ALLIS-CHALMERS MANUFACTURING COMPANY

PLAINTIFF'S EXHIBIT USX-182

Proposal and Contract

MA-2829-R

Dated December 10, 1946 at Milwaukee, Wis., U. S. A.

With Tennessee Coal, Iron and Railroad Company

(HEREINAFTER CALLED THE PURCHASER)

Address .....

Allis-Chalmers Manufacturing Company (hereinafter called the Company) agrees to furnish the Purchaser, and the Purchaser agrees to purchase, on the following conditions, the apparatus described below, or in the Company's specifications attached, which are made a part of this contract, f.o.b. [redacted] factory with freight allowed to the railroad siding nearest destination.

1 - 1500 KVA Double Ended Load Center Substation consisting of the following:

2 - Incoming line sections including 2-15 KV interrupter switches and potheads.
2 - Power transformer sections including 2-750 KVA, Chlorextol liquid filled, indoor type transformers.
1 - Set of low voltage, indoor type, metal enclosed switchgear including 2- main breakers, 6-feeder breakers and 1- bus tie breaker.

All to be in accordance with attached Load Center Substation Specifications MA-2829-R.

RECEIVED
JAN 9 1947
T. C. I. & R. R. CO.
Chief Electrical Engineer

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"PRICE PROTECTION CLAUSE"

"In the event of a change in the Company's price for material or apparatus of the type to be delivered under this contract, the price of units undelivered hereunder will be the price in effect on the date of delivery. In no event shall any increase be in excess of the applicable maximum price established by any agency of the Federal Government and in effect on the date of delivery."

ALLIS-CHALMERS MANUFACTURING COMPANY

Price:

The contract price is Twenty Four Thousand Six - and 00/100 Dollars ($ 24,006.00), payable in United States funds, subject to adjustment in accordance with the Price Adjustment Clause, Form 3081 attached.

Terms:

Terms of payment are as follows:

60% when ready and offered for shipment.

20% within thirty days thereafter.

20% within sixty days after date of first payment.

Pro rata payments shall become due as shipments are made. If shipment is delayed by the Purchaser, the date of readiness for shipment shall be regarded as the date of shipment in determining when payments for said apparatus are to be made. If manufacturer of the apparatus herein specified, or any part thereof, is delayed by the Purchaser, the date of shipment called for by the contract shall be regarded as the date of shipment in determining when payments for said apparatus or part are to be made, and payments shall be made based upon the contract price and percentage of completion on such payment dates, balance payable when shipment is actually made. Apparatus held for the Purchaser shall be at the risk of the Purchaser and at his expense as to upkeep and storage.

If in the judgment of the Company the financial condition of the Purchaser at the time apparatus is ready for shipment does not justify the terms of payment specified above, the Company may require full payment in cash before making shipment.

All notes and securities given to the Company by Purchaser are taken by the Company, not in payment, but as evidence only, of Purchaser's indebtedness; if any payment (including notes) is not paid when due, all remaining payments (including outstanding notes) shall, at the option of the Company become immediately due and payable. All collection and exchange charges and all taxes shall be payable by the Purchaser.

Delivery:

Dating from the receipt of the accepted contract and complete information from the Purchaser at the Company's works, the apparatus described herein shall be shipped as follows:

Approximately 12 months after receipt of full information at our factory.

If at the time of receipt of the accepted contract and complete information, conditions at the Company's factory have changed because of factors beyond control of the Company, such schedule may be modified by the Company to the extent of any delay so caused and the purchaser notified accordingly.

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Delays:

In the event that the Company suffers delay in performance due to any cause beyond its control, including, but not restricted to, act of God or of the public enemy, act of the Government or any agency thereof, civil or military authority, act of the Purchaser, fire, flood, strike, riot, sabotage, embargo, unusually severe weather, delay in transportation, delay or inability to obtain specified or suitable equipment or materials or transportation facilities, or delays of subcontractors or those furnishing equipment or materials, then in any such event the time of completion shall be extended a period of time equal to the period of such delay and its consequences; and the Company shall not be liable for any expense, loss, or damage that may result from any such delay.

Warranty:

The Company warrants that the apparatus to be delivered hereunder shall be of the kind and quality described in the specifications, and no other warranty, except of title, shall be implied. The conditions of any tests shall be mutually agreed upon and the Company shall be notified of and may be represented at all tests that may be made. If any failure to comply with the specifications appears within one year from the date of shipment, the Purchaser shall notify the Company thereof immediately and the Company shall thereupon correct the defect, or defects, by repair, or by replacement f.o.b. factory of the defective part or parts. But if the apparatus is installed or its installation supervised by the Company, said one year shall run from the completion of installation, provided same is not unreasonably delayed by the Purchaser. The liability of the Company (except on warranty of title and on the liability respecting patents hereinafter set forth) arising out of the supplying of said apparatus, or its use, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the apparatus as above set forth, and, upon the expiration of said one year, all such liability shall terminate. The Company shall not in any event be liable for indirect or consequential damages.

Patents:

The Company shall at its own expense defend any suit instituted by any party against the Purchaser so far as it is based on the claim that any apparatus or part thereof furnished under this contract constitutes infringement of any United States patent, provided the Purchaser shall give to the Company immediate notice in writing of the institution of such suit, and shall permit the Company, through its counsel, to defend the same, and shall give all needed information, assistance and authority to enable the Company to do so, and the Company shall pay all damages and costs finally awarded therein against the Purchaser by reason of such infringement, but the Company shall not be liable under any compromise made without its consent. If in any suit which the Company agrees hereinabove to defend, said apparatus or part thereof is held to constitute infringement and its use is enjoined, the Company shall at its own expense either procure for the Purchaser the right to continue using the said apparatus or part thereof, or replace said apparatus or part with noninfringing apparatus or part, or modify it so that it becomes noninfringing, or remove the enjoined apparatus or part and refund the sum paid therefor, including any transportation or installation cost thereof. The foregoing states the Company's entire liability for patent infringement by said apparatus or any part thereof.

Title:

The title and right of possession of the apparatus herein specified, and any replacements thereof or substitutions therefor, shall remain in the Company, whatever may be the mode of its attachment to realty or other property, until all payments hereunder (including deferred payments and any notes or renewals or extensions thereof) shall have been fully made in cash, and the Purchaser agrees to perform all acts which may be necessary to perfect and maintain said right and title in the Company. The Purchaser shall assume all risk of loss after delivery of the apparatus to the Purchaser. Upon failure to make payments, or any of them, as herein specified, the Company may retain as liquidated damages any and all partial payments which have been made, may declare all remaining payments due and payable, and shall be entitled to take immediate possession of said apparatus, and be free to enter the premises where said apparatus may be located, and to remove the same as its property, without prejudice to any further claims on account of damages which the Company may suffer from any cause. The Company may pursue all legal remedies to enforce payment hereunder, without prejudice, if unable to make collection, to its right at any time to repossess the apparatus and pursue the remedy outlined in the last preceding sentence, or any other remedy allowable under the laws of the place where the apparatus is located.

Insurance:

Immediately upon delivery of any of the apparatus described herein the Purchaser shall procure and maintain for the benefit of the Company and the Purchaser, as their interests may appear, adequate insurance for the said apparatus against loss or damage by fire and the elements, and the Purchaser shall be liable for all loss to both parties resulting from fire and the elements, in case of failure to effect or maintain such insurance.

Taxes:

The above quoted price of said apparatus does not include any sales, privilege, use, excise, or other similar tax, local, state or Federal. The amount of any such tax which the Company pays because of the furnishing of said apparatus shall be paid to the Company by the Purchaser upon presentation of invoice.

Containers:

All special containers (such as oil barrels, reels, tarpaulins, etc.) used in the shipment of apparatus covered by this contract shall remain the property of the Company and shall be returned by the Purchaser in good condition to the point of origin or other point designated by the Company, transportation charges prepaid, within thirty (30) days after their actual receipt by Purchaser. Cradles and cribs used in the shipment of the apparatus shall be so returned, f.o.b. point of unloading of apparatus, upon request of the Company, if such request is made within thirty (30) days after their actual receipt by Purchaser.

