

White Paper

# MCCs for commercial application

Motor Control Centers

**Executive Summary:** Electrical designers for commercial and retail facilities have discovered that MCCs (motor control centers) can replace traditional switchboards for electrical distribution. This new approach can reduce the amount of space required for equipment while bringing additional safety measures, such as arc flash resistance.

# MCCs--New Possibilities for Electrical Distribution in Commercial Buildings

## Introduction

Motor control centers are breaking out of industrial applications and replacing traditional switchboards in commercial facilities to bring greater safety and adaptability.

MCCs (motor control centers) have countless industrial applications, and they're finding new uses for electrical distribution for commercial construction markets. Electrical designers have shifted more toward VFDs (variable frequency drives) for motors driving compressors, pumps and other equipment in hospitals, offices and retail space since they can provide major efficiency benefits in those applications. But MCCs are being adopted for new applications in some unexpected places. To borrow from the old ad slogan, they're not just for motors any more.

Switchboard users are looking more at MCCs because they offer an appealing mix of capabilities suitable for commercial installations. In fact, in growing numbers of applications, switchboards are being displaced by MCCs capable of delivering the same functionality in a smaller package and often with a growing list of attractive capabilities. MCCs can't replace switchboards in every situation, but the number of possibilities is growing.

## Why Use an MCC?

MCCs perform many switching functions similar to switchboards, but their basic design concepts came from a different direction.

Switchboard design begins with the assumption that they will be installed in utility spaces where the amount of room available isn't a major constraint. Cabinets are designed for easy access and ventilation, so efficient use of space is secondary. Those utility rooms are normally unfinished, but they are expected to be relatively clean and protected from the elements.

MCCs are designed for installation in industrial environments that are often wet, dirty, subject to huge temperature swings and potentially corrosive atmospheres. Installations are usually congested, so creating compact enclosures without sacrificing safety is very important.

That industrial breeding has helped create advantages that make MCCs attractive for complex commercial installations:

**Space:** Most building applications don't have all the space necessary for bulky switchboard enclosures. Owners of older structures often have to install more equipment than the original designers could have ever imagined, and that puts space at a premium. While many standard switchboard configurations are

designed for a 20 in. deep cabinet, comparably rated MCCs are only 15 in. deep, and can reduce floor space requirements by half.

**Environmental durability:** Switchboards are designed with internal spaces and vent openings to permit air movement and convection cooling. Those openings and internal air passages add to the overall bulk, and they can also allow dust, dirt and liquid to get in. Over time such accumulations can cause corrosion and foul contacts. MCCs can be fully sealed and NEMA 12 certifications are common. Your building might not be as difficult as a steel mill, but that environmental resistance saves on maintenance.

**Safety features:** Switchboards have not changed all that much over the last 10 or 15 years, whereas MCCs have made great strides in arc flash resistance and other safety features. Cabinets are now reinforced to withstand internal arcing events while providing passages to channel gasses out the back and top, away from people. Internal barriers open and close automatically to allow insertion and removal of units while protecting technicians from contact with the vertical bus. Siemens' tiastar arc-resistant MCCs are the first products compliant with ANSI/IEEE C37.20.7, verified through UL-witnessed testing (see sidebar).

**Maintenance and troubleshooting:** Industrial users need to identify problems quickly, and they insist on fast replacement parts availability. When a unit is down in an automotive or chemical plant, the cost is enormous. Siemens smart MCCs offer troubleshooting tools to diagnose problems on-the-spot, backed up with easy replacement parts ordering. That same capability extends to your application to keep your facility and people productive.

