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**Integrated Power &  
Control System  
Buildings— Type ISB**



# Type ISB Integrated Power & Control System Buildings

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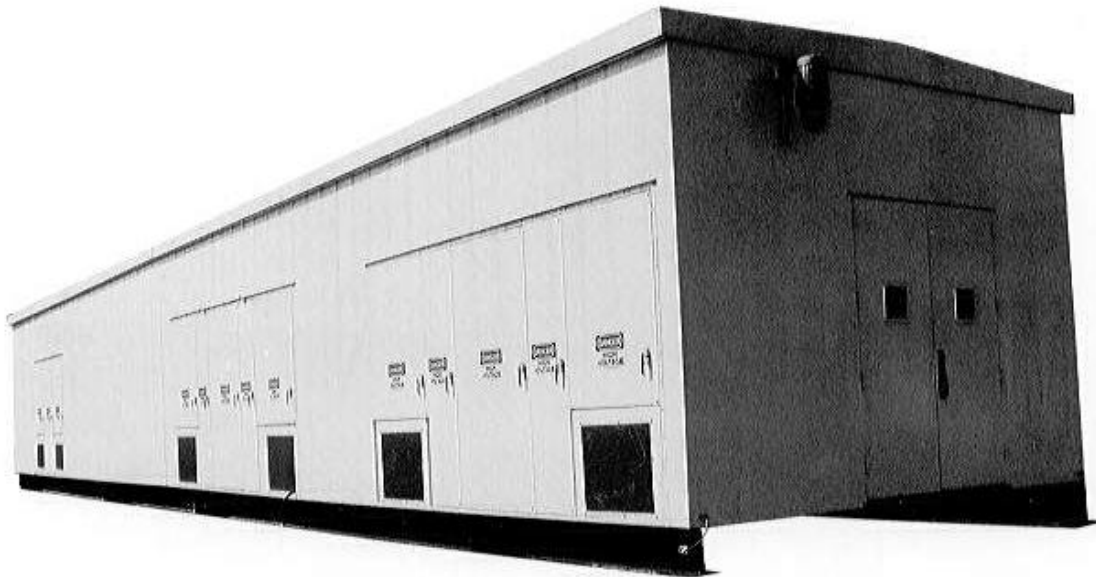


Figure 1—Typical M&I type ISB Building

## Introduction

Driven by an increasingly competitive global economy, the construction and modernization of manufacturing and process plants has changed significantly over the last two decades. Reduced construction budgets, enhanced environmental concerns, and reduced staffing allowances are often accompanied by a reduction in the time frame allowed for the project. The construction, engineering, and manufacturing industries have collaborated successfully to develop new procedures, methods, and products which allow manufacturing and process plants to be constructed more affordably and quickly.

Among the products which have been developed to meet these challenges are a wide range of factory assembled portable power and control buildings units to meet the power distribution and/or control requirements of new or modernized plants can offer significant reductions in the total cost of the power or control system, can improve the overall quality of the systems involved, and is often helpful in reducing the overall time required to construct the plant.

These cost and quality benefits are best realized when electrical switchgear and control apparatus, power system controls, process controls, and related systems are carefully designed and manufactured as a single integrated unit, which is subsequently delivered to the final construction site for installation on a prepared foundation.

M&I Electric Industries, Inc. has long been a supplier of this type of portable power and control building, and is uniquely positioned to meet the requirements of a broad

range of customers and industries for an equally wide range of power and control systems. M&I type ISB Integrated Power and Control System Buildings can therefore be constructed to meet the most stringent project requirements.

## Overview

All of the equipment for an offshore platform, a manufacturing facility, or a process plant (or a section thereof) can be brought together at a single point in a controlled factory environment and integrated into a functional whole within a portable building.

The individual pieces of power and control equipment and the elements of the various control systems can then be installed into the portable building, and fully wired and interconnected. The completed power and control systems can then be factory tested as a complete system.

