

Essential and Non-Essential Power

MECHANICAL SERVICES - ESSENTIAL
SWITCHBOARD BTG - MCPE - 4

BTG - MCPE - 4 FED FROM
TAKE OFF BOX 148E

OUTLINE

- ESSENTIAL VS NON-ESSENTIAL SOURCES
- USAGE (LIFE SAFETY VS BUSINESS CRITICAL)
- ARRANGEMENT
- GENERATORS
- LABELLING

SOURCES

→ WHAT MAKES SOME POWER ESSENTIAL AND OTHER POWER NON-ESSENTIAL?

ESPECIALLY WHEN IT IS EFFECTIVELY ALL COMING OFF THE SAME GRID SUPPLY?

THE ANSWER IS THERE IS NO DIFFERENCE

THE DISTINCTION IS WHAT THE POWER IS USED FOR AND HOW IT IS DISTRIBUTED

USAGE

→ LET'S START WITH USAGE...

POWER MAY BE REFERRED TO AS “ESSENTIAL” FOR:

1. LIFE SAFETY APPLICATIONS; OR
2. BUSINESS CRITICAL APPLICATIONS

LIFE SAFETY

- Life safety covers the power needed to ensure safety of the building occupants in an emergency.

- This is done by providing power to the equipment needed to be operating for the protection of occupants during evacuation and the extinguishing of a fire

- This equipment might include:
 - Smoke exhaust fans
 - Stair pressurisation fans
 - Supply fans for zone pressurisation
 - EWIS panels / FFCP / FIP (battery backed)
 - Fire lifts
 - Sprinkler and hydrant pumps

BUSINESS CRITICAL (ESSENTIAL FOR OPERATION)

- Business critical covers the power essential to allow continuation of all or part of a business operation when the external grid supply is lost.

- This is usually supplied from a generator

- This equipment might include:
 - Operating theatre
 - Manufacturing process
 - Computer / data systems
 - General office

- This could also apply to operation of emergency services such as fire, police & ambulance dispatch centres, defence facilities or aircraft control towers

BUSINESS CRITICAL (ESSENTIAL FOR OPERATION)

- When we supply business critical essential power from a generator it should be noted that if the building is to remain populated under backup power, the fire essential power (which will have been lost) must change over by an ATS to be supplied from the generator.

