How to determine data and communications systems

A data and communications system for a business can provide telephone, electronic banking such as EFTPOS,
television, and internet services such as broadband and Wi-Fi.

Hard wiring a phone system as a separate system to data has become almost obsolete. Most businesses use software installed on computers and incorporated within the data system. For example, in Skype for business, phone calls are made and received on the same computer used by the employee for their job. A telephone is no longer needed on everyone's desk.

To determine the best system, discuss the client's business and how they want to operate. You will also need to consider the target market, and the facilities needed to meet their expectations. For a private residence, the list of requirements is likely to be shorter and is most

Communication systems

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Systems provision

Here's a general overview of the system layout of data and communications for a commercial building.

- Infrastructure. This is the cable that comes from the street into the building, normally to a separate IT room. This work is done by the client's internet service provider (ISP), including the supply and install of their hardware inside the IT room, but normally organised and coordinated by the data and communications subcontractor.
- Structured cabling system. This is the system inside the building. It is supplied and installed by the data and communications subcontractor and includes the patch panel inside the IT room and all the cabling leading from the patch panel to the individual data outlets.

Look at Telecommunications in New Zealand for an overview of the phone systems, radio, television and internet options available, and consider what systems would be best for the proposed café that we discussed earlier.

Regulations

The Telecommunications Act 2001 regulates the supply of telecommunications services in New Zealand. The New Zealand Telecommunications Forum is recognised by the government and the

Commerce Commission as being the industry forum referred to in this Act. The Act created a forum to foster cooperation in the industry and promote competition to benefit consumers. Go to the New Zealand Communications Forum (TCF) for information to guide you in the telecommunications activity for servicing a construction.

Relevant sections in the website include:

- market overview
- about NZ broadband
- PABX fraud
- Payforit NZ

Thoughts on this page?

What are the operating requirements?

1m

et's look again at the example of
ıe proposed café refurbishment, to see the
perating requirements for a specific project.

Example

For customer convenience and the anticipated traffic turnover within the café, the minimum services selected are:

- telephone – for business operations such as supplier transactions and customer convenience
- EFTPOS – a customer payment facility
- broadband – for supplier and customer convenience
- Wi-Fi network – for customers
- Sky – for customer entertainment (optional).

What are the connectivity requirements for

each of these?

For the telephone system, check out Spark's Total Office which offers plans for business premises. Features include:

- a business line
- choice of broadband plan
- data speed options
- hardware supplied.

For EFTPOS, broadband, and Wi-Fi connectivity options, go to eftpos New Zealand Ltd for an overview of:

- broadband
- Wi-Fi, features target the hospitality industry
- a secure wireless network
- dial-up options.

For cable television provision, go to the Sky Help & Support page for an overview of:

- what is provided, products and services
- technical support

For cable television provision, go to the Sky Help & Support page for an overview of:

- what is provided, products and services
- technical support
- programming
- installation, terms and conditions
- billing, ways to pay.

Thoughts on this page?

How is a specification written for a data and communications system?

1m

For a guide to writing specifications, go to the Masterspec Guide to Writing Specifications.

As noted in the Electrical section, it is common to find the specification for data and communications as a subsection in the electrical specification. The data and communications scope is often included in the tender quote from the electrical subcontractors and awarded as part of the electrical trade rather than as a separate trade.

The data and communication specification should clearly state the demarcation point between what the subcontractor provides and what the client provides. This is important as a lot of commercial clients have their own IT people and only the infrastructure for the building is required to be installed by the data

Example

Here is a data and communications specification 🔗 for a medical centre. You might want to check it out to see the detail required for the café project.

What does a schematic of a data and communications system look like?

1m

For the services selected in the café, you will need to consider both an installed hard wired network system and a wireless network system.

For diagrammatic examples of an installed hard wired network, look at ConceptDraw Computer Network Diagrams.

For diagrammatic examples of a wireless system, look at the ConceptDraw Wireless Network Diagrams.

Thoughts on this page?

Need to know more?

1m

Data and communications is a fast changing area of construction. Are you wiring for a Smart Home provides information on considering data and communications in residential buildings.

For an overview of ultra fast broadband in New Zealand, check out Crown Fibre Holdings.

Thoughts on this page?

Fact sheet 3.1: Electrical supply

1n

How do you determine the level of electrical supply you will need?