When this fully integrated and tested system is delivered to the jobsite, it is generally only necessary to connect the plant's power and control wiring or other systems (data highway, fiber optic, microwave, etc.) to the incoming and outgoing connection points of the power and control systems within the portable building. Work within the power and control building is thus kept to a minimum, and field construction labor time and costs are reduced.

Since the equipment or system interconnections have been factory tested, final start-up is usually simplified and proceeds more quickly than in plants employing conventional power and control room construction.



## Type ISB Integrated Power & Control System Buildings

Additionally, factory assembled portable power and control buildings offer a controlled environment for the equipment installed therein. This extends the usable life of the apparatus over equipment employing other types of outdoor construction, and may even be necessary to assure the successful operation of some types of electronic equipment.

The controlled environment also benefits the operation or maintenance of the equipment, freeing these activities from the restrictions of inclement or unfavorable weather. Operations and maintenance can thus proceed as scheduled, and plant downtime may even be reduced when compared to installations which use outdoor no-walk in switchgear or control apparatus.

### Integrated Source

M&I has the ability to design, manufacture, install, and test all of the traditional elements of electrical power and control systems, and to package this equipment in a variety of portable building types and designs. M&I can thus serve as a single source of supply for all of the equipment in most electrical power and control buildings.

Among the elements of electrical power and control systems which are designed and built by M&I are the following:

- M&I type MC medium voltage metal clad switchgear, employing a selection of vacuum and gas (SF<sub>6</sub>) circuit breakers.
- M&I type MS metal enclosed switchgear employing load break switches, and a variety of other modern switching elements.

- Medium voltage (NEMA E2) motor control centers, employing vacuum, and air-break contactors.
- M&I type MX medium voltage busway.
- M&I type LC low voltage metal enclosed switchgear, employing iron frame power circuit breakers with solid-state protection.
- M&I type LS low voltage switchboards per NEMA or marine requirements and employing a selection of circuit breakers or fusible switches.
- Low Voltage (NEMA standard) motor control centers, employing air-break or vacuum contactors, and a selection of circuit breakers and fusible switches.
- M&I type LX low voltage busway.
- Electrical protection panels—simplex and duplex line relay panels.
- Power system and/or process control panels including electronic controls, computer based controls (PLC and DCS systems), control system interfaces (RTUs and Marshalling Cabinets), Turbine controls, Engine/Generator controls, Co-generation system controls, pneumatic control systems, and virtually any other control technology.
- Variable Speed Drives (VSDs).



Figure 2—Interior view of type ISB Building

# Type ISB Integrated Power & Control System Buildings

In addition to the ability of M&I to design, manufacture, and integrate the equipment noted above, M&I can integrate a variety of third party equipment (such as communication, control, and UPS equipment) into complete power and control systems.

M&I also has the flexibility and experience necessary to integrate complete power and control systems into type ISB portable buildings which employ a variety of construction materials and methods.

## Interlocking Panel Construction

The great majority of power and control buildings may be successfully constructed from standardized interlocking steel panels. This method has a number of advantages when compared to other building technologies. Among these advantages are:

- A wide variety of portable building sizes can be produced using this method, up to and including any size transportable by road.
- The interlocking panels are self framing, and therefore do not require a separate structural frame, reducing the cost and weight of the building.
- Buildings built with interlocking panels are extremely strong, and can successfully withstand hurricane force winds and major earthquakes.
- The interlocking panels are economically produced with existing tooling, helping control the overall cost of the building.
- The individual panels individually factory painted, assuring effective and long-lasting corrosion control, both on the exposed and concealed surfaces.
- M&I type ISB interlocking panel buildings can be built with a wide range of material and construction parameters, depending upon the customer's specifications and the project requirements.

## Structural Base

Type ISB buildings are by definition portable, and must therefore be suitable for handling and transport by a variety of methods. These buildings have been designed to be handled by crane with a four point lift, large forklifts, dockside or overhead cranes, and even helicopters.

