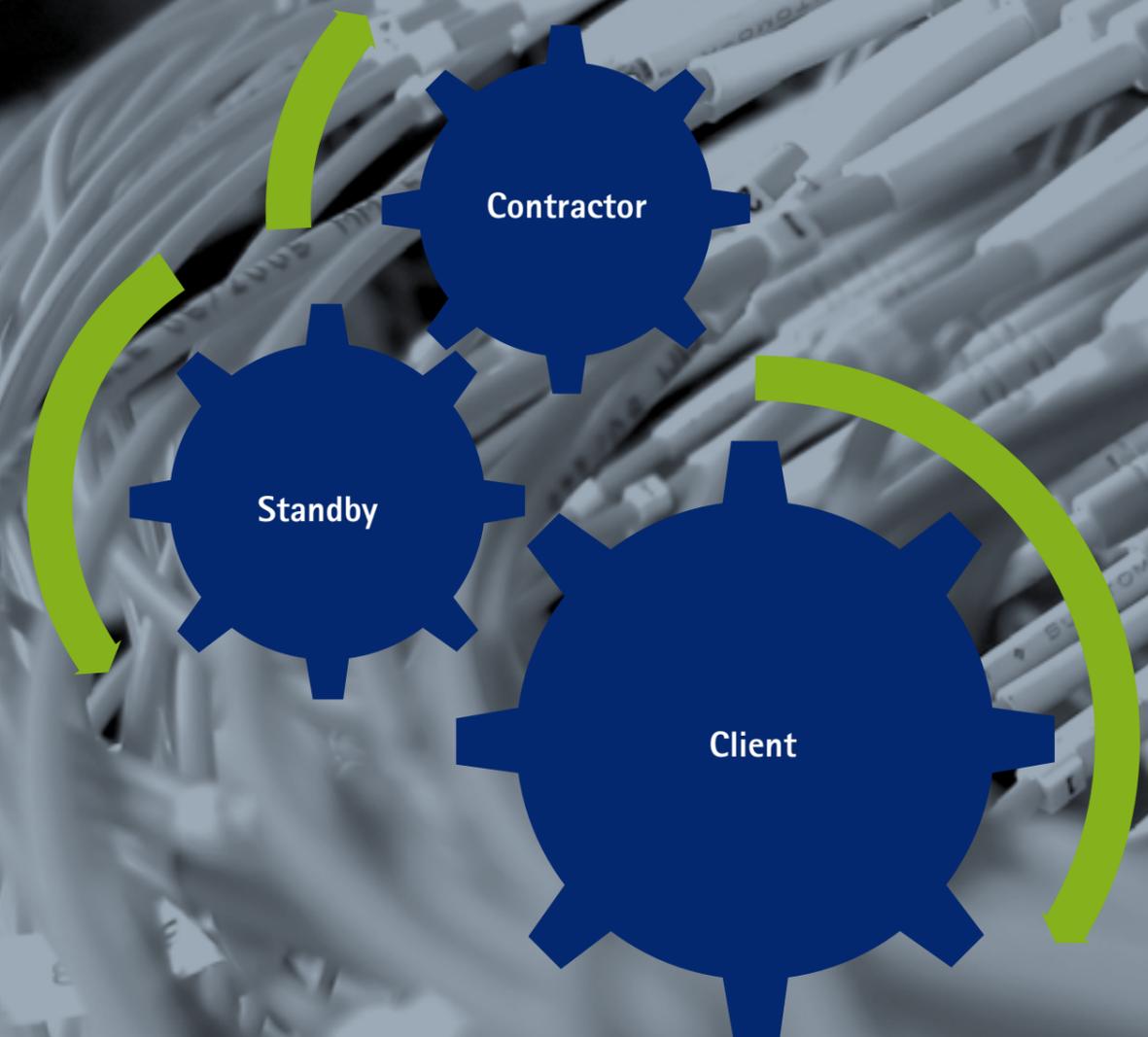
Today, risk assessments are a requirement of organisations by Boards and Governmental Organisations such as central banks. Carrying out risk assessment utilising external consultants has many benefits to an organisation, especially in the area of server and computer rooms. The provision of written reports and details of the actions taken to address these is seen positively by stakeholders and external organisations.

Typically our risk assessment covers such matters as:

- Physical construction of the room
- Cooling
- Fire detection and suppression
- Site security
- Resilience of electrical supply
- Data protection and backups
- Computer hardware installation
- Data cabling and standards
- Risk from water damage
- Single Points of Failure
- Operational documentation
- Ability to recover from a disaster.

Foul water pipe in ceiling space above servers

Holes into ceiling space in a server room; compromising fire suppression plus it will allow smoke into the server room if a fire broke out elsewhere in the building

One of seval holes into ceiling space

Power and data cables together

We bring it all together...

Contractor

Standby

Client

...leaving you to focus on your core business...