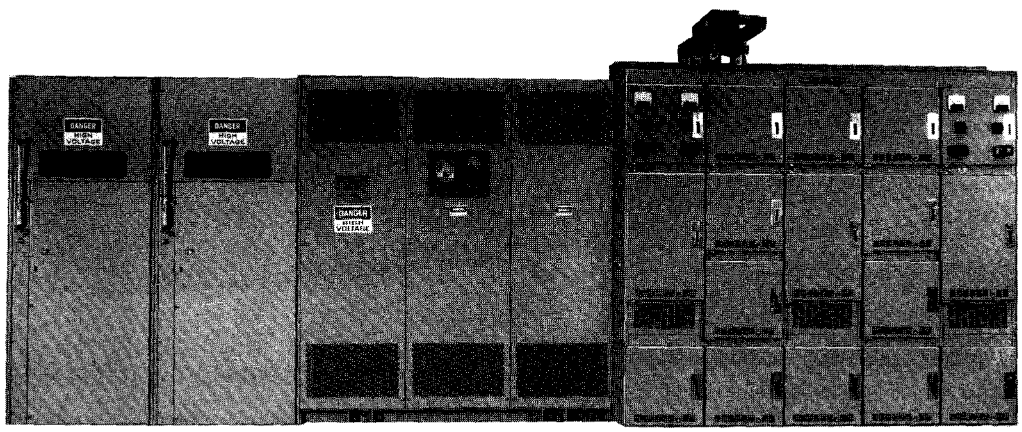


POWER-ZONE®
Load Center Unit Substations

CONTENTS

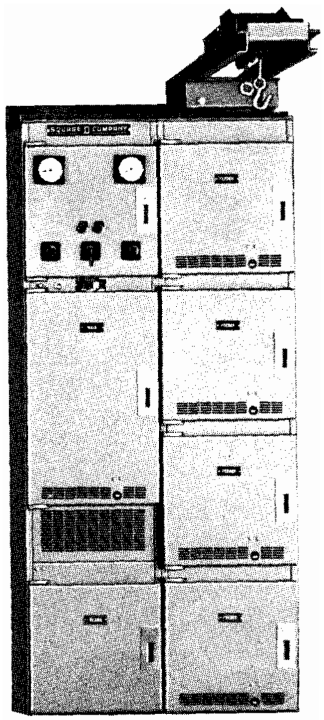
SQUARE D COMPANY

FILE: Distribution Products Catalog

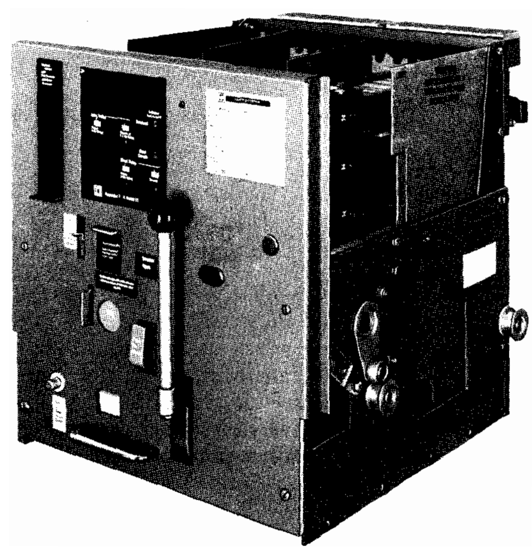
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

LOW VOLTAGE DISTRIBUTION SECTIONS
APPLICATION DATA

POWER CIRCUIT BREAKER DRAWOUT SWITCHGEAR



- METAL ENCLOSED DRAWOUT CONSTRUCTION
- STORED ENERGY BREAKER MECHANISM MANUALLY OR ELECTRICALLY OPERATED
- 800, 1,600, 2,000, 3,200, AND 4,000 A. FRAMES
- ADJUSTABLE SOLID STATE TRIP DEVICES
- INTERRUPTING RATINGS TO 85,000 A. SYM.
- INTEGRALLY-MOUNTED CURRENT LIMITERS FOR 200,000 A. INTERRUPTING CAPACITY



CONSTRUCTION

The low voltage distribution section of many POWER-ZONE LOAD CENTER UNIT SUBSTATIONS consists of low voltage power circuit breaker drawout switchgear which provides a combination of the most modern circuit breaker devices with flexible structure design to offer the maximum in system protection to most low voltage distribution requirements. The self-powered fully adjustable solid state trip devices utilized in the circuit breaker elements provide completely coordinated over current and short circuit protection with the availability of narrow trip bands, selective tripping, and integrally mounted ground fault protection.