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FORM

ALLIS-CHALMERS MANUFACTURING COMPANY

Erection:

Unless otherwise expressly stipulated herein, all apparatus shall be installed by and at the expense of the Purchaser. However —

a. In case it is stipulated herein or in the Company's specifications attached that the apparatus is to be erected or installed by the Company, the cost thereof will be included in the purchase price, and the Company shall be liable for any damage to persons or property caused by the negligence or wrongful act of its own employes or subcontractors, and shall maintain public liability and property damage insurance in reasonable amounts to cover such liability, and shall maintain (and cause its subcontractors to maintain) workmen's compensation insurance to cover injuries to its (or their) own employes, and shall save Purchaser harmless from unemployment benefits and taxes relating to such employes; the Purchaser, however, guarantees to furnish such employes a safe place to work.

b. In case the installation of the apparatus is under the supervision of one or more engineers, millwrights, or mechanics furnished by the Company at the request of the Purchaser, the Purchaser shall, upon monthly invoices independent of the contract account, pay to the Company for the said services of such person or persons for work done within the United States at a rate of ..... Five and 00/100 ..... Dollars ($5.00 .....) each per hour for straight time, plus overtime as specified below, plus all traveling and living expenses. Time and expenses for such persons will be charged from the time they leave for such work until their return (while en route, and while not working due to causes not attributable to the Company, not exceeding eight hours per day will be charged as straight time, including Saturdays, Sundays and legal holidays). For actual work, straight time shall be paid for eight hours per day (except Saturdays, Sundays and legal holidays) between 7:00 A.M. and 6:00 P.M. or for eight hours on regular night shift, if arranged by mutual agreement. Overtime shall be determined by multiplying the above straight time hourly rate by actual overtime hours worked by overtime rates as follows: Time and one-half after regular eight hour shift and on Saturdays; double time after sixteen hours work until such person is relieved for regular interval of rest; double time for Sundays and legal holidays. The Company will endeavor to furnish only persons who are experienced and reliable engineers, millwrights, and mechanics, as the case may be, but it is understood that during the term of such service the Purchaser shall assume all responsibility for any act or omission of such person or persons. The Purchaser shall furnish and assume responsibility for all labor, materials, and tools required in connection with the services of such person or persons.

O.P.A. Compliance:

The Company affirms that to the best of its knowledge, information and belief the prices, terms, and conditions of this contract do not violate any provision of the Emergency Price Control Act of 1942, or any regulation issued thereunder, applicable to the Company.

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ALLIS-CHALMERS MANUFACTURING COMPANY

General:

The Purchaser shall not assign this contract or any rights hereunder without the written consent of the Company. All of the terms, and provisions of the contract between the parties pertaining to the subject matter hereof are fully set out herein, and no understanding, warranty, or obligation not herein expressly set forth is binding upon the parties, and no subsequent modification of this contract shall be binding upon the parties unless the same is in writing, accepted by the Purchaser, and approved in writing by an executive officer of the Company.

This contract must be accepted by the Purchaser and returned to the Company within -30- days from its date, and shall not be binding upon the Company until so accepted and returned, and approved in writing by an executive officer of the Company.

Allis-Chalmers Manufacturing Company

By.....

Approved:.....
TREASURER

ACCEPTANCE

The foregoing contract is hereby accepted this

.....day of....., 19.....

(Purchaser's Firm Name).....

By.....

Title.....

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ALLIS CHAL[illegible] UNIT SUBSTATION SPECIFICATIONS

TYPE LCS UNIT SUBSTATION

for

COLD REDUCTION DEPARTMENT

FAIRFIELD TIN MILL

TENNESSEE COAL, IRON AND RAILROAD COMPANY

12-6-46

Purchaser's Spec. No. 1408

A-C Specification No. MA-2829-R

The type LCS Indoor Load Center Unit Substation described in these specifications will be rated 1500 KVA. The substation assembly will consist of two incoming line sections, two power transformer sections, and a distribution feeder section. General construction features are described in the attached printed material. The complete unit will be of coordinated design so that the sub-assemblies are easily bolted together in the field into a complete sub station. Necessary standard connecting materials are supplied by Allis-Chalmers.

The front of the unit will be the switchboard side of the metal-enclosed switchgear and the accessory side of the transformer. Both transformers of the double ended unit substation will be inter changeable each having the low voltage throat on the right when facing the accessory side of the transformer.

When facing the front of the substation, the general arrangement is as shown in drawing MA-2829-R, which is part of this specification. A single line diagram is superimposed on the general arrangement drawing to show the location of equipment supplied.

The substation as a unit and all its component parts will comply with all the applicable standards of A.S.A., A.I.E.E. and N.E.M.A.

INCOMING LINE SECTION

On the side of the transformer opposite the low voltage throat will be a metal-enclosed compartment housing an Chlorextol-liquid immersed, interrupter switch. The switch will be manually operated by a handle located on the front of the substation.

To prevent interrupting load current, the switch will be equipped with a key type interlock so that it can be operated only when the transformer secondary breaker is open.

The incoming cable will enter from below and will terminate in a three-conductor pothead.

LOAD CENTER TRANSFORMER SECTION

Two Duplicate Transformers

Ratings:

Capacity	750 KVA self cooled
Frequency	60 Cycles
Phase	3
Type	Indoor
Insulating Medium	Chlorextol Liquid
Temperature Rise	55° C.
High Voltage	6600 Volts Delta
Low Voltage	240 Volts Delta

Four 2 1/2% full capacity taps two above and two below normal rated voltage on the high voltage side will be provided. The tap changer will be manually operated when the transformer is de-energized. These taps are used to compensate for the slight difference in supply voltage that occur in different substation locations and with system changes.

Secondary

3 - Low voltage bushings with connectors will be brought out through the right side of the transformer tank into a throat for connection in the field to the distribution switchgear.

TANK CONSTRUCTION:

Sealed tank construction will be used on the transformer to prevent sludging of the liquid due to excessive oxidation.

The tank will be of rectangular shape with radiating tubes located so as to provide free circulation of the cooling air. The transformer coil and core base will be of heavy structual sections to allow skidding the unit into position without damage to the tank.

TRANSFORMER ACCESSORIES:

Drain valve and sampling device
Necessary Chlorextol liquid.
Filling plug in cover
Ground Pad
Liquid level gauge.
Provision for towing.
Provision for lifting
Nameplate.
1" filter-press valve
Jack bosses
Relief Device
Dial type thermometer

Accessories are located as shown on Drawing No. SPW-877 which is part of this specification.

LOW VOLTAGE SWITCHGEAR

The distribution feeder switchgear will consist of 2 transformer secondary units, 6 feeder units and 1 bus tie.

The units will be of the drawout type of indoor metal-enclosed construction. Each compartment will be equipped with hinged front doors. The unit will be shipped on a channel iron base in as large sections as the customer can conveniently handle. Throats on the left and right hand side of the assembly will be provided for connection in the field to the low voltage throats on the power transformers.

Low voltage breakers will be supplied as follows:

8 Air circuit breakers, 600 volt, drawout three pole, single throw, trip free, position indicator, primary and secondary disconnecting devices, mechanical interlock to prevent making or breaking current on the primary disconnects, rated as follows:

No.	Amps Rating	Amps Interrupting Capacity	Service	Trip Attachment	No. C.T.'s	Operation E.O.	Operation M.O.	Meters A	Meters WHM
2	2000	75,000	Main Breaker	Dual Magnetic		X			
3	1600	50,000	Feeder	"	"		X		
3	600	25,000	Feeder	"	"		X		
1	1600	50,000	Bus Tie	"	"		X		

The bus tie breaker shall be interlocked with the two main breakers so that only two of the three breakers may be closed at one time.

