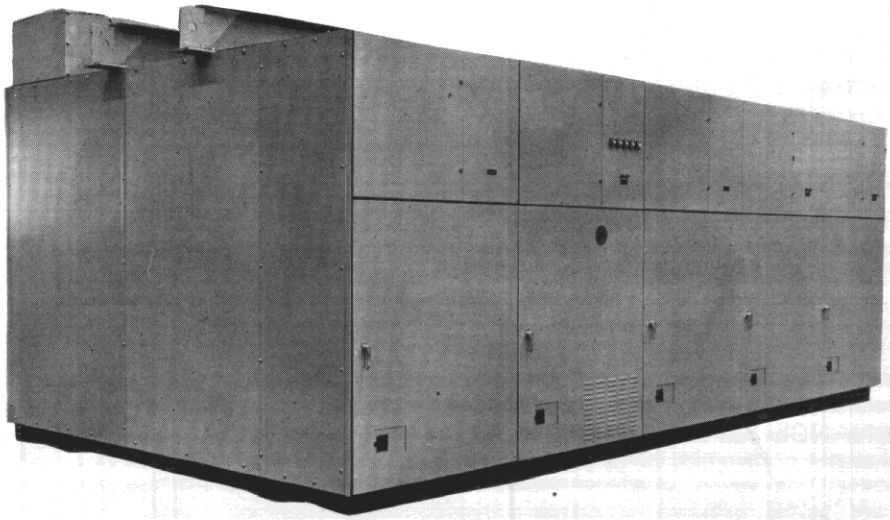
IB-8.3.7-2
ISSUE A

GOULD I-T-E METAL-CLAD SWITCHGEAR

INSTRUCTIONS

METAL-CLAD SWITCHGEAR

TYPE 38HKV



GOULD

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TYPE 38HKV
METAL-CLAD SWITCHGEAR

INTRODUCTION

Instructions for installation, operation and maintenance of metal-clad switchgear are furnished with each shipment.

These instructions should be read carefully and used as a guide during installation and initial operation.

File these instructions in a readily accessible place together with drawings and descriptive data of the switchgear. The use of these instructions will facilitate proper maintenance of the equipment and prolong its life and usefulness.

SCOPE OF INSTRUCTIONS

These instructions are general. They cover requirements for installation as applied to metal-clad switchgear utilizing type 38HKV vacuum circuit breakers.

Specific information on particular applications is furnished in the form of specific drawings. The first sheet of the Bill of Material indicates application of the drawings.

1. Bill of Material
2. Front view showing arrangement of relays and instruments.
3. Single line diagram showing power connections.
4. Floor plan indicating available space for power and control conduits.
5. Special construction details.
6. Electrical Drawings.

TRANSPORTATION

Prior to shipment, the switchgear undergoes careful factory inspection. Each section is plainly marked at convenient places with its number and position. When size or other reasons make it necessary to divide the equipment for shipment, the unit number of the particular equipment is also marked on the section, along with its weight. The circuit breakers are shipped in individual cartons or crates.

Immediately upon receipt of the switchgear, examine for any damage or loss sustained during transportation. Check the contents against the packing list before discarding any packing material.

If there is any shortage, notify the nearest Gould representative at once.

Gould Inc. is not responsible for damage after delivery of shipment to the carrier. However, if the company is notified of such claims, it will furnish forms to facilitate securing any adjustments. If damage to the shipment indicates rough handling, claim for damage should be filed at once with the carrier and Gould Inc. promptly notified.

STORAGE

Leave each switchgear group on its shipping base for subsequent moving.

Observe the following precautions:

1. Check for missing or damaged parts.
2. Store in clean, dry place.
3. Cover parts susceptible to rust with heavy oil or grease.
4. Cover with heavy wrapping paper to keep dirt or dripping water from entering. Plastic film wrapping materials are not recommended if storage is to be for a long period of time as these materials retain moisture due to condensation. Dirt or moisture may foul working parts or deteriorate contacts and insulation.
5. If an indoor switchboard is to be stored for any length of time, or in any place where dampness may be present, then portable space heaters should be used to keep the switchboard dry until it is placed in service. When outdoor switchboards equipped with heaters are stored, the power source for the heaters should be brought to the load terminals of the thermal circuit breaker or cutout device which controls the heater circuits and the heater circuit energized.