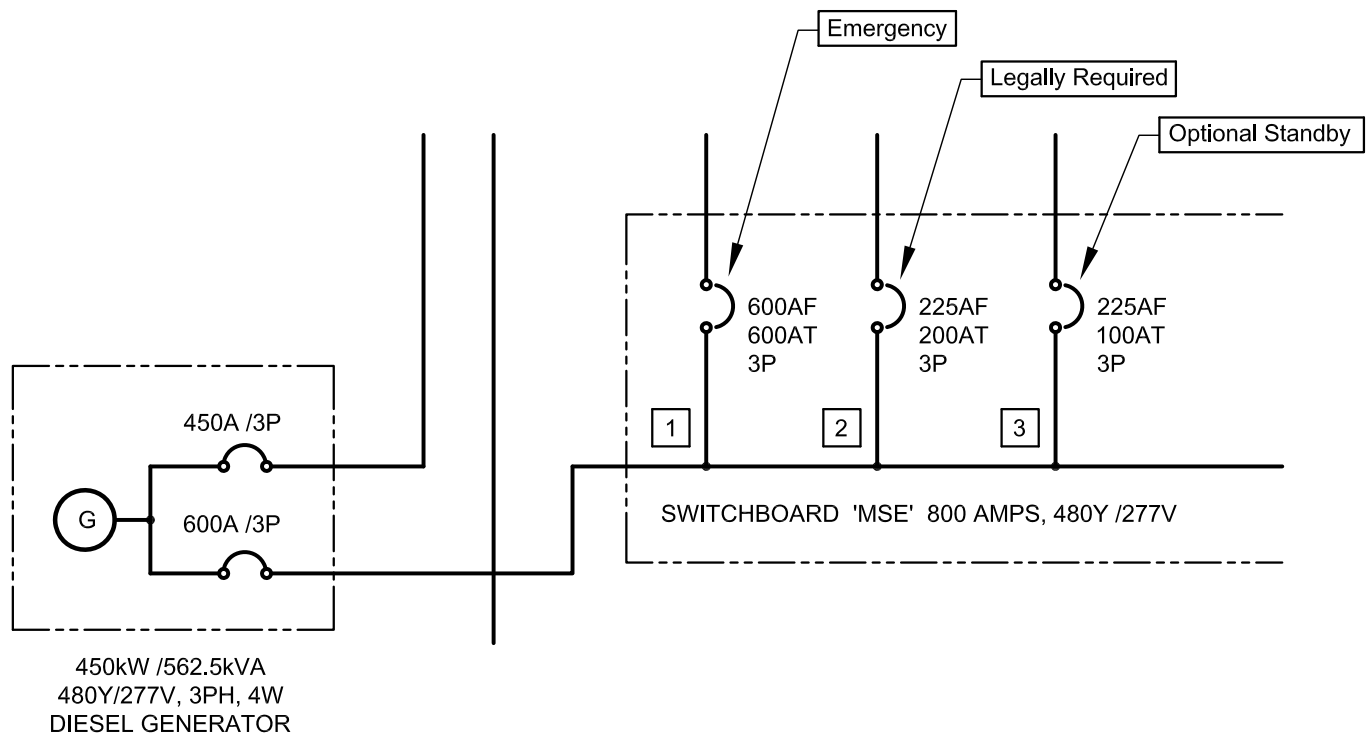
## How Do MCCs work?

MCCs started out as beefed-up relays designed to handle the enormous electrical loads from starting and stopping large electrical motors. With inrush currents of hundreds or thousands of amps, the starter had to bear the brunt of this difficult service. Given the costs of all the equipment involved, producers like Siemens developed ways to manufacture more sophisticated designs capable of extending the life of the motor as well as the switchgear, and the product evolved into the MCC we know today. Durability, safety and sophistication have all grown over the years resulting in better products that last longer.