METERS

- (A) A.C AMMETER
- (V) A.C. VOLTMETER
- (W) WATTMETER (INDICATING)
- (RW) WATTMETER (RECORDING)
- (WH) WATTHOURMETER
- (RM) REACTIVE VOLTAGE
- (PF) POWER-FACTOR METER
- (FM) FREQUENCY METER
- (T) TEMPERATURE METER
- (DCA) D.C. AMMETER
- (DCV) D.C. VOLTMETER

RELAYS

- (OC) OVERCURRENT (51)
- (OCD) OVERCURRENT DIRECTIONAL (67)
- (OCI) INSTANTANEOUS OVERCURRENT (51-I)
- (D) DIFFERENTIAL (87)
- (RP) REVERSE POWER
- (UV) UNDER VOLTAGE (27)
- (TH) THERMAL (49)
- (G) GROUND RELAY (51-G)
- (AUX) AUXILIARY (X)

EQUIPMENT

- OIL CIRCUIT BREAKER
- AIR BLAST BREAKER
- MAGNETIC-AIR BREAKER
- CURRENT TRANSFORMER
- POTENTIAL TRANSFORMER
- POWER OR CONTROL TRANSFORMER
- FUSE
- TERMINAL CONNECTOR
- DISCONNECT SWITCH
- DRAWOUT DISCONNECTS
- REACTOR
- AUTO TRANSFORMER
- POTHEAD

* N. E. M. A. STANDARD NUMBERS

ALL DIMENSIONS ARE APPROXIMATE AND NOT TO BE USED FOR CONSTRUCTION PURPOSES

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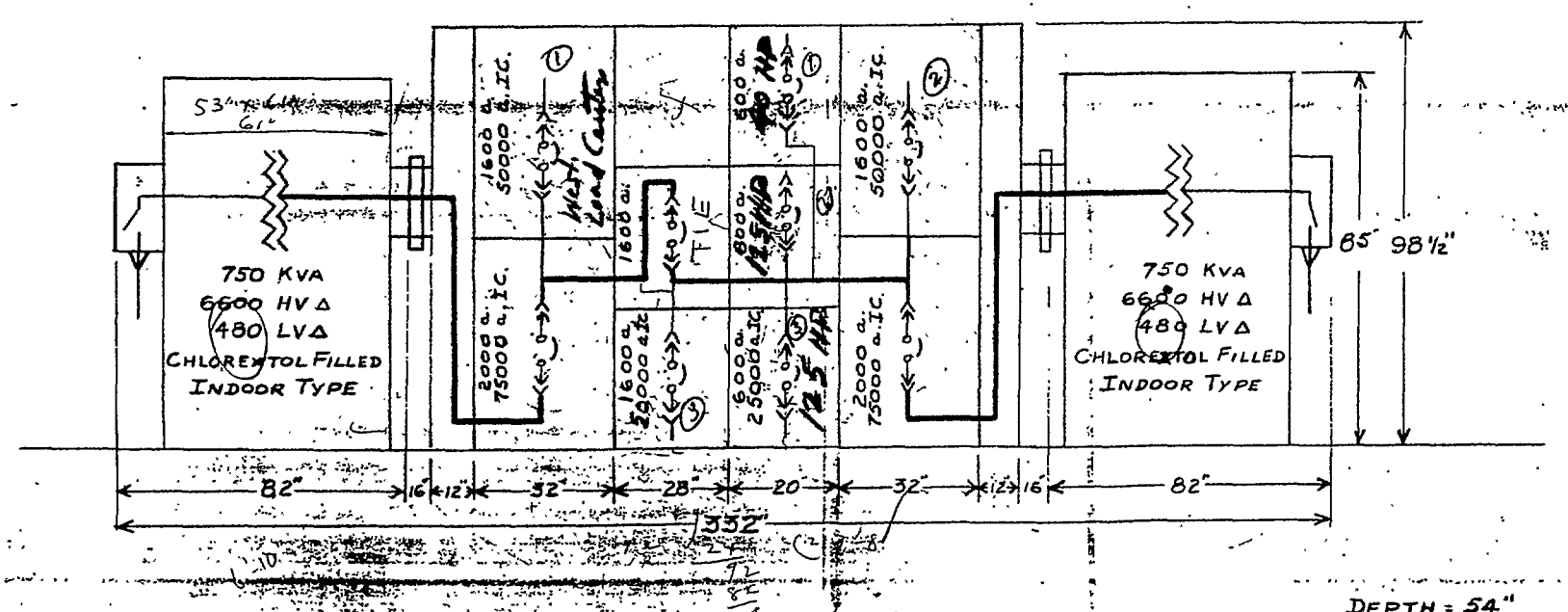


ALLIS-CHALMERS MFG. CO.
SWITCHGEAR DIVISION
MILWAUKEE, WISCONSIN U. S. A.

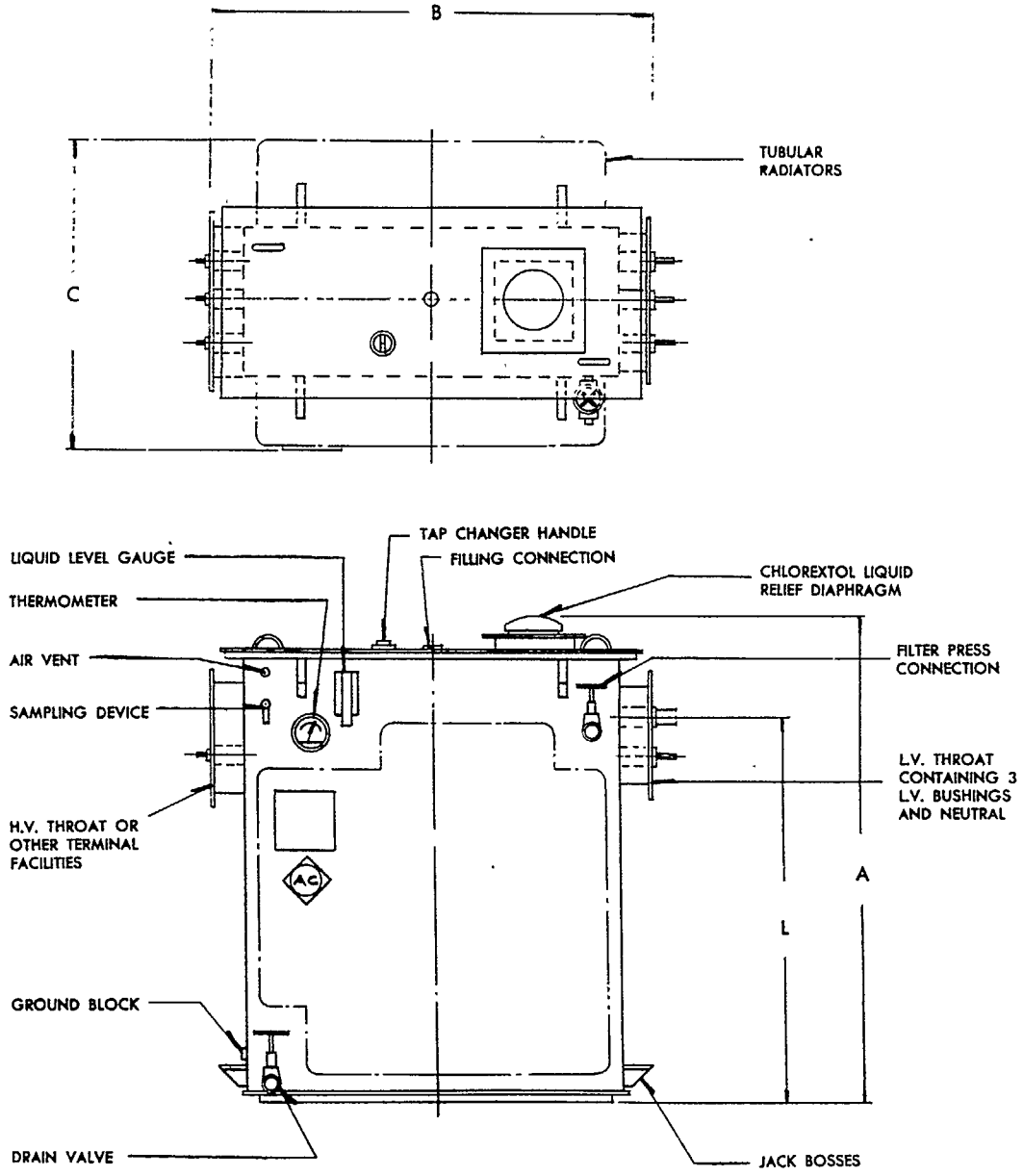
TENNESSEE - COAL, IRON & RAILROAD CO.

SPECIFICATION NO. 8-8829
SKETCH NO. 8-8829-1
DRAWN BY M.L. DATE 12-4-29

USHO 000246

ALLIS-CHALMERS TRANSFORMER SPECIFICATIONS

OUTLINE FOR TYPE LSC DISTRIBUTION TRANSFORMER



FOR PRELIMINARY USE ONLY — DO NOT USE FOR CONSTRUCTION PURPOSES

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ALLIS-CHALMERS TRANSFORMER SPECIFICATIONS

PERFORMANCE STANDARDS

RATING — The voltage ratings are based on the turn ratio. The ratio of voltages will be subject to the effect of regulation at various loads and power factors. The kva rating is based on rated secondary voltage maintained by impressing on the primary winding the voltage necessary to compensate for the effect of regulation of the transformer.