The structure is completely compartmentized to isolate each circuit breaker in its own cell. A full height load side rear cable compartment eliminates the need for pull boxes and may be optionally isolated from the bus compartment in front of it. Standardized busing provides most of the common low voltage distribution busing arrangements and is equipped for future extension. Cable or busway connections are easily made out the top, bottom, or other locations as required.

ACCESSORIES

Standard accessories easily provided are: secondary metering, including transformers, feeder metering, electrical, mechanical, and key interlocking, breaker element lifting device, and an array of tripping and auxiliary functions available on the breaker elements. For detailed descriptive and rating information, see Catalog Class 6030.

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

LOW VOLTAGE DISTRIBUTION SECTIONS
APPLICATION DATA

MOLDED CASE DRAWOUT SWITCHBOARDS
TYPE MCDO II

UTILIZES TYPE SE SOLID STATE TRIP CIRCUIT BREAKERS
- **—100% CONTINUOUS DUTY RATED**
- **—7 FUNCTION ADJUSTABLE SOLID STATE TRIP DEVICE**
- **—STORED ENERGY MECHANISM, MANUALLY OR ELECTRICALLY OPERATED**
- **—INTERRUPTING RATINGS TO 150,000 AMPERES SYMMETRICAL**
- **—INTEGRAL ZONE SELECTIVE INTERLOCKING AVAILABLE**
- **—MAXIMUM 5 CYCLE CLOSING**

MAIN BUS RATINGS TO 3,000A.
LORES™ PLUG IN LINE AND LOAD CONNECTIONS
TRUE DRAWOUT ASSEMBLIES
COMPARTMENTALIZED CONSTRUCTION
UL LABELED

Power Zone® Load Center Unit Substation may contain Powerstyle MCDO II Switchboards. Utilizing type SE, stored energy, solid state, circuit breakers they represent the most advanced individually mounted circuit breaker distribution switchboard design available. MCDO II switchboards offer the user many safety features, minimum down-time, system selectivity, ease of maintenance and expansion of functional capacity.

Functional and operational benefits are:

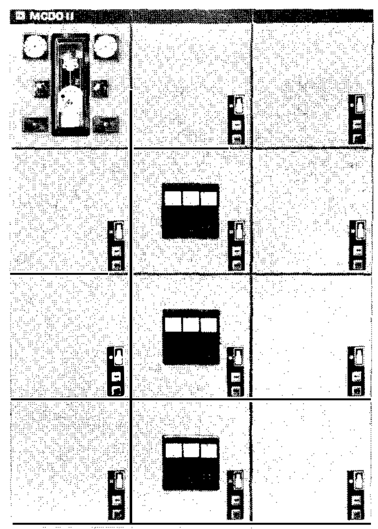
Safety Features — Compartmentalized and barriered construction assures protection to equipment and operating personnel even under severe short circuit conditions.

Minimum Down-Time — Drawout construction allows quick and simple replacement of breaker elements. Breakers may be removed from low priority circuits and re-installed to serve high priority circuits.

System Selectivity — The solid state trip device provided on each SE circuit breaker is field adjustable, enabling the user to attain optimum selectivity and coordination.

CONSTRUCTION

All front accessible circuit breaker compartments are completely metal enclosed. The type SE circuit breakers may be operated, with the compartment door closed, by



mechanically linked trip and close pushbuttons. Hinge pins permit easy door removal if desired.

The breaker compartment provides for three positions of the removable element; connected, test/disconnected and remove. In the connected position both primary and secondary disconnecting devices are engaged the circuit breaker is ready for operation. The test/disconnected position permits the secondary control contacts to be engaged while the primary line and load connections are disengaged. In the remove position the breaker may be withdrawn from its compartment. The compartment door may be closed and latched with the removable breaker element in any one of the above positions. The primary line and load breaker stabs are connected to the bus utilizing LoRes connectors (refer to the description on page 10). All cable terminations are located in a rear accessible cable compartment.