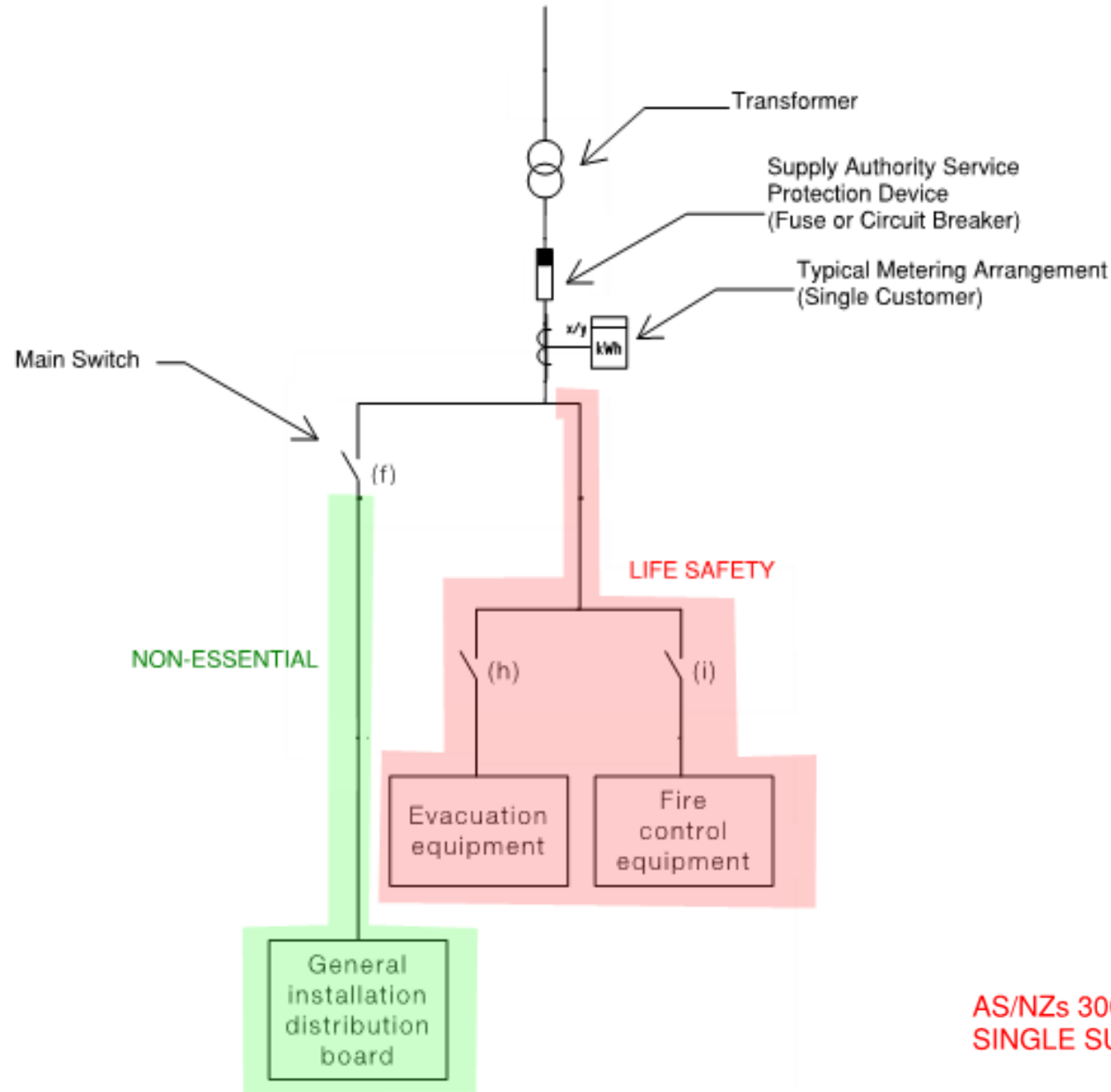
ARRANGEMENT - DEMARCATION

- Now we have established the two types of essential power, let us consider how these are supplied and how they are distributed.
- Both essential and non-essential power are coming off the same grid.
- The demarcation occurs as soon as the cables enter the building's main switch board once the cable has passed the service isolation point (usually fuses in the top of the switchboard that are only accessible by the supply authority)
- The cable is attached to the live side of the main isolating switch, where the power is then split into essential and non-essential

ARRANGEMENT – SWITCHING AND WIRING

- The non-essential passes through the main switch adjacent to the rest of the building (this switch is what the fire brigade head for to isolate power to the building).
- The cable from this switch throughout the building is of the normal double insulated non fire rated type.

- The essential power is piggy backed off the incoming side of the main switch, which means the power cannot be turned off and therefore is always available for fire safety.
- The second criteria is that all cabling, switch board etc used to distribute this safety essential power is fire rated to ensure supply is available in a fire.
- All switches in the circuits, even down to the service equipment isolators must be locked in the on position and suitably labelled.
- It should be noted that all cabling should be supported on 2 hour rated cable tray and fixed with stainless steel ties.



AS/NZs 3000 WIRING RULES (WSP MODIFIED)
SINGLE SUPPLY EXAMPLE

ARRANGEMENT – SWITCHING AND WIRING

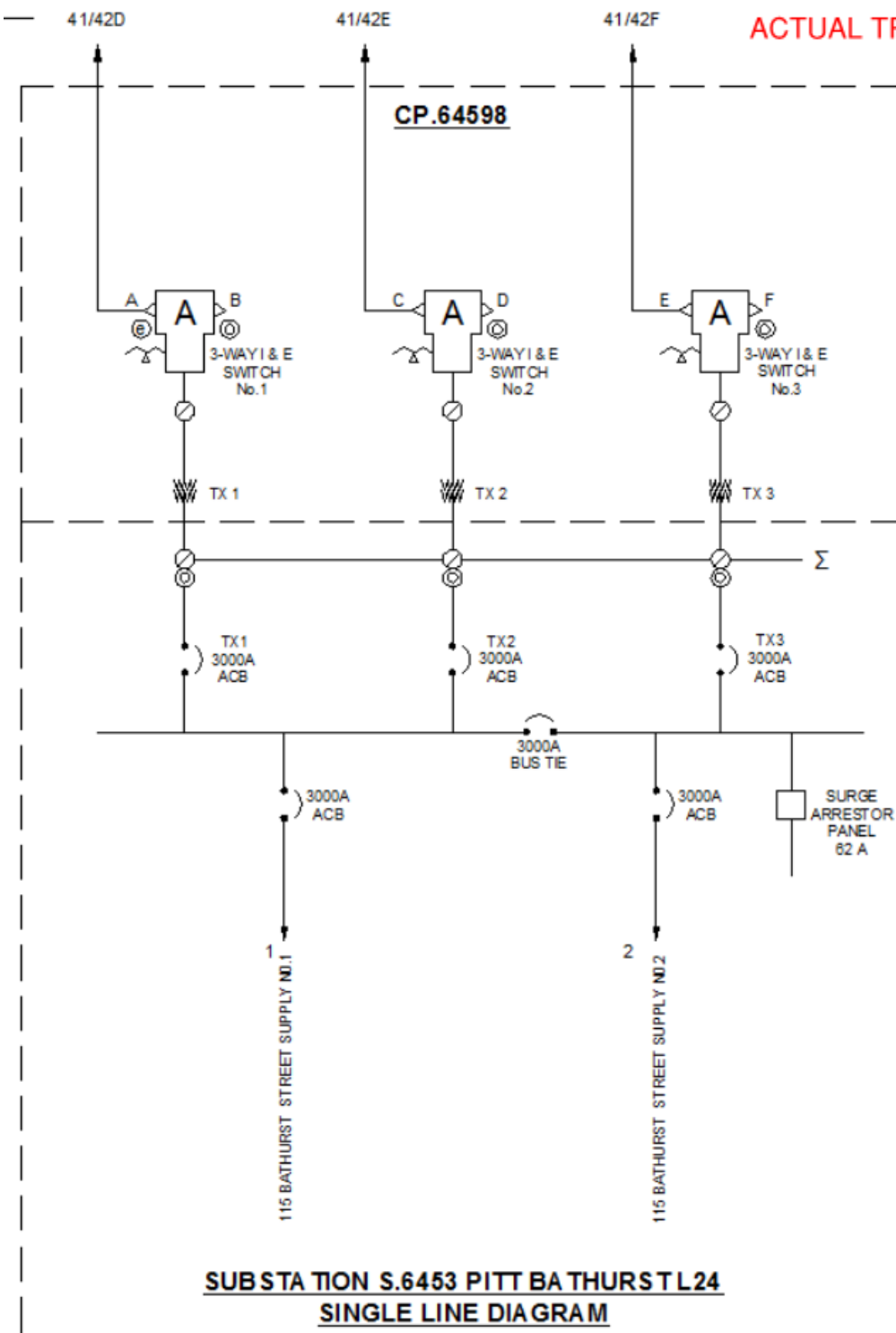
- In some circumstances a switch may be installed at the main board, but this will be lockable and only available to authorised personnel for maintenance.
- This applies to ALL switches on essential circuits