TEMPERATURE RISE — Determined by increase in resistance corrected to instant of shutdown and by thermometer. As it is obviously impossible to obtain resistance readings at the exact instant of shutdown, the observed readings are corrected for the drop in temperature occurring between the instant of shutdown and the time when readings are made.

Temperature rise is based on rated frequency with the transformer connected to give the maximum loss and upon the conditions listed below applying to the type of transformer covered by these specifications.

SELF COOLED AND FORCED AIR COOLED — Conditions of ventilation which will result in an ambient temperature not to exceed 40° C. maximum or 30° C. average for any 24 hour period and an altitude not to exceed 3300 feet (1000 meters).

WATER COOLED* — Specified quantity of cooling water to be circulated at an ingoing temperature not to exceed 25° C.

FORCED OIL COOLED* — Specified quantity of oil to be circulated. Cooling water temperature not to exceed 25° C., or an ambient air temperature not to exceed 40° C. maximum or 30° C. average for any 24 hour period, and an altitude not to exceed 3300 feet (1000 meters).

AIR BLAST* — Specified quantity of air to be circulated at an ingoing temperature not to exceed 40° C. maximum or 30° C. average for any 24 hour period, and an altitude not to exceed 3300 feet (1000 meters). The temperature rise by thermometer will not be more than 5° C. above the specified temperature rise by increase in resistance.

*Water cooled, forced oil cooled, and air blast transformers are not designed to be excited or loaded without artificial cooling.

TEMPERATURE TESTS — Will be made on at least one transformer furnished in accordance with these specifications unless temperature tests are available on a duplicate or an essentially duplicate transformer. The temperature rise, as determined by the test, will not exceed that specified, and the test results will be considered as having determined that the temperature rise of each of the other transformers will not exceed that specified.

APPLIED VOLTAGE TEST — For one minute.

INDUCED VOLTAGE TEST — At lowest practicable frequency for 7200 cycles when tested at 120 cycles or higher, or for 60 seconds when tested below 120 cycles.

LOSSES — At rated frequency, voltage and kva. Losses measured by wattmeter and corrected to 75° C.

The tested losses of one three-phase transformer, or the average tested losses of all duplicate transformers on the same order, will not exceed the specified values. However, the tested losses of one single-phase transformer, and of individual transformers when two or more duplicate transformers are furnished on the same order, may exceed the specified losses by not more than 10% of the no load loss and 6% of the total loss.

PER CENT REGULATION — Based on rated kva, voltage and frequency corrected to 75° C. The transformer regulation, computed from impedance volts and impedance watts measured by wattmeter, may exceed the specified regulation at specified power factors by not more than 7½% for two-winding transformers, or 10% for three-winding and auto-transformers.

PERFORMANCE STANDARDS

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Temperature rise is based on rated frequency with the transformer connected to give the maximum loss and upon the conditions listed below applying to the type of transformer covered by these specifications.

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LOSSES — At rated frequency, voltage and kva. Losses measured by wattmeter and corrected to 75° C.

The tested losses of one three-phase transformer, or the average tested losses of all duplicate transformers on the same order, will not exceed the specified values. However, the tested losses of one single-phase transformer, and of individual transformers when two or more duplicate transformers are furnished on the same order, may exceed the specified losses by not more than 10% of the no load loss and 6% of the total loss.

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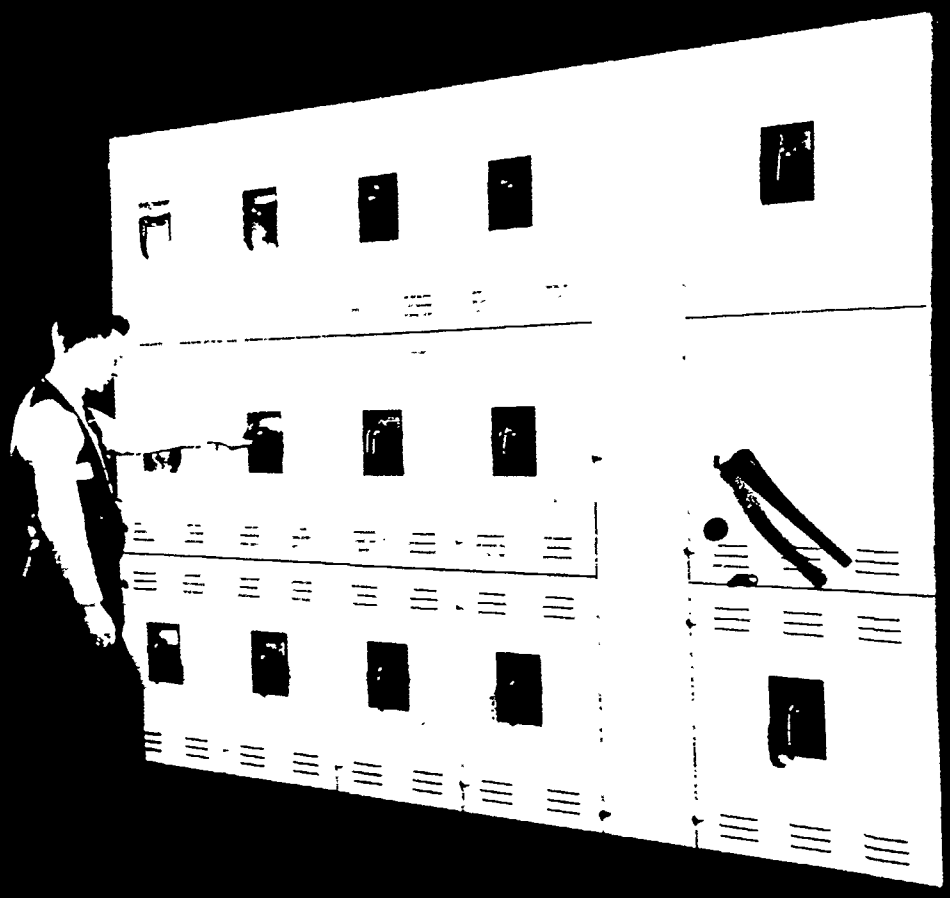
Low Voltage Metal Enclosed Switchgear



ALLIS-CHALMERS MFG. CO.

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ALLIS-CHALMERS SWITCHGEAR SPECIFICATIONS

LOW VOLTAGE DEAD FRONT METAL-ENCLOSED SWITCHGEAR

GENERAL CONSTRUCTION

The equipment described in this specification is Allis-Chalmers low voltage dead front metal-enclosed switchgear. It is completely factory built, wired and assembled, and each unit contains within itself the circuit breaker, busbars and necessary features. The units are designed so that additional units may be added easily in the future.

FRAMEWORK

The framework of Allis-Chalmers low voltage dead front air circuit breaker switchgear units is constructed of steel channels and angles, welded together and reinforced, forming a rigid, self-supporting structure. This framework is arranged for mounting on channel sills to insure proper alignment of switchgear units. The sill channels may be either set on edge or flat mounted.

ENCLOSURE

The tops, rear and ends of the switchgear units are enclosed with removable bolted-on plates of sheet steel. The fronts of the units are enclosed with hinged panels, equipped with thumb-screws.

COMPARTMENTS

Each air circuit breaker compartment is designed to enclose equipment of the particular type and capacity required. The sides, top and bottom of each compartment are constructed of sheet steel as described under the heading "Enclosure" and are lined with a suitable arc resisting flash barrier where necessary. The entire circuit breaker compartment is sufficiently sealed to prevent ionized gases from passing into adjacent circuit breaker or bus compartments.

Each circuit breaker compartment is equipped with a hinged front door mounted on concealed hinges. This door is equipped with thumb screws for holding it in the closed position and is provided with louvers to ventilate adequately the circuit breaker compartment.

Framework of indoor low voltage switchgear.