UNLOADING AND HANDLING

The following is a recommended method for unloading and handling metal-clad switchgear housings.

Indoor Installation

The switchgear should be unloaded as near to the installation site as possible.

General

Before attempting any installation operations consult all drawings furnished by Gould Inc. for the particular order. These drawings are in the form of floor plans, front views, electrical drawings and a bill of material of the equipment furnished.

Preparation of Floor

Floor plan drawings are supplied for each installation. Typical floor plan drawings are not provided since they usually vary with each installation due to length and arrangement of housings.

The design of the floor may include channel iron sills embedded in the concrete. It is important that these sills be straight and level their full length, and correctly spaced. To insure this condition, it is recommended that ties be bolted between the sills at various intervals after which the lower flange of the sill be shimmed to proper level.

Where necessary, power and secondary (control) conduits should be installed before the installation of the housings. Available space for the conduits is given on the floor plan accompanying each order. These conduits should not extend more than one inch above the station floor level. Take precautions to plug conduit openings before pouring concrete.

The floor in front of the housings should be smooth to facilitate the handling of the circuit breakers. The finished floor level should be flush with the top of the channel sills so that the circuit breaker will roll evenly into the housing. Concrete should be prepared in accordance with instructions issued by the Portland Cement Association, available at their offices in the large cities.

Outdoor Installation

Outdoor switchgear is constructed with a steel base that serves as a shipping convenience as well as a permanent

support for the internal housings. Jacks may be placed under the shipping bases to raise the whole structure for positioning rollers.

Before assembling any outdoor structure carefully read the drawings concerned with erection and gasketing procedures. These drawings are listed on the front sheet of the Bill of Material.

FIELD ASSEMBLY PROCEDURE

The 38HKV switchboards will be factory assembled in single shipping units of up to six frames. For jobs requiring no more than six frames in a single line-up, field installation will consist of lifting or rolling into position and connecting source and load terminations. When the switchgear lineup consists of more than six units, the welding of the main bus at the shipping splits must be done as part of the field assembly procedure.

The bus used in the 38HKV switchgear is aluminum and all joints are welded. The bus is insulated with a dip coated epoxy. After the joints in the bus are welded, they are covered with molded epoxy boots.

The main bus in the switchboards is supported at the unit lines by means of wall bushings which are placed over the insulated bus and bolted to the steel supporting structure. The main bus is made in unit lengths (48") and is welded in each unit at the jump bus from the primary disconnects. The main bus is made self locating by notching the web of the channel and fitting the jump bus into the notches. The jump bus is also notched to receive a back-up plate for the main bus weldment.

Individual bus sections are first insulated with an epoxy dip coat. Then to provide dimensionally stable supports for the wall bushings and the boots at the bus terminations, a bus support seal molding and termination moldings are cast on the insulated bus. The location of the support seal molding is varied to correspond with the staggered arrangement of the bus. The splits in the main bus occur at the location of the jump buses from the primary disconnects.

Generally each line-up of indoor switchgear is shipped with lifting I beams mounted on the roof. Four hat-shaped beams are provided on the base. These beams permit longitudinal rolling of the switchgear. Drawing 368307 shows the methods for placing the switchgear line-ups in position prior to making the bus and termination connections. (Indoor only; for outdoor, see 368329.)

If the switchgear consists of a number of sections, the center sections should be installed first, and the remaining sections added at each end. When the first section is in position, it should be checked for distortion in shipment. This may be done by dropping a plumb bob from the center of the front and rear doors. If the structures are not true, they should be straightened before proceeding. As each section is added, it should be checked for distortion, otherwise considerable pressure may be required to bring the sections into alignment.

Holes are provided in the floor for plug welding the housings to the channel sills.

When shipment is made in sections, the main bus, control wiring, and inter connections are dismantled at the point where the switchgear is separated. These should now be re-assembled and all bolts and screws tightened. Bus support bolts should be reinserted through both side sheets. Incoming and outgoing connections should be made for both the main power circuit and all control circuits.

The primary main bus is located in the front section of the switchgear above the lower primary breaker disconnection at the shipping split together with its supports, is shipped disassembled. These parts are shown on drawing 837314.