Transport to destination may be by truck, rail, air, or sea, or a combination of land sea, and air transport. Buildings may be trucked to the seaport, carried by ship to another country or another part of the United State, and may finally be delivered to site by a truck.

Regardless of how they are to be handled or transported, the key supporting element of type ISB buildings is their structural skid or base. It is this base which must support the building



Figure 3—Typical Base Under Construction

throughout its handling and transport and which must ultimately support the building upon its foundation at the jobsite.

The jobsite foundation may be a concrete slab, or it may be a series of piers or perimeter walls. Again, the building's base must successfully support the building, its enclosed equipment, operating loads, wind or snow loads, and incidental loads imposed by connected structures.

To meet all of these requirements, type ISB buildings employ bases or skids which are carefully designed and fabricated from ASTM A36 structural steel members and plate. While each base is individually designated for its building, a typical 10 foot by 40 foot building may employ a perimeter of 16 inch (406 mm) channels and 12 inch (305 mm) wide flange beam runners, with 4 inch (102 mm) I-beam cross members and a three-sixteenths inch (5 mm) plate floor.

Penetrations for bottom-entry cables, and in-floor wireways with removable access plates are other requirements which influence the design of the base, as well as the necessity to provide provisions to lift and tie down the building.

All structural members are cut to length, coped and fitted as required, and are then welded into an integrated structure. The floor plate is then welded in place, and carefully inspected. The completed base is then sand blasted and painted as required by the particular project.

In most cases, the underside of the base is primed and then coated with a coal-tar based mastic. The outside of the base is primed and then finish coated with a catalyzed epoxy paint.



# Type ISB Integrated Power & Control System Buildings

The base may also be overcoated with a catalyzed urethane if the client wishes to cover the epoxy.

The floor is primed, and is usually given a suitable catalyzed epoxy finish. Textured paint, vinyl tile, switchboard matting, sheet flooring, or a combination thereof may be installed on the floor once the completed building has been tested and released for shipment to the jobsite.

## Walls

Unless otherwise specified or required by design, external wall panels are fabricated from 18 gauge (1.3 mm) electro-galvanized sheet steel. Individual panels are formed to length with integrated framing and interlocking bends on the edges. It is this interlocking design which frames the building and which provides the high strength required to meet tough industrial requirements. Most buildings are designed with panels on 16 inch (407 mm) centers, and an overall wall depth of 3 1/2 inches (89 mm).

Insulated buildings are supplied with interior panels fabricated from 16 gauge (1.6 mm) electro-galvanized sheet steel. These panels are designed with single metal-thickness offset over-lapping seams to assure a continuous interior skin, and a strong diaphragm construction.

After fabrication and inspection, all panels are degreased. They are then painted with a vinyl wash primer, and are finished with one or more coats of a catalyzed polyurethane enamel, to assure a long service life under adverse environmental conditions.