BARRIERS

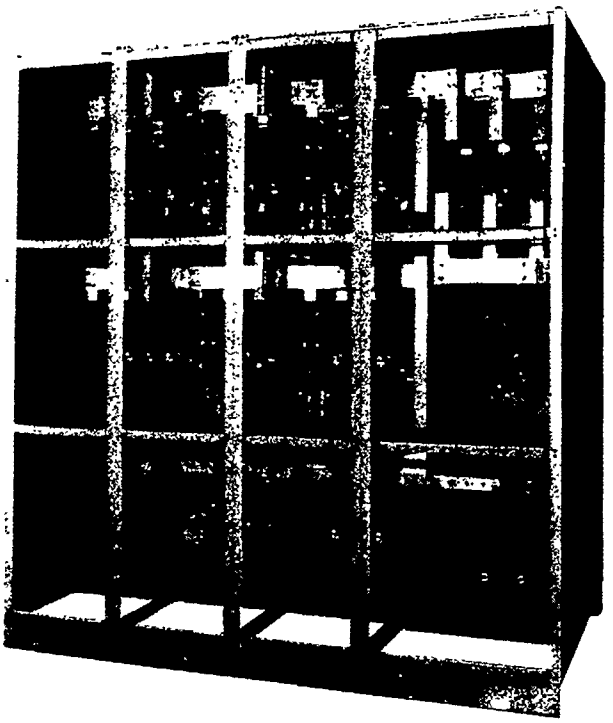
Ebony asbestos panels on which the circuit breakers are mounted form vertical barriers which divide the unit into front and rear compartments.

Switchgear units having more than one air circuit breaker per vertical section are divided into compartments by horizontal barriers.

The front compartments are used for housing the circuit breakers and associated features and the rear compartments are used for housing instrument transformers, bus work, and purchaser's conduits or cables.

ALLIS-CHALMERS SWITCHGEAR SPECIFICATIONS

LOW VOLTAGE DEAD FRONT METAL-ENCLOSED SWITCHGEAR



Rear View of Low Voltage Switchgear, showing arrangement of buses from 50,000 A.I.C. main breaker to 25,000 A.I.C. feeders.

BUSES

Main buses are constructed of high conductivity bars, held in place by insulating supports. Where bolted connections are made, surfaces are silver plated.

All buses are rigidly supported to withstand repeatedly the shocks and magnetic stresses caused by faults of a magnitude corresponding to the interrupting rating of the circuit breakers connected to them.

Control wiring is No. 14 gauge, solid tinned copper, insulated with flame-proof asbestos braid. All secondary and control wiring is terminated at terminal blocks, conveniently located in the switchgear unit and clearly marked for lead identification.

The switchgear units are equipped with a ground bus, extending throughout the unit, which may be properly grounded by the Purchaser. Equipment requiring ground connection is connected to this bus.

BUS TRANSITION UNIT

The bus transition unit is constructed in the same general manner as the circuit breaker switchgear unit.

Where required, the lower section of the bus transition unit may be used for housing an air circuit breaker.

The hinged front panel of the bus transition unit may be used for mounting instruments, meters or relays.

PURCHASER'S CONDUITS AND CABLES

Necessary space is provided in the rear of the switchgear unit for Purchaser's conduits and cables. It is understood that any conduits or cable, exterior to the switchgear unit, are to be supplied by the Purchaser unless otherwise specified in Detailed Specifications.

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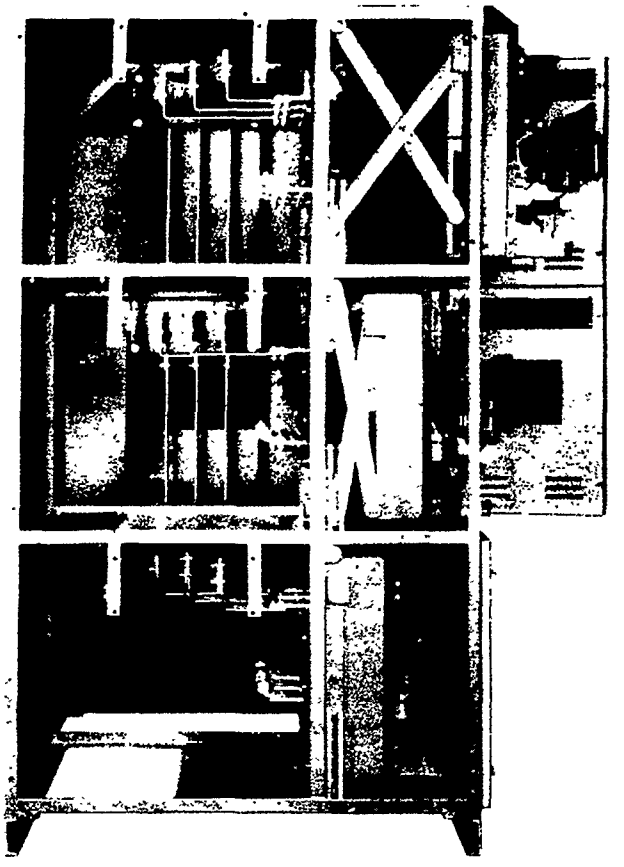
ALLIS-CHALMERS SWITCHGEAR SPECIFICATIONS

DRAWOUT TYPE AIR CIRCUIT BREAKERS



Side Plate of low voltage switchgear unit removed to show details of pantograph action for breaker withdrawal.

REMOVABLE ELEMENT

The drawout type air circuit breaker is mounted on a mechanical withdrawal arrangement in the form of a pantograph which permits the circuit breaker to be moved into or from the connected position while the main bus is energized. This operation does not require opening or entering the bus compartment.

The pantograph frame holds the circuit breaker in a vertical position during the racking in and out operation. The withdrawal pantograph is actuated manually by a screw type mechanism operated through the use of a removable crank handle.

When the circuit breaker is in the fully withdrawn position, it may be readily lifted from the pantograph frame without the necessity of removing bolts, screws, nuts, etc.

INTERLOCKS

Each drawout type circuit breaker is equipped with interlocks of a positive mechanical type which insure against inserting into or removing the breaker from the operating position when the breaker is closed.

A mechanical arrangement trips the circuit breaker before it is possible to move it into or out of the connected position by means of the withdrawal mechanism, thus insuring that the circuit is never completed, or the current interrupted, by the main disconnecting contacts.

The nature of the withdrawal device is such that it will prevent the circuit breaker from moving into or out of the compartment, due to vibration or shock. The circuit breaker may be moved only through operation of the withdrawal mechanism.

ALLIS-CHALMERS SWITCHGEAR SPECIFICATIONS

LOW VOLTAGE DEAD FRONT METAL — ENCLOSED SWITCHGEAR

INSTRUMENTS, METERS AND RELAYS

Instruments, meters and relays included under this specification, are semi-flush mounted.

Indicating instruments are of the rectangular type, having white dials with black scales.

Induction relays are of the drawout type of construction.

Control switches and instrument transfer switches are of the rotary type.

Indicating lamps are of Allis-Chalmers manufacture.

FINISH

All steel surfaces of the framework and enclosures are thoroughly cleaned and given a priming coat of rust resisting paint. The interior surfaces are covered with two coats of light color paint for high visibility and the exterior surfaces are finished with two coats of pearl gray durable paint, unless otherwise specified in Detailed Specifications.

FACTORY TESTS

Primary and secondary connections are given standard dielectric tests to insure that the insulation is ample for the rated voltage.

The assembled units are carefully inspected and all wiring is checked to insure proper functioning of the equipment.

The equipment covered by this specification is tested in accordance with the NEMA Standards for this class of equipment.

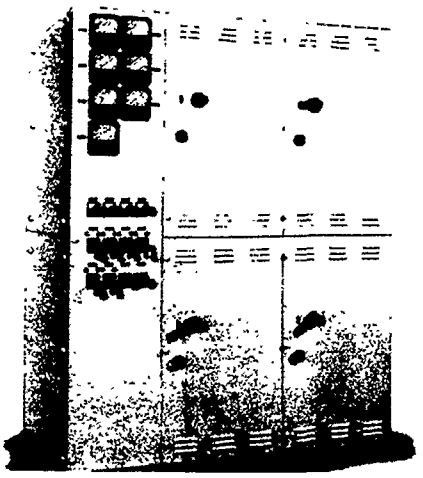
SHIPMENT

The equipment covered by this specification will be shipped in groups as large as shipping and handling facilities will permit, unless otherwise specified.