POWER-ZONE® LOAD CENTER UNIT SUBSTATIONS

LOW VOLTAGE DISTRIBUTION SECTIONS APPLICATION DATA

MOLDED CASE DRAWOUT SWITCHBOARDS TYPE MCDO

- CURRENT RATINGS TO 4,000 AMPERES
- LORES PLUG-IN LINE, LOAD CONSTRUCTION
- CIRCUIT BREAKERS INDIVIDUALLY MOUNTED
- LOAD SIDE LUGS EXTENDED TO BARRIERED REAR COMPARTMENTS
- TRIP ON REMOVAL MECHANICAL INTERLOCK
- ALL BRANCH CIRCUIT BREAKERS RATCHET IN & OUT
- COMPARTMENTALIZED CONSTRUCTION
- UL LABELED
- STANDARD BRACING 100,000 AMPERES
- ISOLATED VERTICAL & HORIZONTAL BUS

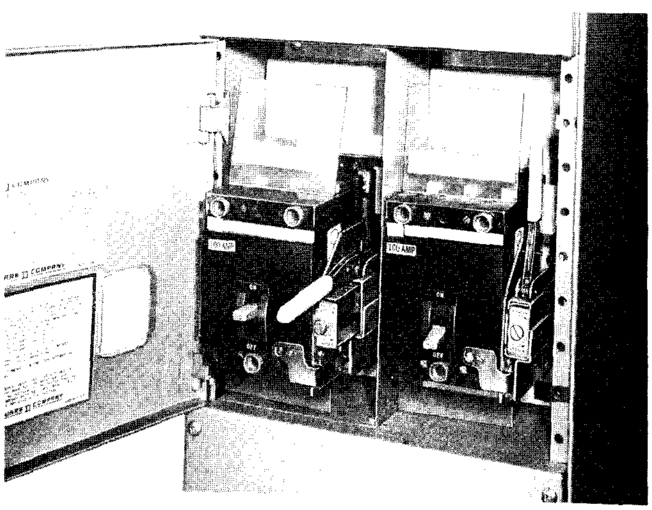
POWER-ZONE® Load Center Unit Substations containing POWER-STYLE Switchboards Type MCDO represent the most advanced individually mounted circuit breaker distribution switchboard design available. All circuit breaker branches are compartmentalized and drawout mounted. Inspection of the circuit breaker compartments will reveal no exposed current carrying parts. The mechanically interlocked drawout unit will trip an energized circuit breaker if personnel attempt to remove it.

Type MCDO is a front and rear accessible switchboard design. (Rear access is required to make load side cable connections.) Factory assembled per customer specifications. Type MCDO Switchboards can accommodate the Square D line of molded case thermal-magnetic, current limiting and solid state trip circuit breakers.

Type MCDO Switchboards are available in through bus ratings through 4000 amperes. Type MCDO can be combined with other POWER-STYLE main or distribution sections offering the flexibility to meet most low voltage distribution requirements.

CONSTRUCTION

All front accessible circuit breaker compartments are completely metal enclosed. The circuit breaker operating handles extend through cut-outs on the hinged cover doors. Hinge pins permit easy removal of the door if desired.



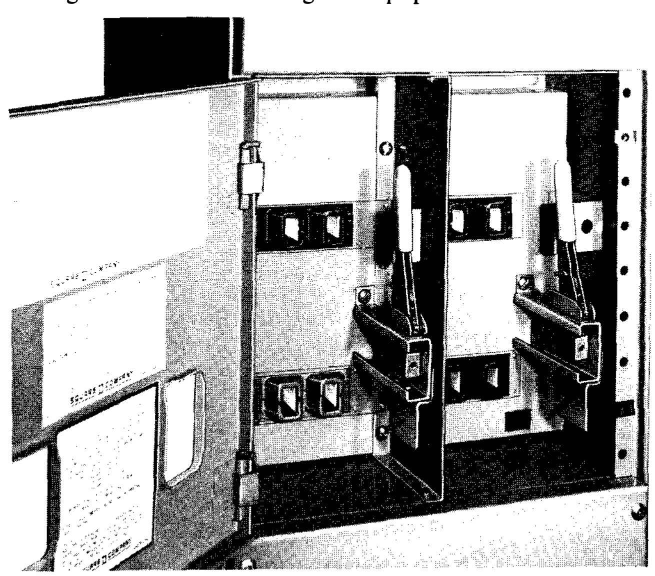
TWIN MOUNTED CIRCUIT BREAKERS IN INDIVIDUAL COMPARTMENTS

Both the stationary and drawout bus connectors use copper or high tensile strength electrical grade aluminum extrusions. The removable drawout stabs are slotted and fitted with LoRes connectors. These connectors keep insertion force to a minimum and maintain low heat rise characteristics. The spring connectors on the removable stab are readily visible for routine field inspection. This

LoRes CONNECTOR

revolutionary new connection eliminates the historical problems associated with "Spring Connectors." The one piece copper and aluminum extrusions have been designed and verified through extensive short circuit current testing to retain their mechanical integrity under high level fault current conditions.