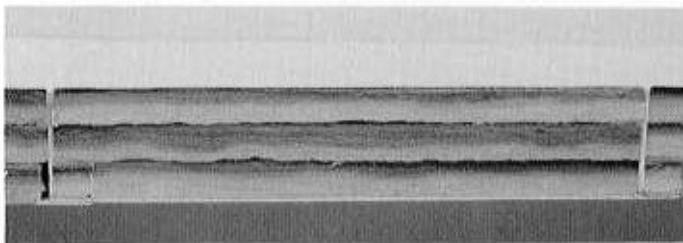


Figure 4—Wall Construction Detail

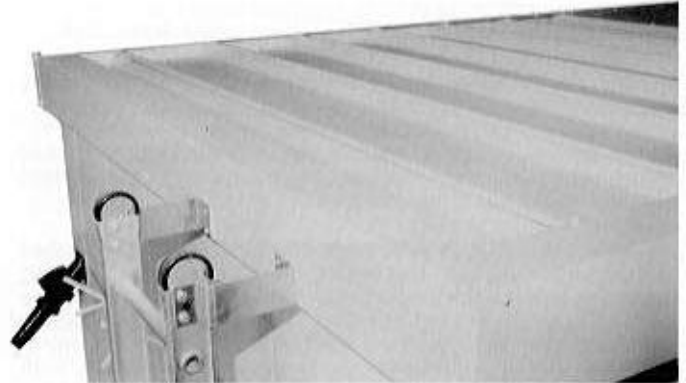


Figure 5—Roof Construction

Upon request, either aluminum or stainless steel may be substituted for the electro-galvanized sheet steel describe above. The use of these premium materials can result in building which is able to provide an acceptable life span extremely corrosive environments, as may be encountered plants which produce free chlorine.

## Roof

Most type ISB buildings are constructed with a simple single pitch sloping roof which has been assembled using interlocking panels, which are essentially identical to the exterior wall panels described in the preceding section.

These panels are generally fabricated from 18 gauge (1.3 mm) electro-galvanized sheet steel. Individual panels are formed to length with integrated framing and interlocking bends on the edges. As with the wall panels, the roof panels are placed on 16 inch (407 mm) centers, and are 3 1/2 inches (89 mm) thick.

After fabrication and inspection, all panels are degreased. They are then painted with a vinyl wash primer, and are finished with one or more coats of a catalyzed polyurethane enamel, as are the wall panels.

The roof is assembled by constructing a grid of interlocking panels, laid at right angles to one another. This design creates a virtual torsion box, which is extremely rigid despite

# Type ISB Integrated Power & Control System Buildings

## Interlocking Panel Construction

Type ISB buildings are usually insulated to help control the temperature within the building. As most of these buildings are built from interlocking panels, fiberglass insulation batts are installed in the walls and ceiling. This material has a thermal resistance rating of R-11 for a 3 1/2 inch (89 mm) thick bat. Further, the fiberglass is inherently non-incendive, and will not support combustion.

When extremely cold is expected, alternate insulation materials may be specified and installed. As an example, 3 inch (76 mm) Celotex board has a thermal resistance rating of R-24.

All type ISB buildings which are insulated are also supplied with a vapor barrier. The vapor barrier prevents sweating within the walls which would greatly diminish the effectiveness of the insulation in cold climates, and which might promote corrosion and decay of the insulation in moderate to tropical climates. This vapor barrier may be polyethylene sheet, kraft paper, or aluminum foil, depending upon the project requirements.

## HVAC

Type ISB buildings can be supplied with an extremely wide range of HVAC (Heating, Ventilation, and Cooling) systems, each of which is carefully engineered and assembled to meet the specific requirements of the individual project. The design

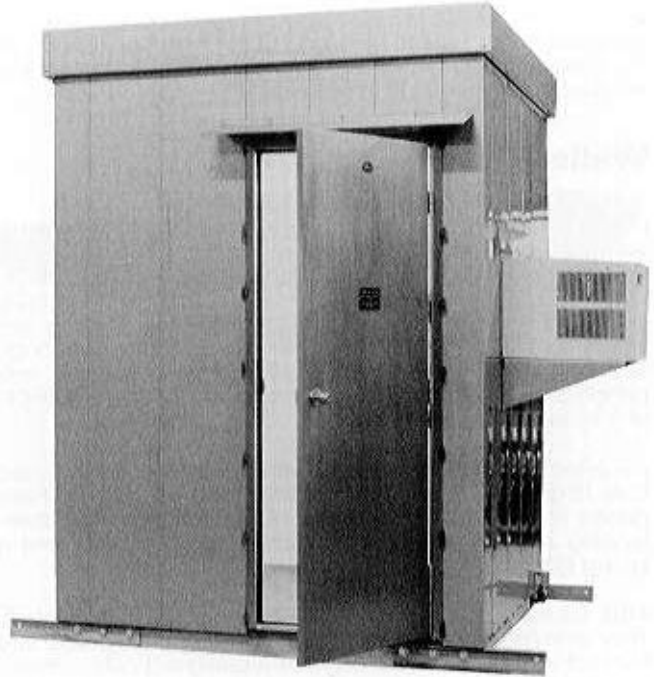


Figure 7—Stainless Steel ISB Building with M&I Door

of these systems must consider the characteristics of the equipment in the building (minimum and maximum operating temperatures, and any heat given off by the equipment itself), the climate of the jobsite (minimum and maximum temperatures expected, typical humidity, etc.), and the anticipated use of the building.