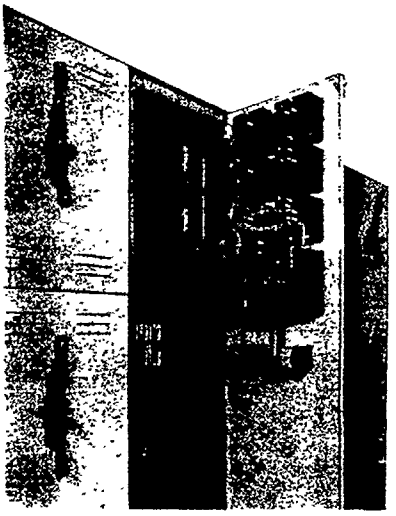
All shipments are suitably braced and supported to prevent movement or distortion of the units while in transit.

STANDARDS

The proposed apparatus will be as specified and in accordance with the latest AIEE and NEMA Standards, subject to modification by War Production Board's Instructions and Conservation Orders.



Electrically operated low voltage switchgear, showing arrangement of meters, meter switches and control switches on front panel of bus transition unit.



Bus transition unit of low voltage metal-enclosed switchgear, with door open to show panel wiring and mounting of meters.

N.E.M.A. RULE SG2-15

Because system, maintenance and operating conditions are beyond the manufacturer's control, the obligation to repair or replace, f.o.b. original delivery point, any part of a circuit breaker which proves defective within one year after delivery (or after completion of installation, if done or supervised by the manufacturer, provided same is not unreasonably delayed by the customer) shall be the only liability, except on warranty of title, including patents, of the manufacturer with respectto a circuit breaker after it is ready for operation.

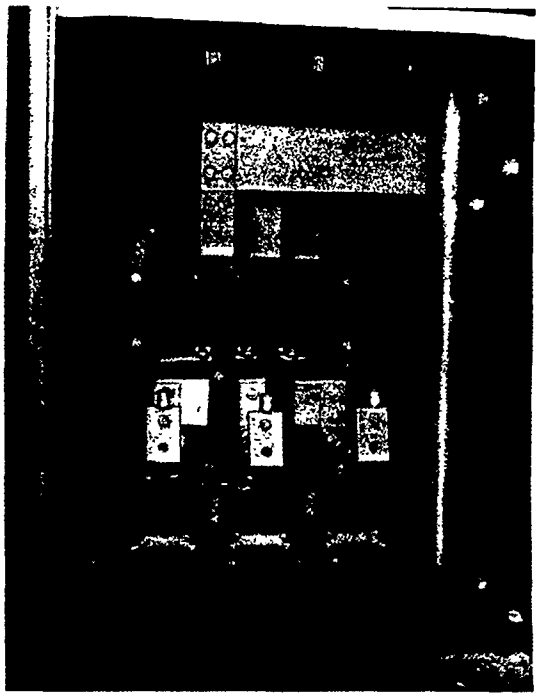
INSTRUMENT TRANSFORMERS

CURRENT TRANSFORMERS

Current transformers are mounted in an easily accessible position.

The current transformers covered by this specification are of Allis-Chalmers manufacture, insulated and built to NEMA and AIEE Standards. All current transformers have silvered primary terminals.

The current transformers have ample capacity for the burdens of the relays and meters with which they are used.



Current transformers mounted in rear of air circuit breaker compartment.

POTENTIAL TRANSFORMERS

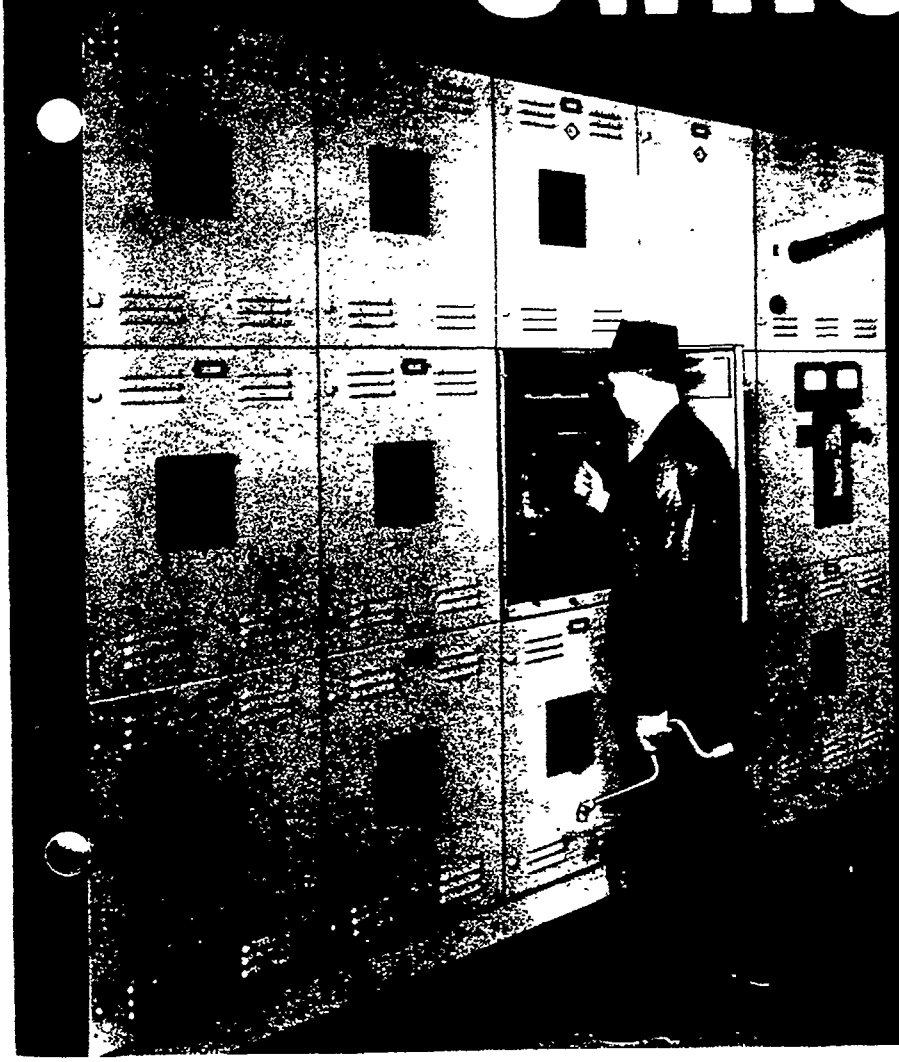
The potential transformers covered by this specification are of Allis-Chalmers manufacture and have uniformly low phase angle and ratio errors as is illustrated by the ratio and phase angle curves which are typical of the Allis-Chalmers potential transformers.

While the nominal rating on an accuracy basis is 200VA. these potential transformers are thermally capable of supplying 500 VA continuously without damage.

All potential transformers are manufactured and tested in accordance with the latest AIEE and NEMA Standards.

Potential transformer fuses, where specified, completely clear a faulty transformer from the line.

Low Voltage Switchgear



IMPROVED SERVICE AND PROTECTION . . . REDUCED INSTALLATION AND OPERATING COSTS

1
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Modern Protective

For Low Voltage Distribution Circuits

METAL-ENCLOSED dead front switchgear is today replacing the open panel type, stationary-mounted equipment used for many years at ratings of 600 volts a-c or 750 volts d-c. The factory-assembled and wired switchgear *protects personnel, lowers installation costs, saves installation trouble!*

Air circuit breakers rated up to 100,000 amperes interrupting capacity, and 6000 amperes current-carrying capacity, are standard in this class of equipment.

DRAWOUT CONSTRUCTION POPULAR

Drawout construction of breaker elements gives greatest continuity of service, since each drawout type air circuit breaker can be inspected, removed, and replaced without disconnecting any other circuit. In the Allis-Chalmers style of drawout construction most commonly employed, each breaker is supported by a framework which in turn is mounted on a simple pantograph, as illustrated on the opposite page.

Drawout type air circuit breakers with current-carrying capacities of 4000, 5000, and 6000 amperes, and an interrupting rating of 100,000 amperes, are truck-mounted.

Allis-Chalmers also makes low voltage switchgear with stationary breaker elements. Breakers are fixed to the switchgear framework by standard bolted construction from breaker studs to bus, when stationary elements are employed.