ARRANGEMENT – MULTIPLE FEEDS

- Many major buildings have power available from several sources, that is, different substations, which ensures essential power is virtually always available
- While this virtually means power at all times, this is usually not acceptable as a guaranteed source, even when part of a triplex connection (three separate high voltage feeds with two operating at any one time)

ACTUAL TRIPLEX SUBSTATION CONFIGURATION (TYPICAL SYDNEY CBD)



GENERATORS & UPS

- Where a business/operation requires uninterrupted/guaranteed supply, a backup supply is created locally by installing gas or diesel fired generators.
- Generators are attached to the main switch board with an automatic transfer switch (ATS). This switch enables the automatic startup of the generator when a power failure is sensed in the main. Once power is available from the generator, the ATS then switches over to feed the building from the generator (this is usually up to 20 seconds in a large system (up to 30 is allowed by Code), but can be milliseconds with small loads). Even though this is a very small period, there will be no power at some stage.
- Where it is unacceptable to have any loss of power (eg data centre, operating theatre etc), an uninterruptable power supply (UPS) is usually installed between the power supply and the critical items. This is basically a battery system that cuts in before the power has completely dropped out of parameter +10, -6%. ie 240 volt would cut in at 216 volts instantly

GENERATORS & UPS

- You may have heard the terms *seamless transfer* or *close synchronised changeover*. This system allows a circuit to be supplied with power from the grid and the generator concurrently. Most supply authorities will permit this for a maximum of 1 second.
- The generator starts and synchronises with the existing incoming current and jointly feeds the power into the system before the ATS changes over.
- This is used to change over in maintenance (ie: when the building mains need to be turned off) or when returning from generator to the grid without loss of power.
- Due to issues of fault levels from 2 different power sources, this is not particularly liked by the supply authorities.
- An important thing to remember when sizing a generator is what you actually need to run. Eg if you need 5,000 amps to run a hospital but only 1,000 amps for the theatres, intensive care, a small chiller etc, then the equipment not required needs to be isolated from the generator feed.
- This is called load shedding and while it can be done with relay logic or dedicated switchboards, it is generally done by the BMS (which should always be on a UPS)

LABELLING AND IDENTIFICATION

- Labelling of essential, non-essential and generator essential switch boards and cabling is extremely important to avoid incorrect connection.
 - Life safety is best referred to as fire safety and labelling with white letter on red
 - Non essential is usually white on black or black on white
 - Generator feed should be referred to as generator essential and labelled with a black on yellow background.

- If a board is fed by both essential in normal mode and generator essential in a full power failure, the board should carry both labels.

SUMMARY

→ KEY POINTS:

- SAME SOURCE – DEMARCATION OCCURS AT MSB
- DON'T CONFUSE BUSINESS CRITICAL WITH LIFE SAFETY
- FIRE RATING REQUIRED FOR LIFE SAFETY
- GENERATOR SUPPLY OF LIFE SAFETY
- CLEAR LABELLING

THANK YOU

QUESTIONS?