A ratchet mechanism and rails are provided as standard with all circuit breakers. Use of the ratchet mechanism assures smooth, safe, and positive removal or insertion of the circuit breaker. The rail supports the circuit breaker while the ratchet clears the drawout stags from the stationary assembly. All drawout assemblies are provided with a mechanical interlock that will activate the trip bar within the circuit breaker when it is not completely racked in and fully engaged. This feature helps protect personnel and equipment from the hazards of electrical shock or burn during the removal of energized equipment.



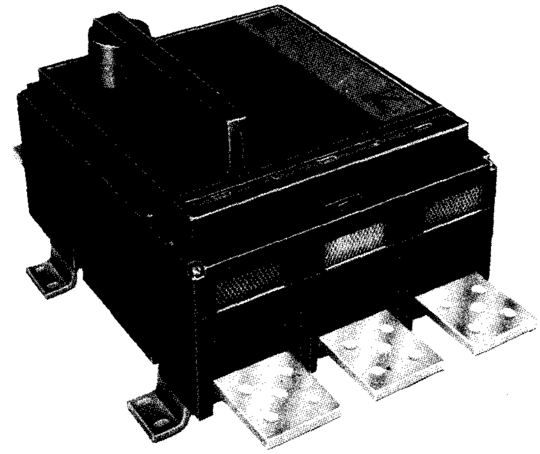
STATIONARY BUS CONNECTORS AND DRAWOUT ASSEMBLY RAIL SUPPORTS

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

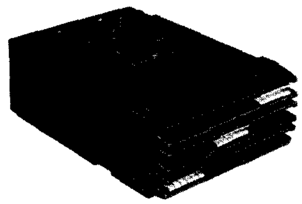
LOW VOLTAGE DISTRIBUTION SECTIONS
APPLICATION DATA

MOLDED CASE CIRCUIT BREAKERS

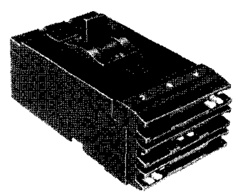
- 15 THROUGH 4,000 AMPERE RATING
- INTERRUPTING RATINGS TO 200,000 A. SYMMETRICAL
- POSITIVE INDICATING TRIP FREE MECHANISMS
- STANDARD THERMAL MAGNETIC, I-75,000™ HIGH INTERRUPTING CAPACITY, CURRENT LIMITING OR SOLID STATE TRIP CIRCUIT BREAKERS
- GROUP-MOUNTED PLUG-ON I-LINE ARRANGEMENT THROUGH 800 AMPERE RATINGS
- INDIVIDUALLY MOUNTED DRAW-OUT MCDO CONSTRUCTION



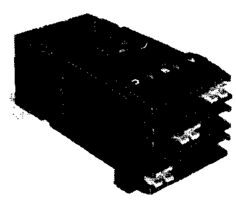
PA, 600-2,000 A.



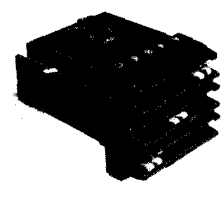
ME, 125-800 A.



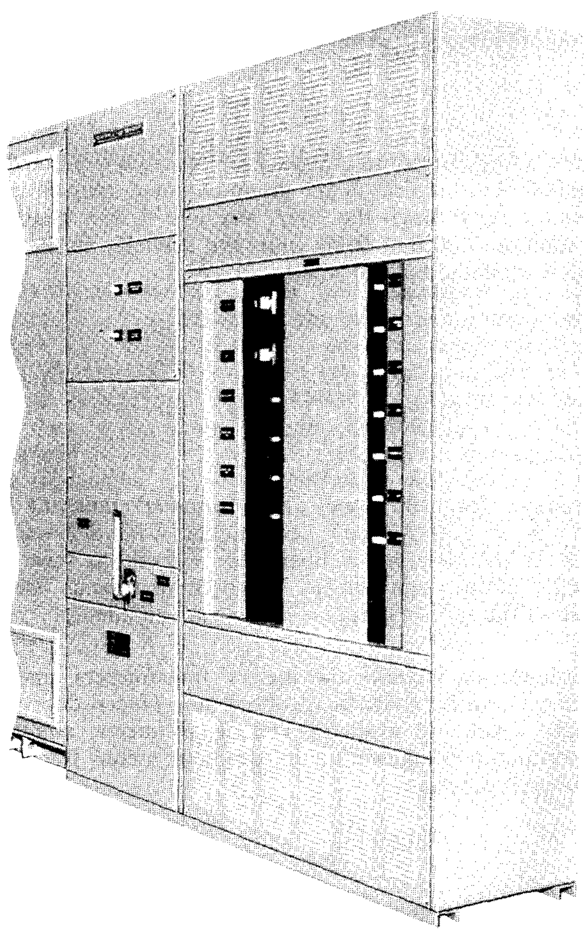
LA, 250-400 A.