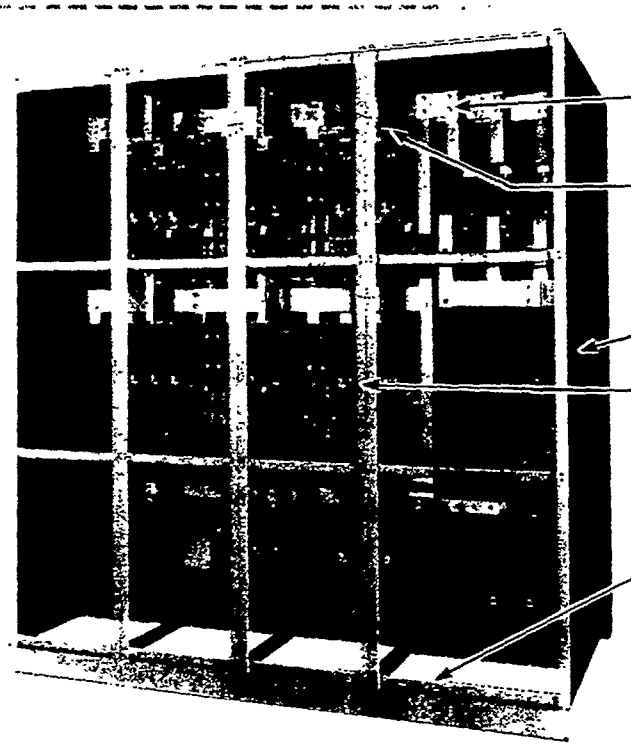
Each vertical unit in Allis-Chalmers low voltage switchgear may include one, two, or three individual, standardized breaker sections, depending upon circuit breaker interrupting ratings.

OUTDOOR SWITCHGEAR

To save valuable factory floor space, to utilize an outdoor load center between two buildings, or for some other reason of convenience, outdoor low voltage switchgear may be preferred.

Allis-Chalmers offers outdoor switchgear enclosed in a weather-proof housing. Ventilating louvers in the housing are designed to prevent the entrance of foreign materials, snow, and driving rain. Hinged front and rear outer doors are made full height, permitting ready access to the equipment mounted within the weather-proof housing. The outer doors can be padlocked.

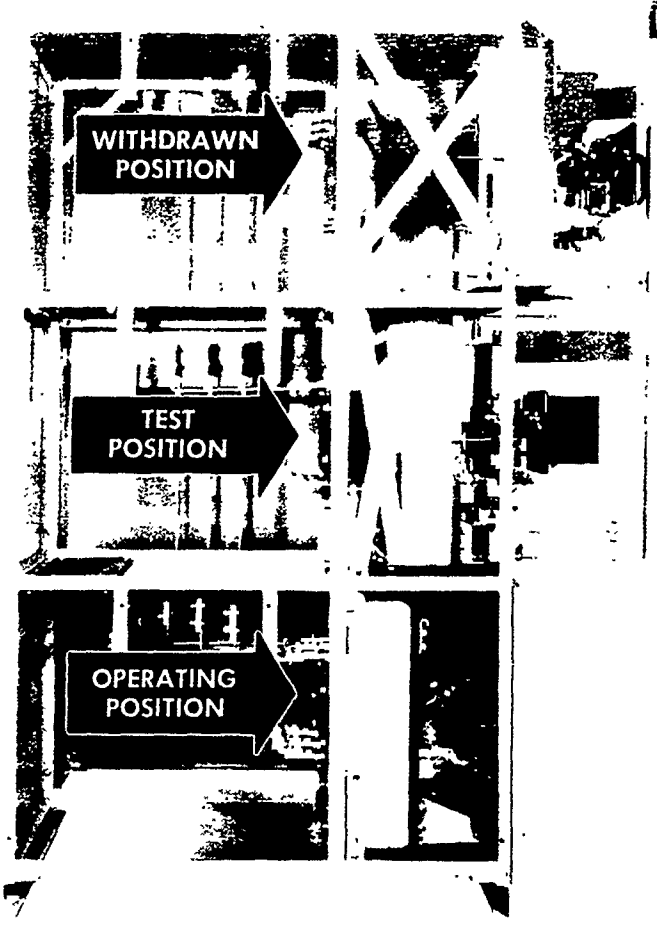
The popularity of low voltage metal-enclosed switchgear for the secondary side of load center unit substations has led to the development of standard designs. Enough flexibility has been provided, however, to allow for customer preference. See the back cover of this bulletin for standard, low voltage switchgear dimensions.



PLATES ARE REMOVED to show the general arrangement of buses, connections, and equipment in the rear compartment of a group of metal-enclosed, low voltage switchgear units. Buses are securely supported and well braced to withstand short circuit stresses caused by faults within the rating of the installed breakers. Where bolted connections are made on main buses, surfaces are silver plated.

DRAWOUT WITH PANTOGRAPH

FOR CONVENIENCE



ILLUSTRATING PANTOGRAPH CONSTRUCTION

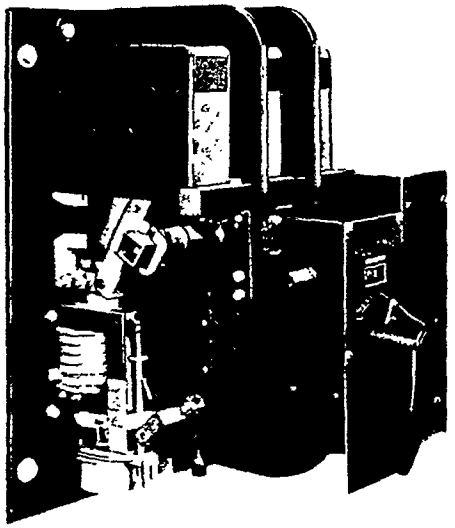
PANTOGRAPH CONSTRUCTION, employed in Allis-Chalmers low voltage metal-enclosed switchgear, is a simple and effective arrangement for withdrawing breaker elements.

As shown at left, fixed points of the pantograph are at the top, and it is pivoted at one point in the center. The lower points of the pantograph are free to move in vertical slots at either side of the structure. A screw-type operating mechanism, actuated by a crank handle, opens and closes the pantograph.

Pantograph construction results in the following user benefits: automatic alignment, elimination of rail extensions, and simple crank withdrawal.

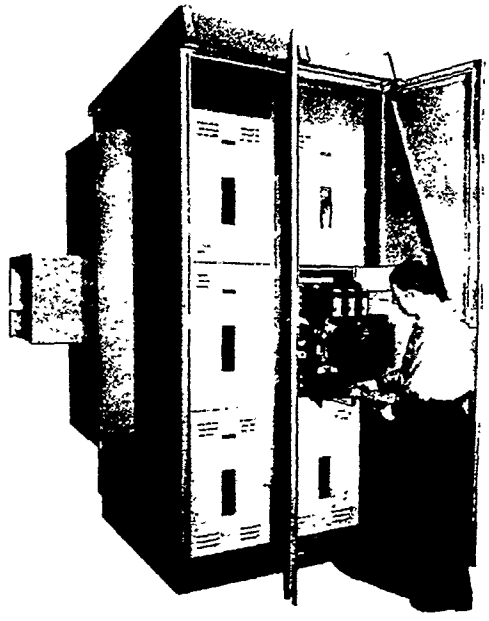
Since the breaker is supported by a frame, it is not necessary to remove bolts or screws to lift the breaker away from its compartment. To facilitate removal of the breaker from its pantograph, lifting yokes are provided for each size of breaker.

Mechanical interlocks on Allis-Chalmers drawout type air circuit breakers prevent making or breaking the circuit on the disconnecting contacts, because the breaker will be in the tripped position. The circuit breaker is also prevented from moving out of its compartment due to shock or vibration . . . an additional safety measure!



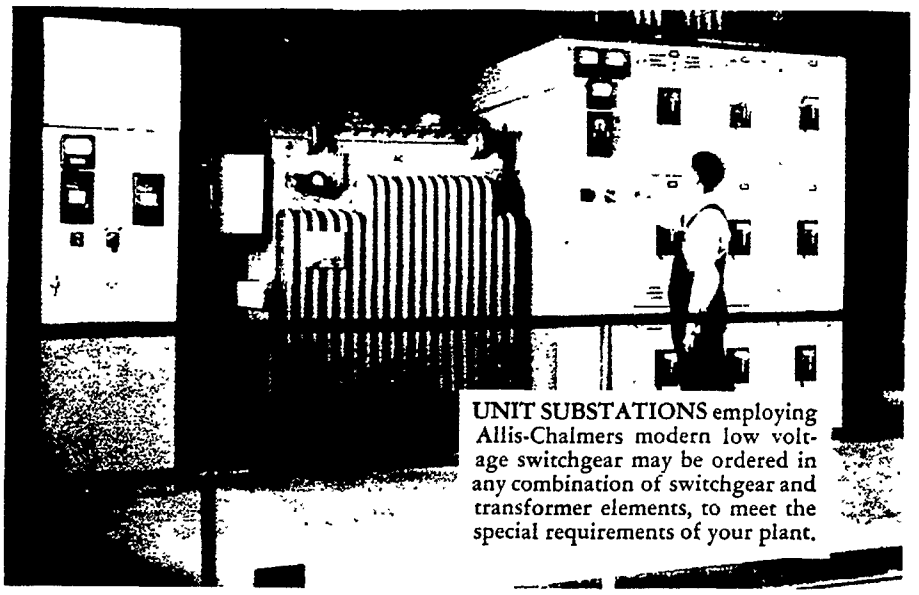
HIGH PRESSURE, self-aligning, finger-type contacts, with spring pressure behind each pair of fingers, make up the primary disconnects of A-C drawout-type switchgear, rated 3000 amperes current-carrying capacity and below.