Since the primary main bus is located in the front portion of the switchboard, it is necessary to remove terminations and accessories located in the rear compartments in order to gain access to the bus. The parts, which must be removed from the two switchboard frames adjacent to the shipping split may include barriers, cable terminators and lightning arresters. With these parts removed, the lower primary disconnects and the riser bars to which they are connected, become accessible. It may be convenient, but not usually necessary, to remove the lower primary disconnects from the two units. The mounting bolts for the primary disconnects must be removed from the front. The shutters in the breaker compartments must be unlatched and propped open to gain access to the primary disconnect mounting bolts.

A typical assembly of the connecting bus section is shown on drawing 837314. Referring to this drawing, the "O" rings Pc. No. 4 should first be assembled on the three bus sections. Then, the baffle insulators, Pc. 5, are assembled as shown in step 1. There will be two subassemblies shown as A phase and B phase in step no. 1. The baffle insulator for C phase is not assembled on the bus at this time.

The back-up plates for the weld should be placed in the slotted openings in the jump buses. The assembly is shown in Figure 1 drawing 368319. The B phase main bus is then placed in the switchboard from the right hand side of the shipping split. The A phase bus is then put in place in a similar manner from the right hand unit. The baffle insulators are made so that the lower edge of the A phase will overlap the upper edge of the B phase. A filler plate is used at the top of A phase to position the upper edge of the A phase baffle insulator. The filler plate is shown as Pc. 3 on 837314. The bus for C phase is placed in the board from the left hand unit while the C phase baffle insulator is slipped over the bus from the right hand unit. A similar filler plate Pc. 3 is used at the bottom of the C phase insulator. The notched ends of the phase buses should be lined up on the ends of the jump buses. The baffle insulators should be bolted in place using the hardware provided. The main buses should then be welded as shown on drawing 368319, Figure 1.

After the main buses are welded, they are insulated with epoxy boots which are cemented in place with epoxy adhesive as directed on drawing TD-7155.

The parts which were removed from the rear compartments, should then be replaced.

Connection of Primary Cables

For instructions on making primary cable entrance connections, see instruction data furnished with the cable terminating device furnished with the switchgear.

Connection to Ground Bus

Ground bus bars are bolted to the frames of the housings at the factory before shipment. When housings are shipped separately, it is necessary to bolt the ground bus to the framing. Ground bus bars should be solidly and permanently connected to the station ground by means of a cable or bus of cross section not less than that of the housing ground bus.

Ground cable or bus should not be in conduit, and

Connection to Control Source

The control source wiring to the switchgear should be of larger cross section than the balance of the control wiring in order to reduce the voltage drop, particularly when this source is some distance from the switchgear. Provision is made in the switchgear, in the form of heavy duty terminal blocks, for the connection of these control source leads. The leads should first be checked for proper electrical sequence before the connection is made.

Secondary and Control Connections

All secondary and control connections on metal-clad switchgear are factory wired in accordance with the connection diagrams applying to the installation. The secondary and control connections for all outgoing connections are wired to terminal blocks accessible to the conduit connections.

Control connections between housings are provided through openings in the side sheets of the switchgear. When shipment is made in groups of several units each, the cross connections between groups are installed at the factory, one end of each of the group connectors is then disconnected and tagged. Care should be taken to insure that all these connections between groups are securely remade when the groups are placed together again.

Primary Disconnects

The primary disconnects are made to be self-aligning within tolerances which are suitable for the removable elements. No adjustments are required and it is only necessary to insure that the disconnects are free of grease and dirt. Any necessary lubrication is provided on the removable element disconnects.

TESTING AND INSPECTION

With the housings erected, assembled and connected, observe the following precautions:

1. Remove all extraneous matter and see that all internal parts are free of dirt, grease and moisture. If moisture had penetrated, dry out with air or heat. Do not grease or degrease any contact areas without authorization of Gould, Inc.
2. IMPORTANT: Proper phasing of all main circuits should be checked according to diagram.
3. Remove all blocks in relays used for protection in shipment.
4. Apply potential tests to check for any damaged insulation.
5. Check continuity of all circuits. A great deal of this work can be done after the circuit breakers are installed by energizing the control source and operating the equipment with the main circuit dead. Indicating instruments check the continuity of current transformer and potential transformer circuits after the main circuit is energized.
6. Set all relays, regulators, and other devices for proper operation of loads. No relays are set at the factory. Remove screws from short circuiting strip on terminal blocks in current transformer circuits. Screws should be stored in tapped holes in corners of the blocks. See SAFETY PRECAUTIONS.
7. If finish has been marred during shipment or installation, apply touch-up paint (which may be secured from the factory).