IK, 110-225 A.



FA, 15-100 A.



LOW VOLTAGE DISTRIBUTION SECTION CONTAINING I-LINE GROUP MOUNTED MOLDED CASE CIRCUIT BREAKERS

Power-Zone® Load Center Unit Substation's offer the flexibility and reliability of the Power-Style switchboard product line. Versatility is achieved by offering a complete line of circuit breaker and fusible over-current protection devices, metering, automatic transfer switches and relaying devices. This equipment is designed to meet the latest UL short circuit current requirements. For additional information see Catalog Class 2700, 2760 and 2770.

The circuit breaker line includes thermal magnetic (standard and high interrupting), current limiting, solid state trip and systems power circuit breakers. These circuit breakers can be group mounted utilizing I-Line construction or individually mounted in draw-out type MCDO construction through 800 amperes. Separately mounted circuit breakers up to 4,000 amperes completes the line of available devices.

TABLE 1
APPLICATION DATA

SECONDARY FULL LOAD AND SHORT CIRCUIT CURRENTS

Trans-former Rating 3Ø kVA (%Z) ◆ ①	Available Primary Short Circuit kVA	SECONDARY DISTRIBUTION VOLTAGE — 3 PHASE											
		208			240			480			600		
		◓ Normal Load Cont. Amps.	Short Circuit†④⑤ RMS Sym. Amps.		◓ Normal Load Cont. Amps.	Short Circuit† RMS Sym. Amps.		◓ Normal Load Cont. Amps.	Short Circuit† RMS Sym. Amps.		◓ Normal Load Cont. Amps.	Short Circuit† RMS Sym. Amps.	
			Transf. Alone	Plus 50% Motor Load		Transf. Alone	Plus 100% Motor Load		Transf. Alone	Plus 100% Motor Load		Transf. Alone	Plus 100% Motor Load
	50,000		12,616	13,866		10,934	13,100		5,467	6,550		4,373	5,240
	100,000		13,217	14,467		11,455	13,620		5,727	6,810		4,582	5,448
225	150,000	625	13,430	14,680	542	11,640	13,805	271	5,820	6,903	217	4,656	5,522
(4.5%)	250,000		13,606	14,856		11,792	13,957		5,896	6,979		4,716	5,583
	500,000		13,741	14,990		11,909	14,074		5,954	7,037		4,763	5,630
	Unlimited		13,878	15,128		12,028	14,193		6,014	7,097		4,811	5,677
	50,000		16,327	17,993		14,150	17,037		7,075	8,519		5,660	6,815
	100,000		17,348	19,014		15,035	17,922		7,517	8,961		6,014	7,169
300	150,000	833	17,717	19,383	722	15,355	18,242	361	7,677	9,121	289	6,142	7,297
(4.5%)	250,000		18,024	19,690		15,620	18,508		7,810	9,254		6,248	7,403
	500,000		18,261	19,927		15,826	18,713		7,913	9,357		6,330	7,485
	Unlimited		18,504	20,170		16,037	18,924		8,018	9,462		6,415	7,570
	50,000		23,131	25,907		20,046	24,858		10,023	12,429		8,018	9,943