FIRST IN A LINE of Allis-Chalmers air circuit breakers for low voltage applications, the G-25 breaker is an efficient tool for switching and protecting electrical distribution circuits at 600 volts a-c and below, where 25,000 ampere interrupting capacity is required. The G-25 breaker is insensitive to shock and vibration encountered in normal applications, and requires a minimum of adjustment. It is designed to meet service conditions at all loads and power factors.



OUTDOOR SWITCHGEAR is completely enclosed by Allis-Chalmers in a weather-proof housing.

Planning Your Low Voltage Switchgear



UNIT SUBSTATIONS employing Allis-Chalmers modern low voltage switchgear may be ordered in any combination of switchgear and transformer elements, to meet the special requirements of your plant.

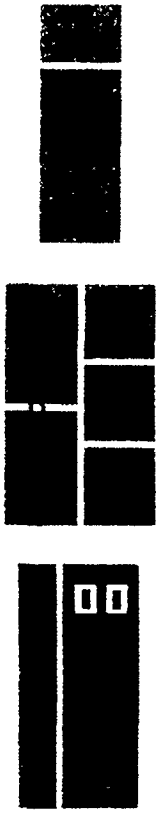
Send for Helpful Aids

FOR A SIMPLE method of selecting air circuit breakers of adequate interrupting capacity . . . for single-line diagrams of basic low voltage systems . . . for a discussion of the merits of radial circuits versus cascaded circuits . . . ask for the CHECK LIST to Simplify Unit Substation Planning, B6325.

Ask also for the Allis-Chalmers Unit Sub Slide Rule, another handy means of calculating air circuit breaker ratings required for either radial or cascaded circuits.

For a preview of the way an assembled unit substation will look in your plant, or for engineering advice on modernization or new installations, call upon your nearby A-C district office.

Space Requirements of Standard Low Voltage Switchgear



Ampere Int. Rating of A.C.B.	Ampere Current Rating			Panel Type	INDOOR		OUTDOOR	
					Width (in.)	Depth (in.)	Width (in.)	Depth (in.)
25,000	225	Stat.	Man.	C	20	46	24	54
			Elec.	C	20	46	24	54
		D.O.	Man.	C	20	54	24	57
			Elec.	C	20	54	24	57
25,000	600	Stat.	Man.	C	20	46	24	54
			Elec.	C	20	46	24	54
		D.O.	Man.	C	20	54	24	57
			Elec.	C	20	54	24	57
50,000	1200 to 1600	Stat.	Man.	C	28	46	32	54
			Elec.	B	28	46	32	54
		D.O.	Man.	C	28	54	32	57
			Elec.	B	28	54	32	57
75,000	2000 to [illegible]	Stat.	Man.	B	32	46	36	54
			Elec.	B	32	46	36	54
		D.O.	Man.	B	32	54	36	66
			Elec.	B	32	54	36	66
75,000	3000	Stat.	Man.	B	40	46	44	54
			Elec.	B	40	46	44	54
		D.O.	Man.	B	40	54	44	66
			Elec.	B	40	54	44	66
100,000	4000 to 5000	Stat.	Man.	A	48	58	52	66
			Elec.	A	48	58	52	66
		D.O.	Man.	A	48	58	52	66
			Elec.	A	48	58	52	66
Standard Transition Unit				D	12	To match base	24	To match base
Instrument Panel				E	Width depends on No. of devices			

Height of Indoor Switchgear: 90" (Stat.) and 92" (D.O.). Height of Outdoor Switchgear: 96" (Stat.) and 108" (D.O.). Height does not include channel sill.

NOTE: Dimensions are subject to change and should be verified for construction purposes.

ALLIS-CHALMERS, MILWAUKEE

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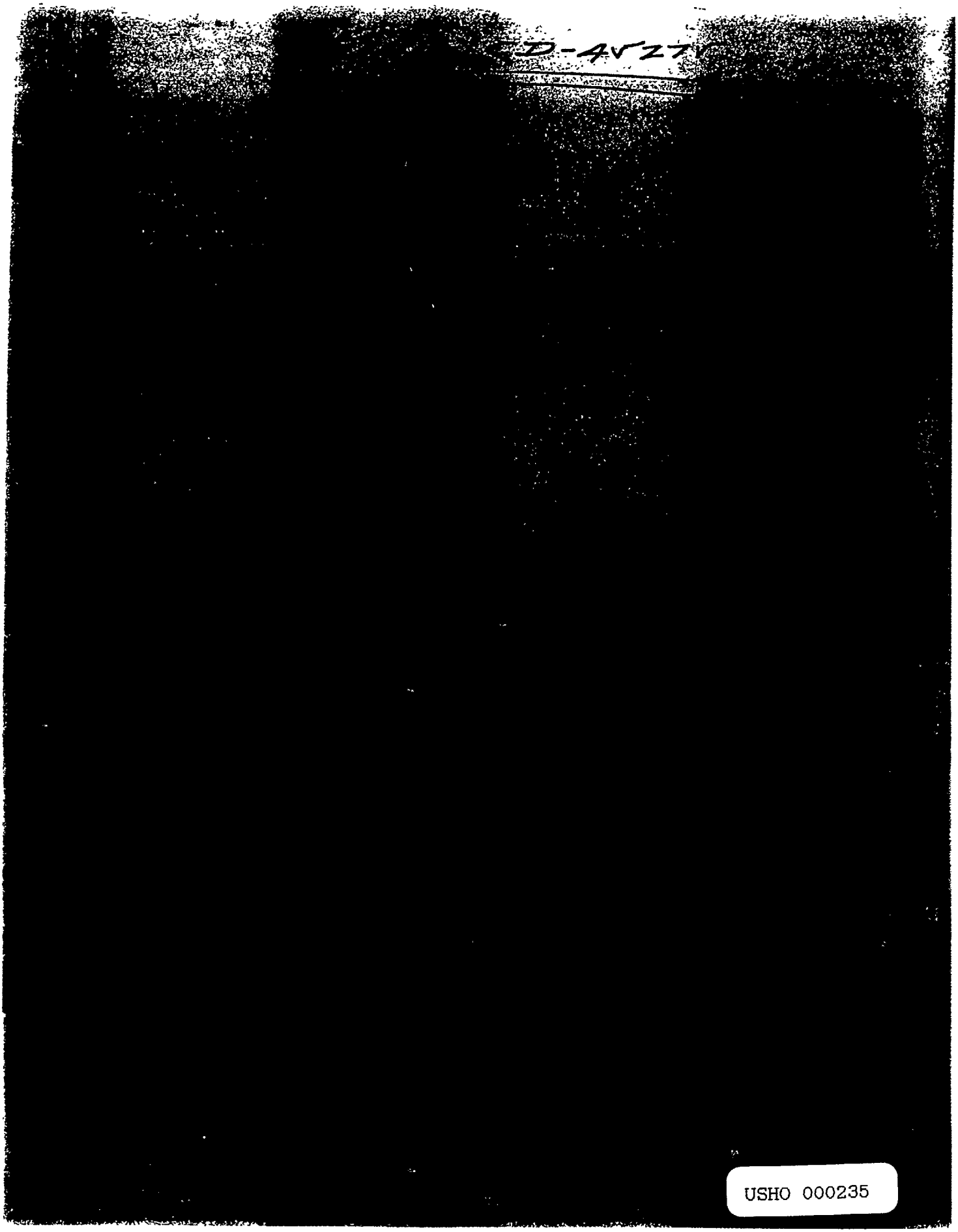
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