Final Inspection

After the switchgear, together with the apparatus it is to control, has been installed and all interconnections made, it should be given a final check and test before being put into service. This is necessary to insure that the equipment has been correctly installed and that all connections are completed. Extreme care must be exercised to prevent the equipment to be controlled from being connected to the system while the preliminary tests are being conducted.

If disconnecting switches are not part of the apparatus or switchgear, the line leads should be disconnected to accomplish this. The testing equipment required will depend entirely on the type of installation. Portable voltmeters both a-c and d-c with a wide range of scales will usually be required. If the equipment to be put into service is quite extensive and complicated, both a-c and d-c ammeters should be available in case unexpected trouble develops.

Some simple portable device for ringing or lighting out circuits should be included in the testing equipment.

HOW TO PUT THE SWITCHGEAR IN SERVICE

General

Before energizing the switchgear observe that:

1. The board is completely assembled with all barriers in place, and all extraneous material has been removed.
2. Potential tests have been made to determine that all insulation is in good condition.

60 CYCLE, RMS, WITHSTAND VOLTAGES (1 MINUTE)		
Rated	Factory Test	Field Test
60 volts	500 volts	375 volts
61 to 220 volts	1500 volts	1100 volts
221 to 600 volts	2200 volts	1650 volts
34,500 volts	80,000 volts	60,000 volts

CAUTION: IF PHASE TO PHASE TESTS ARE MADE IN ADDITION TO PHASE TO GROUND TEST, CARE MUST BE TAKEN THAT NO SHUNT CONNECTED COILS SUCH AS POTENTIAL TRANSFORMERS ARE CONNECTED DURING THE TESTS.

3. All outgoing cables are either permanently connected or thoroughly insulated so as not to cause a fault, especially at end remote from switchboard.
4. All current circuits are complete beyond the current transformer short circuiting terminal blocks and that protective relays are set properly and are operable. Refer to safety precautions for removal of short circuiting devices.
5. All circuits are properly phased.
6. There is a back-up circuit breaker which is in operating condition and set so as to clear any fault that inadvertently may occur.

Safety Precautions

THE CIRCUIT BREAKERS SHOULD BE IN DISCONNECT POSITION WHEN PRACTICABLE. WHEN A THOROUGH INSPECTION OR WORK IS REQUIRED ON A BREAKER, IT MUST BE REMOVED FROM THE HOUSING. THE BUS SHOULD BE DE-ENERGIZED AND SOLIDLY GROUNDED WHEN WORK IS TO BE DONE ON SWITCHGEAR.

The secondary circuits of energized current transformers SHOULD NEVER BE OPEN CIRCUITED. Current transformer secondaries are short circuited when shipped from the factory.

To open the short circuiting device:

1. Check current transformer secondary circuits to assure that they are complete. Do not open circuit the secondary of an energized current transformer.
2. Remove the special short circuiting screws from the short circuiting strip. IMPORTANT: DO NOT REMOVE THE GOUNDING SCREW.
3. Store the screws in the holes provided at the corners of the moulding.

Procedure

The operator should thoroughly familiarize himself with the circuit breaker operation before proceeding. This is covered in the Circuit Breaker Instruction Manual IB-8.3.7-3.

All circuit breakers should be in the disconnect position initially. Then first energize the control circuit with the main power circuit de-energized. Rack one circuit breaker into the test position. The charging of the closing springs will indicate that the control power is connected. Then rack the remaining circuit breakers into test position, one at a time.

With the circuit breaker in the test position, open and close the breaker by the push buttons provided on the breaker, and by the control switch, or any remote operating point that may be provided. The circuit breaker should be tripped by individually manipulating all relays and protective devices. Interlocks and special controls must be checked for proper operation.