The resulting HVAC systems may be designed simply for corrosion control and equipment protection only, with minimal concern for personnel comfort, in which case simple forced air ventilation, with or without electrical heating, may be intended to be manned for extended periods, to be used as a control room, to house delicate equipment, or for ongoing maintenance activities. In these cases, a complete air conditioning and heating system may be required to keep the internal temperature within a typical range of 65°F, (18°C), to 75° F, (24°C).

Finally, M&I types ISB buildings can be designed to be located within areas which are potentially or normally hazardous for the operation of electrical apparatus (NFPA Class I or II, Division 1 or 2 classifications). In these cases, the building may be equipped with specializing purging and pressurization systems (with or without air conditioning and heating) which draw uncontaminated air from outside the hazardous area, and assure the safe operation of the building's equipment and systems. Such systems are designed, built, and tested in accordance with NFPA 496 - "Purged and Pressurized Enclosures".

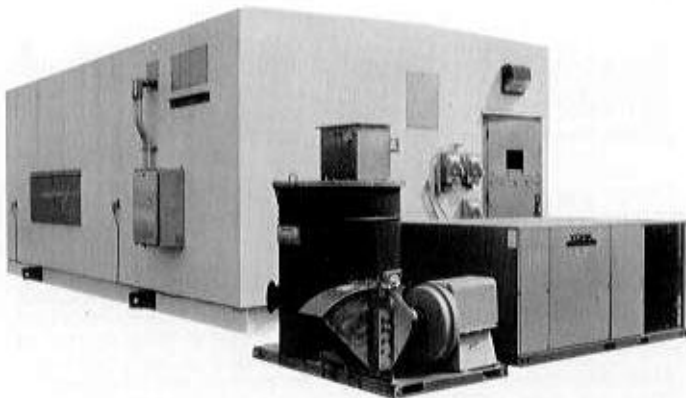


Figure 6—HVAC System for Purged Building



# Type ISB Integrated Power & Control System Buildings

## Doors

Type ISB buildings are built with doors and hardware which meet or exceed the most stringent requirements. Long experience has taught that the most common part of failure in portable power and control buildings, regardless of who originally built them, has been failure of the personnel access doors.

As a result, type ISB buildings typically employ single return door frames and doors which have been fabricated of 16 gauge (1.6 mm) electro galvanized steel. The doors are insulated with Celotex board, and they are fully seal welded to prevent internal corrosion. The doors are provided with welded internal stiffeners and with hinge and hardware reinforcement plates.

All hardware is of the heavy duty industrial type per ANSI and Federal standards, and is usually fabricated from stainless steel. Each door is supplied with a minimum of four heavy duty ball bearing hinges and with panic (crash bar) type hardware.

## Alternative Construction

While the vast majority of requirements for power and control buildings can be successfully met by buildings constructed from interlocking steel panels as previously described herein, special applications may require the use of special building materials and methods.

As previously noted, type ISB buildings may be constructed of interlocking aluminum or stainless steel panels, for increased corrosion resistance. Other construction methods are also available to meet the specific requirements of almost any project.

Among the alternative construction methods available for type ISB buildings are:

- Welded plate construction (such as crimp-wall construction).
- Seam welded stud and plate construction
- Non-metallic construction (fiberglass skin over metallic or non-metallic frame, and interlocking fiberglass panels).