	100,000		25,233	28,010		21,869	26,681		10,934	13,340		8,747	10,672
500	150,000	1388	26,022	28,798	1203	22,552	27,364	602	11,276	13,682	482	9,021	10,946
(5.0%)	250,000		26,689	29,465		23,131	27,942		11,565	13,971		9,252	11,177
	500,000		27,212	29,989		23,584	28,396		11,792	14,198		9,433	11,358
	Unlimited		27,757	30,533		24,056	28,868		12,028	14,434		9,622	11,547
	50,000		28,714	32,878		24,885	32,103		12,442	16,051		9,954	12,841
750	100,000	2082	32,027	36,191	1805	27,757	34,974	903	13,878	17,487	722	11,102	13,990
863*	150,000	2395*	33,308	37,472	2075*	28,867	36,084	1038*	14,433	18,042	831*	11,547	14,434
1000*	250,000	2776*	34,409	38,573	2406*	29,821	37,039	1203*	14,910	18,519	963*	11,928	14,815
1125*	500,000	3120*	35,284	39,448	2706*	30,579	37,797	1353*	15,289	18,898	1083*	12,231	15,119
(5.75%)	Unlimited		36,205	40,369		31,377	38,595		15,688	19,297		12,551	15,438
	50,000		35,815	41,367		31,040	40,663		15,520	20,331		12,416	16,265
1000	100,000	2776	41,121	46,673	2406	35,638	45,261	1203	17,819	22,631	963	14,255	18,105
1150*	150,000	3193*	43,258	48,809	2767*	37,490	47,113	1384*	18,745	23,556	1107*	14,996	18,845
1333*	250,000	3702*	45,133	50,685	3208*	39,115	48,738	1604*	19,557	24,369	1284*	15,646	19,495
1500*	500,000	4164*	46,650	52,202	3609*	40,430	50,053	1805*	20,215	25,027	1443*	16,172	20,021
(5.75%)	Unlimited		48,273	53,825		41,836	51,459		20,918	25,730		16,734	20,584
	50,000		47,583	55,911		41,239	55,673		20,619	27,837		16,495	22,269
1500	100,000	4164	57,428	65,756	3609	49,771	64,205	1805	24,885	32,103	1444	19,908	25,682
1725*	150,000	4789*	61,682	70,010	4150*	53,458	67,892	2075*	26,729	33,946	1660*	21,383	27,157
2000*	250,000	5552*	65,568	73,895	4812*	56,825	71,260	2406*	28,412	35,630	1925*	22,730	28,504
2250*	500,000	6246*	68,819	77,147	5414*	59,643	74,077	2706*	29,821	37,039	2165*	23,857	29,631
(5.75%)	Unlimited		72,410	80,737		62,755	77,189		31,377	38,595		25,102	30,876
	50,000		56,937	68,041		49,346	68,591		24,673	34,296		19,738	27,436
2000	100,000	5552	71,631	82,734	4812	62,080	81,326	2406	31,040	40,663	1925	24,832	32,530
2300*	150,000	6385*	78,373	89,476	5534*	67,923	87,169	2767*	33,961	43,584	2214*	27,169	34,867
2667*	250,000	7403*	84,754	95,858	6416*	73,454	92,699	3208*	36,727	46,350	2567*	29,381	37,080
3000*	500,000	8328*	90,267	101,370	7217*	78,231	97,477	3609*	39,115	48,738	2888*	31,292	38,991
(5.75%)	Unlimited		96,548	107,650		83,673	102,919		41,836	51,459		33,469	41,168

PRINTED IN U.S.A.