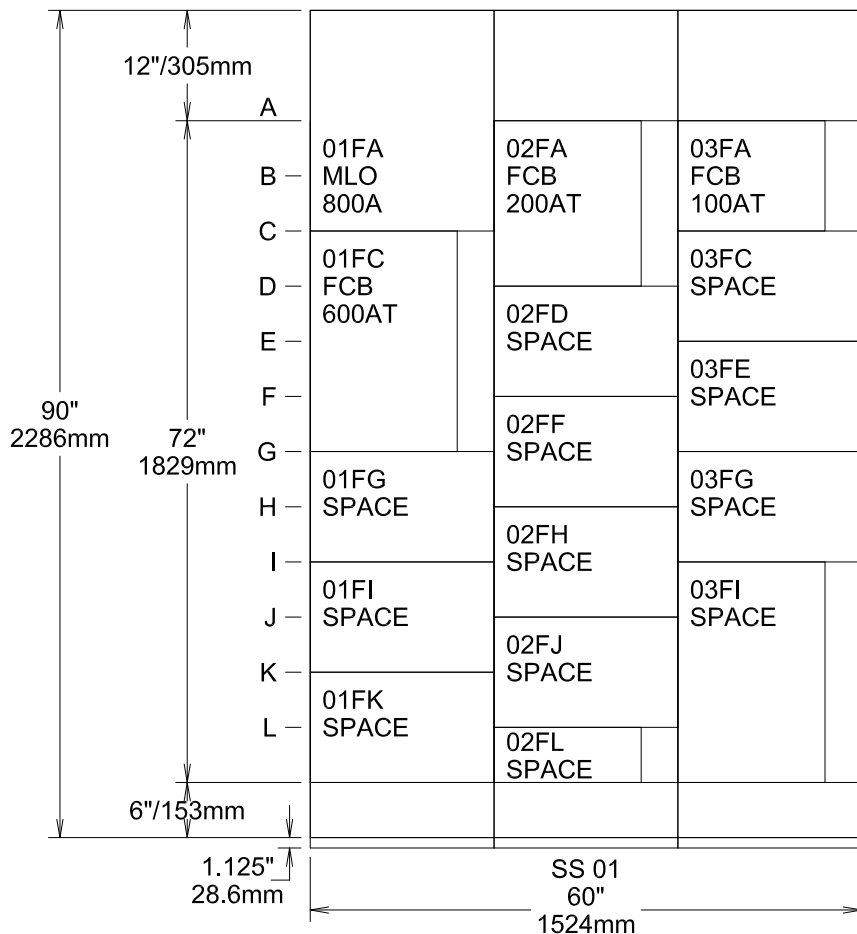
The switching mechanics for controlling motors is similar to controlling power distribution in a building facility, which is why an MCC can be a direct replacement for a switchboard.

### Application Example

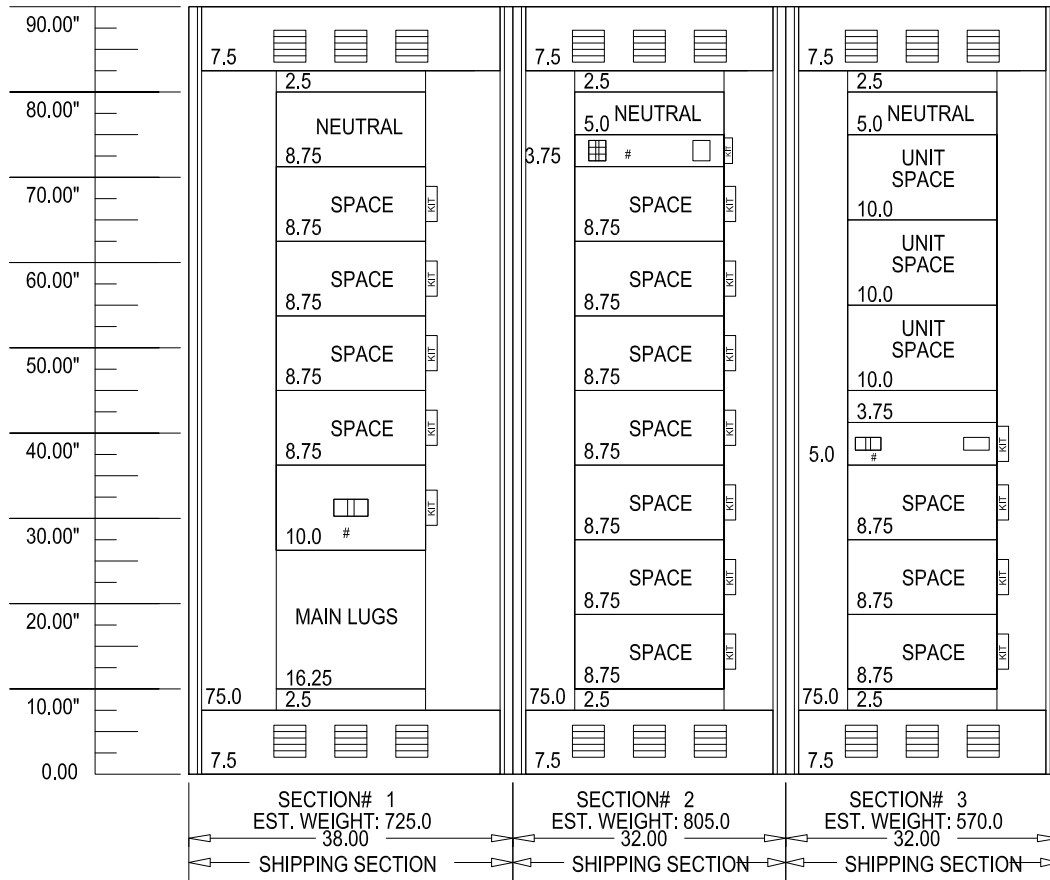
How does this work in real life? Here's a typical example: a facility has an emergency generator that feeds into the building's electrical system via Emergency Switchboard MSE (see diagram). This installation is subject to NEC 700.10(B)5 which requires that emergency loads, legally-required loads and optional loads must be fed from separate vertical sections, connected together with a common cross bus. There are three loads and three sections, so either a switchboard or MCC can satisfy this requirement and the larger application. So what makes an MCC better in this example?