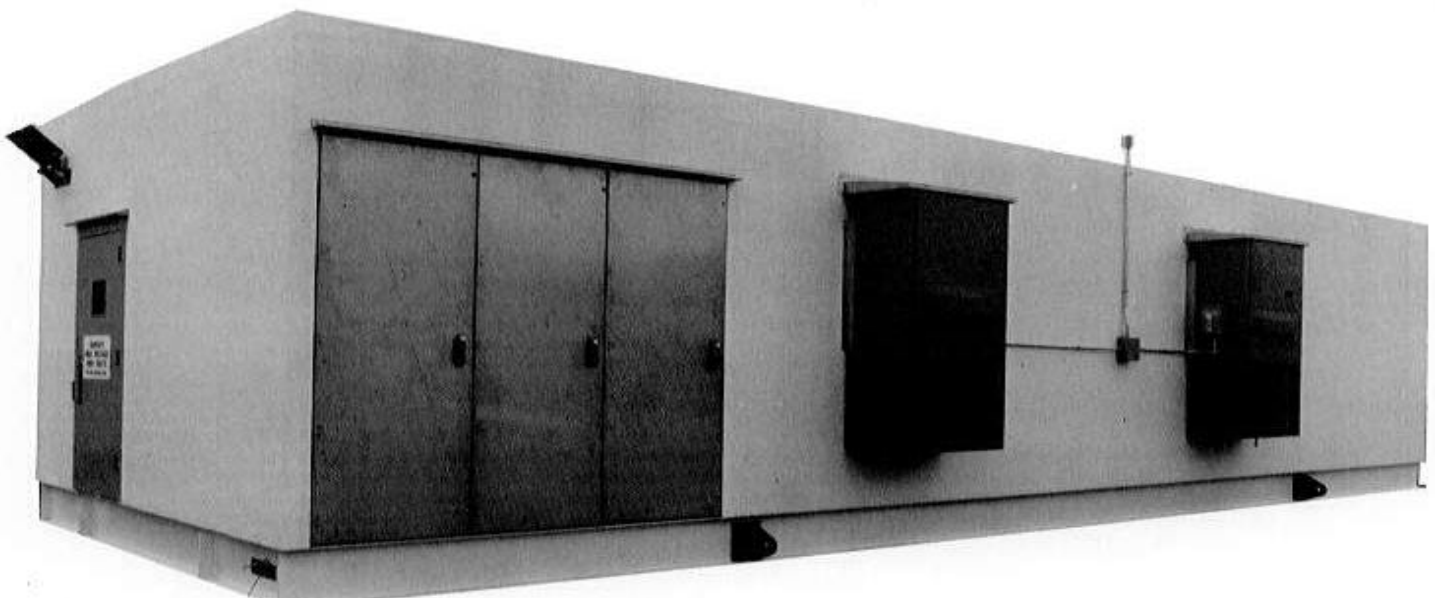


Figure 8—Corrosion Resistant (Fiberglass) ISB Building

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## The M&I Electric Story

Since 1946, M&I Electric has been a leading electrical products and service company. With facilities located in Beaumont and Houston, Texas; Lake Charles, Louisiana and Singapore, the company is uniquely qualified to serve the electrical needs of heavy industry. M&I Electric customers include oil refineries, petrochemicals, paper producers, electric utilities, and steel industries in the Gulf Coast area, also worldwide marine businesses such as oil and gas drilling, exploration and production, ship building and repair. Broad line electrical services from M&I Electric range from electrical contracting through sophisticated evaluation, troubleshooting, modernization and upgrading of electrical distribution and control equipment. Understanding the necessity of continuous operations, response time is short with competent engineering personnel and trained craftsmen available on a 24-hour on call basis. Products offered extend from powerhouses to complex manufactured custom switchgear, SCR systems, variable speed drives, and computer based control systems for unique applications. With the use of modern technology and methods, and its solid experience base, M&I Electric is able to offer state-of-the-art, reliable, workable, cost-effective products in a timely manner. Combining service and product businesses, the company provides worry free, single source turnkey systems and installations. M&I Electric's ability and willingness to perform have made it a leader in the industries served for over 50 years.



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