TABLE 1
APPLICATION DATA

SECONDARY FULL LOAD AND SHORT CIRCUIT CURRENTS

Transformer Rating 3Ø kVA (%Z) ◆ ①	Available Primary Short Circuit kVA	SECONDARY DISTRIBUTION VOLTAGE — 3 PHASE											
		208			240			480			600		
		○ Normal Load Cont. Amps.	Short Circuit†④⑤ RMS Sym. Amps.		○ Normal Load Cont. Amps.	Short Circuit† RMS Sym. Amps.		○ Normal Load Cont. Amps.	Short Circuit† RMS Sym. Amps.		○ Normal Load Cont. Amps.	Short Circuit† RMS Sym. Amps.	
			Transf. Alone	Plus 50% Motor Load		Transf. Alone	Plus 100% Motor Load		Transf. Alone	Plus 100% Motor Load		Transf. Alone	Plus 100% Motor Load
	50,000		64,551	78;430		55,944	80,001		27,972	40,001		22,377	32,000
2500	100,000	6940	84,112	97,991	6015	72,897	96,954	3008	36,448	48,477	2406	29,159	38,782
3125*	150,000	8675*	93,563	107,442	7518*	81,088	105,145	3759*	40,544	52,572	3008*	32,435	42,058
3333*	250,000	9253*	102,804	116,683	8019*	89,097	113,154	4010*	44,548	56,577	3208*	35,638	45,261
3750*	500,000	10410*	111,028	124,908	9021*	96,225	120,281	4511*	48,112	60,141	3609*	38,490	48,113
(5.75%)	Unlimited		120,683	134,562		104,592	128,649		52,296	64,324		41,836	51,459
	50,000		70,869	87,524		61,420	90,288		30,710	45,144		24,568	36,115
3000	100,000	8328	95,167	111,822	7217	82,478	111,346	3609	41,239	55,673	2887	32,991	44,538
3750*	150,000	10410*	107,447	124,102	9022*	93,121	121,989	4511*	46,560	60,994	3609*	37,248	48,795
4000*	250,000	11104*	119,815	136,470	9623*	103,839	132,707	4812*	51,919	66,354	3850*	41,535	53,083
4500*	500,000	12491*	131,136	147,791	10826*	113,651	142,519	5413*	56,825	71,260	4331*	45,460	57,008
(5.75%)	Unlimited		144,820	161,475		125,510	154,378		62,755	77,189		50,204	61,751
	50,000		71,785	92,604		62,214	98,299		31,107	49,149		24,885	39,320
	100,000		76,827	117,645		83,917	120,002		41,958	60,001		33,566	48,001
3750	150,000	10409	109,567	130,386	9022	94,958	131,043	4511	47,479	65,552	3609	37,983	52,417
5625*	250,000	15614*	122,458	143,276	13532*	106,130	142,215	6767*	53,065	71,107	5413*	42,452	56,886
(7.0%)②	500,000		134,309	155,127		116,401	152,486		58,200	76,243		46,560	60,994
	Unlimited		148,699	169,517		128,872	164,957		64,436	82,479		51,549	65,983
	50,000		69,393	90,211		60,140	96,225		30,070	48,113		24,056	38,490
	100,000		92,524	113,342		80,187	116,272		40,093	58,136		32,075	46,509
3750	150,000	10409	104,089	124,908	9022	90,210	126,295	4511	45,105	63,148	3609	36,084	50,518
5625*	250,000	15614*	115,655	136,473	13532*	100,234	136,319	6767*	50,117	68,159	5413*	40,093	54,528
(7.5%)③	500,000		126,169	146,987		109,346	145,431		54,673	72,716		43,738	58,172
	Unlimited		138,786	159,604		120,281	156,366		60,140	78,183		48,112	62,546
	50,000		81,638	109,396		70,753	118,866		35,376	59,433		28,301	47,546
	100,000		115,655	143,412		100,234	148,347		50,117	74,173		40,093	59,339
5000	150,000	13879	134,309	162,066	12029	116,401	164,514	6015	58,200	82,257	4812	46,560	65,806
7500*	250,000	20819*	154,206	181,964	18043*	133,645	181,758	9022*	66,822	90,879	7218*	53,458	72,703
(7.0%)②	500,000		173,482	201,240		150,351	198,464		75,175	99,232		60,140	79,386
	Unlimited		198,265	226,023		171,830	219,943		85,915	109,971		68,732	87,977
	50,000		79,306	107,064		68,732	116,845		34,366	58,422		27,492	46,738
	100,000		111,028	138,786		96,225	144,338		48,112	72,169		38,490	57,735
5000	150,000	13879	128,110	155,867	12029	111,028	159,141	6015	55,514	79,571	4812	44,411	63,657
7500*	250,000	20819*	146,090	173,848	18043*	126,611	174,724	9022*	63,305	87,362	7218*	50,644	69,890
(7.5%)③	500,000		163,277	191,035		141,507	189,620		70,753	94,810		56,602	75,848
	Unlimited		185,048	212,805		160,375	208,488		80,187	104,244		64,150	83,395

① Forced Air cooled (FA) transformer ratings (denoted by an *) based on:
- a) 115% of the self-cooled kVA rating for 750-2000kVA liquid-filled transformers;
- b) 125% of the self-cooled kVA rating for 2500 and 3000kVA liquid-filled transformers;
- c) 133% of the self-cooled kVA rating for Sorgel dry type transformers;
- d) 150% of the self-cooled kVA rating for 3750 and 5000kVA Power Cast transformers.

② Nominal %Z for Power Cast transformers with less than 25kV rated primary voltage.

③ Nominal %Z for Power Cast transformers with 34.5kV and 25kV rated primary voltage.