### Switchboard Solution for NEC700 example



### Motor Control Center solution for NEC 700 example



If MSE is configured using conventional switchboards, the three sections will be 38, 32, and 32 in. wide, for a total footprint 102 in. wide and 20 in. deep. The MCC with equivalent current handling ratings has a total width of 60 in. wide by 15 in. deep. The MCC occupies less than half the floor space of the switchboard.

### Additional Capabilities

Industrial users frequently want to monitor current consumption on a granular level to determine production costs. The modular construction of MCCs makes it easy to install current transformers at strategic points to monitor specific areas. This type of monitoring in commercial facilities is getting to be more common and spelled out in California's Title 24, Chapter 8. It calls for specific types of loads to be measured, such as lighting or HVAC systems. The MCC can be configured such that receptacles, lighting and HVAC loads are segregated into individual panel boards within the unit.

MCCs also have more lower-range integral transformers when compared to the integrated power system switchboard (IPS) concept. While the smallest transformer for a switchboard is 15 KVA, a single phase MCC has seven options below 15 KVA, all the way down to 1 KVA. These small transformers (1 to 5 KVA) reduce the unit height to 12 in. to minimize overall size (see table).

### The Best for Any Application

The needs of your application will determine which technology is best. In many situations, conventional switchboards may be the way to go, but for those projects where space is at a premium or the customer has high safety requirements, it's good to know MCCs can solve many challenges. Siemens offers both approaches, so you can design and install with confidence whichever direction you choose.

### Proving Arc-Flash Resistance

Electrical switchgear wanting to claim arc flash resistance is tested to ANSI/IEEE C37.20.7-2007 to ensure it's capability to protect users on a group of key points. Siemens tiastar MCC passed on all five criteria:

Criterion 1: That properly latched or secured doors, covers, and so on, do not open.

Criterion 2: No fragmentation of the enclosure occurs within the time specified for the test.

Criterion 3: Assessment of burn-through:

- Accessibility Type 1: That arcing does not cause holes in the freely accessible front of the enclosure.
- Accessibility Type 2: That arcing does not cause holes in the freely accessible front, sides and rear of the enclosure.

Criterion 4: That no indicators ignite as a result of escaping gases.

Criterion 5: That all the grounding connections remain effective.

This testing was performed under the observation and supervision of UL with all results validated. For more details, request a copy of Siemens Publication CCWP-ARCRE-0411.

Using conventional switchboard for the emergency generator panel requires three sections to contain the equipment in a way that fulfills NEC 700.10(B)5. This approach is certainly acceptable, but it also illustrates the drawbacks of the approach: it is bulky but at the same time it offers no extra environmental protection no is there any arc flash resistance. Using a tiastar MCC for the same application reduces the amount of floor space necessary, the equipment is protected according to NEMA 12 and is also arc flash resistant.

## Notes

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