With the main power still off, rack the circuit breaker from the test to connected position. Note that a buzzer will sound during the process of racking the circuit breaker between the test and connected position. The buzzer sounding indicates that the circuit breaker is not fully secured in either the test or connect position. The operation of the buzzer ceases only when the circuit breaker is properly positioned. Note also a slight increase in the racking effort as the disconnects of the removable element engage that of the switchboard. Return the circuit breaker to the test position.

After all of the circuit breakers have been placed in the test position, the main power may now be applied to the switchgear. Close all doors to the switchgear as a safety measure. Those circuit breakers necessary to energize the main bus should be moved to the connected position and closed.

Observe undervoltage relays or other devices that should function properly when the main bus is energized. Next move each circuit breaker in turn to the connected position and close. Observe that all relays and instruments are functioning properly. Improper readings of wattmeters, power factor meters, and watthour meters usually indicate improper phasing of main bus connections.

When a switchgear installation is fed from one or more generators, it is usual to bring each generator up to speed and connect it to the bus so as to make adjustments on it for speed and voltage. The generators are then synchronized and adjusted for load division.

MAINTENANCE

General

All switchgear installations should be given a general inspection at frequent intervals. Perform a visual inspection, front and rear, to see that there is no evidence of loose parts, warping or undue vibration. Take steps to remedy any deficiencies of this nature that may appear. Keep the assembly dry at all times. If leaks from overhead pipes and dripping from condensation or other sources cannot be eliminated, prevent the moisture from falling on the gear.

Semi-Annual Inspection

At least twice yearly, a thorough inspection of the equipment must be performed. Prior to this inspection, de-energize all circuits. The following checks in particular are emphasized:

1. Inspect all bolted connections, nuts and screws for tightness.
2. Inspect all cables for tight connections and ample support.
3. Inspect control wiring for signs of wear and damage. Replace wires wherever doubtful.
4. Examine resistors and other devices prone to overheating.
5. Open all hinged panels and remove all bolted panels.
6. Clean all insulation thoroughly.
7. Withdraw all drawout components and clean. (Refer to Circuit Breaker Instruction Bulletin before cleaning circuit breakers.)
8. Clean the stationary portion of the switchgear by wiping with a clean cloth. A compressed air hose will be useful in the relatively inaccessible areas.
9. Remove covers of all panel devices where practicable. Check wiring for secure connections. Clean contacts on relays and switches wherever necessary. Replace covers.
10. Replace all panels and components.

Care of Finish

The finish used on I-T-E Switchgear is of the highest grade baked synthetic enamuel. The switchgear should be kept clean at all times. Wiping with a clean dry cloth will usually suffice. To remove oil and grease marks, use warm water and soap, wiping dry with a soft cloth.

To touch up the exterior or interior finish after final erection, use PPG DZL-3200 light gray primer surfacer and PPG air dry acrylic enamel of the corresponding color. The color finish furnished on the exterior varies, and this information is stated on the front sheet of the Switchgear Bill of Material.

Renewal Parts

The quantity of renewal parts to be stocked varies with the installation. Previous experience and the number of units in service are the best guides available. To order replacement parts, contact the nearest Sales Office of Gould Inc. Give a complete description of the parts and the nameplate data of the device requiring these parts. Specify the quantity required.

DRAWING INDEX

GENERAL

DRAWING NO.	
368319 (Sht. 1 & 2)	Main Bus Welding Joints
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837513	*Shipping Split Main Bus - Both Ends Dead Ends*
837582	Shipping Split Main Bus - One End Dead End, One End Continuous Bus
TD-7155 (Sht. 1 & 2)	Directions for Field and Plant Application of Cast 38kV Bus Joint Covers

INDOOR SWITCHBOARDS

368307	Methods of Handling Indoor 38HKV Switchgear (4 to 6 Frames)
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OUTDOOR SWITCHBOARDS

368329	Methods of Handling Outdoor 38HKV Switchgear
368332	Aisle Enclosure Erection Procedure, Single Row Walk-In RH or LH
837450	Application Procedure for Sealing Aisle Enclosure Roof
368337	Field Instructions & Parts for Joining Outdoor-Swbd Shipping Units, Single or Double Row Walk-In
368547	Field Instructions & Parts for joining Outdoor-Swbd Shipping Units, Non-Walk-In