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For an overview of our electricity supply structure in New Zealand, look at Electricity in

New Zealand.

The website indicates how electricity is generated, transmitted and distributed to consumers. It also provides an overview of what electricity is, and:

- the history of power generation in New Zealand
- the annual spend on electricity by sector
- historical and future demand.

Calculating energy requirements

To determine the required level of electrical supply for a building or a business, you can use an energy calculator.

Please note that this is an American website so you will need to convert the metric measurements to imperial using the following conversion factors.

- To convert square metres (m^2) into square feet (ft^2), divide by 0.0929.
- For temperature conversions, degrees

conversions, degrees Fahrenheit (°F) equal 9/5ths of degrees Celsius (°C) plus 32.

Example

Let's use the energy calculator to work out the energy requirements for a proposed barber shop.

The barber shop has a maximum seating capacity of 10 people, the required temperature controlled environment is 23°C, and the floor area is 140 m2.

Using the energy calculator, we calculate that 22,886 kWh of electricity is required for the proposed café.

As the proposed barbershop is a refurbishment of an existing building, the specification for the electrical trade will need to include an inspection of the existing electrical supply meter and distribution system to determine whether it can provide an adequate electrical supply for the barber shop, while meeting Code and electrical regulations."

What are the operating principles and loadings?

1m

In New Zealand, any electrical work that exceeds 32 volts AC or 100 volts DC is governed by law. Go to Electrical Safety Laws for an overview and access to the electrical safety laws and responsibilities of registered electricians.

The operating principles are identified in AS/NZS: 3000:2007 Part 1 scope, application and fundamental principles.

Loadings are covered in the list of tables. Refer to C8 Guidance on the loading of points per final sub-circuit of the same Standard.

Thoughts on this page?

How is a specification written for an electrical system?

1m

As electrical work is so specialised, an electrical specification for a commercial build should only be written by someone who is qualified in electrical work. This is normally an electrical engineer.

A specification relating to electrical work is broken up into sections, and it is quite normal for the electrical specification to also include subsections for auxiliary trades such as data and communications, security and CCTV, and audio visual. The sections relating only to the electrical works would typically include the following.

- **Section 1 - General clauses**
  - Head conditions of contract

- **Section 1 - General clauses**
  - Head conditions of contract
  - Electrical regulations, standards and codes of practice
  - Overview of project requirements and electrical scope
  - Alternative equipment
  - Quality of work
  - Setting out
  - Shop drawings
  - Inspections, testing and commissioning
  - Certificate of compliance
  - As built drawings and operating & maintenance manuals
  - Defects liability period
  - Guarantees
  - Maintenance

- **Section 2 - Technical and specific clauses**
  - Scope
  - Mains switchboard
  - Distribution boards
  - Metering systems
  - Cables

- Cable support systems (ladders and trays)
- Sub-circuit wiring size and rating
- Conduits, ducts and trenching
- Light fittings
- Lamps and tubes
- Lighting control systems
- Emergency lighting
- Switches and outlets
- Earthing and bonding
- Data and communications wiring
- Fire rating
- Seismic restraint
- Power supply for specified equipment and appliances
- Labelling.

To see how this works in practice, have a look at two example specifications. Both have been written for commercial projects, and while they have different layouts, they provide quite specific requirements on the design requirements of the various components that make up the electrical reticulation in the building.

Example 1: New Zealand Example of Electrical

What does a wiring circuit diagram look like?

1m

Wiring circuit diagrams show what is to be used: the type of cable, switches, outlets, fittings and the distribution board the circuit is fed from. In commercial premises, you may have several switches, outlets and fittings on the one circuit. This would depend on the rating of the fittings used. The person responsible for the electrical design will apply calculations to the design to ensure that there is no overloading of a circuit.

For an overview of wiring diagrams, have a look at Wiring Diagram.

Regulations

AS/NZS 3000:2007 covers design requirements. Check out section 1.6 Design of an electrical Installation.

Distribution boards

For an example of a wiring diagram for a

switchboard, refer to the Schneider Electrical website. Also look at this link to a Distribution Board Schedule 🔗.

Installation

For installation diagrams, consult AS/NZS 3000:2007. Figures 3.3, 3.4 and 3.5 in the standard illustrate the protection of wiring systems in various applications located within the construction process.

Table 3.1 in the standard illustrates the cable types and their application in wiring systems.

Fixtures and fittings

Look at Clipsal for a full range of electrical components for both residential and commercial application.

The Schneider Guide 08 is a brochure that provides a guide to lighting circuits. It includes information on lighting solutions and methods for selecting protection and control devices.

Need to know more?

1m

To reduce costs and be energy efficient, refer to the EECA Business Guide.

For a guide to designing installing and maintaining safe electrical and gas installations and distribution systems, refer to the Worksafe's guide.

What is a mechanically controlled environment?

A mechanically controlled environment is an internal space in which equipment automatically maintains a specified temperature level and flow of air. The equipment may also control other environmental factors such as humidity levels, or protection against dust, which are critical for protection of sensitive electronic equipment.

The equipment is designed, supplied and installed under mechanical services, also known as HVAC, which stands for heating, ventilation and air conditioning.

Module 5 discusses how an HVAC system works and how it improves the functionality of a commercial building environment.

How do you select the correct device?

1m

When you are planning to mechanically control the internal environment of a building, you need to be aware of the objectives and of the functional requirement and performance criteria for the devices required. There is a range of systems and devices to choose from, including heat pumps, ducted systems, and air curtains.

A wide range of devices is available for maintaining a controlled temperature. Look at the range of products available from just one manufacturer, Daikin.

Heat pumps

Mitsubushi provides an overview of heat pumps and their features. These include:

- comparing heating options
- energy efficiency
- comfort control
- air quality

- environmental sustainability.

For an example of a proprietary system, look at the Daikin Light Commercial website. This site also provides capacity data for residential, light commercial (shops, restaurants and small offices) and commercial buildings.

> **Example**
>
> For the café in our scenario, the request has been made for an ambient temperature of 20 degrees Celsius. A decision will need to be made as to whether to select an inverter or non-inverter heat pump. Check out the Daikin site for definitions of inverter and non-inverter heat pumps.

Air curtains/air doors

Read Air door for an overview of air curtains (also known as air doors) and their applications.

For a specified controlled environment, an air curtain may be required. Air curtains serve many purposes. These include:

(...ors) and their applications.

For a specified controlled environment, an air curtain may be required. Air curtains serve many purposes. These include:

- preventing access to flying insects, external odours, smoke and traffic exhaust
- reducing outside air infiltration: winter cold and summer heat
- dust and draft control.

Look at the Mitsubishi air curtain site for an example of an air curtain, dimensions and operational features.

Thoughts on this page?

What are the operating principles and loadings?

1m

There are many variables when considering the mechanical control of a building internal environment, and these variables will need to be known in order to establish how the system is required to operate. Some of these variables include the number of separate areas, the size of each separate area, the number of people who will be occupying each area, and what activity will be carried out in each area. For instance, an office environment where people are sitting stationary will require a higher temperature than a gymnasium where people are moving about.

Heat pumps

Read about heat pumps using a search engine for a full overview of heat pumps and their operating principles.

Heat pumps

Read about heat pumps using a search engine for a full overview of heat pumps and their operating principles.

Then go to principles of heat pump operation for additional information regarding the principles of heat pump operation.

Air curtains

Look at Air curtain usage for the working principles of air curtains covered in the industrial climate control section.

Thoughts on this page?

What are the installation requirements?

1m

There are a number of building codes and regulations that cover the design of mechanical services. The installation of those services will often be affected by the design requirements. For example for a system bringing fresh air into a building, regulations affect where the inlet ducts are sited in relation to other buildings or equipment.

Heat pumps

See the EECA Good Practice Guide for advice on heat pump installation.

Air curtain

Access this Air curtain installation manual to see how they work.

How does it work? 1m

Watch this video on how heat pumps work (chaffeeair, 2012) (3:57). for a visual explanation of the key principles, and summer and winter applications.

The Dimplex video (Dimplex, 2013) (3:51). provides a visual explanation of how an air curtain works, the operating principles, installation and capacity.

Need to know more?

1m

Heat pumps

To calculate the size of heat pump you require, go to the EECA Energywise Heat pumps page.

Air curtains

For an article on the operational efficiency of air curtains, go to Air curtains: Faster is not always better.

To get a brief overview of an air curtain product, go to the Aer Tech site.

Thoughts on this page?