④ Short-circuit currents are calculated by dividing the transformer **self-cooled** secondary full load current by the arithmetic sum of the transformer and primary system impedances (assumes transformer X/R identical to primary system X/R). Vectorial addition of these impedances would produce slightly higher short-circuit current values. Motor contribution to the short circuit amperes based on 4 times the motor full load current (assumes average motor impedance of 25%). Motor full load current assumed to be 50% at 208V or 100% at 240V and above of the transformer **self-cooled** rated full load amperes.

⑤ Short-circuit values are based on the nominal percent impedance (%Z) shown. Per NEMA and ANSI standards, actual %Z may vary ±7.5% due to manufacturing tolerances. If desired to account for a minimum tolerance, multiply the "Transformer Alone" short-circuit values by 1.081.

◆ Per cent impedance (%Z) may vary for different types of transformers of the same rating.

† Based on standard self-cooled ratings, short circuit currents are calculated by dividing transformer full load current by the sum of transformer and system impedance expressed per unit; motor contribution assumed 4 times full load current (2 times on 208 volts). Applies when power factor of 15% or greater (X/R—6.5); if less, check asymmetrical ratings of secondary distribution devices used — see appropriate catalog sections for ratings.

○ NOTE: Ampacities over 4000 A. max. present secondary bus complications. Consult local Square D field office.

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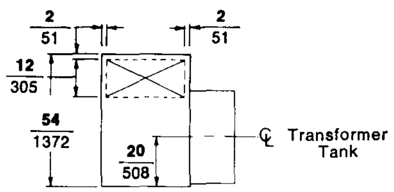
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

(APPROXIMATE DIMENSIONS—NOT FOR CONSTRUCTION)

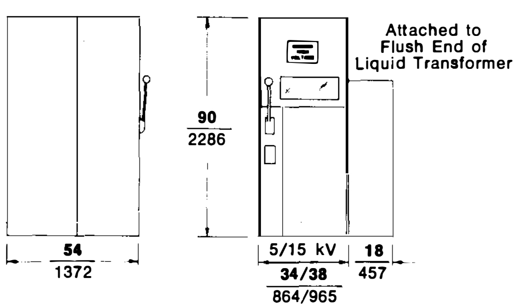
5 & 15 kV

HVL SWITCH CONNECTING TO LIQUID TRANSFORMER

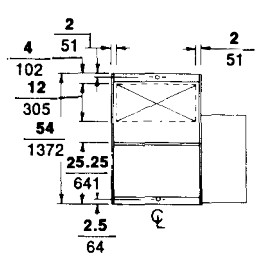
Indoor Equipment



TOP VIEW



LEFT END ELEVATION

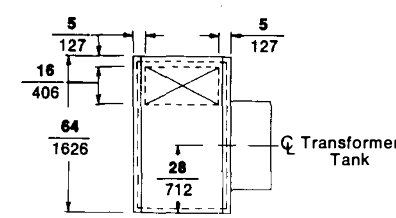


FLOOR PLAN

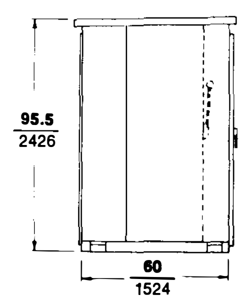
Approximate Weight:
5 kV 1300 lbs./589.7 kg
15 kV 1450 lbs./657.7 kg

HVL SWITCH CONNECTING TO LIQUID TRANSFORMER

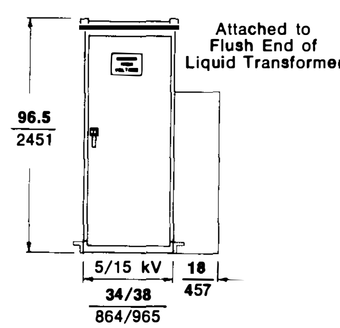
Outdoor Equipment



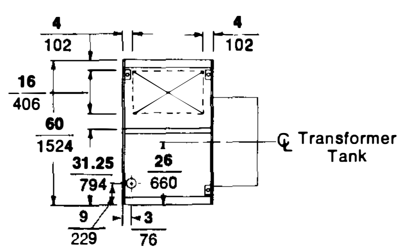
TOP VIEW



LEFT END ELEVATION

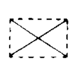


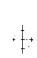
FRONT ELEVATION



FLOOR PLAN

Approximate Weight:
5 kV 1500 lbs./680.0 kg
15 kV 1650 lbs./748.4 kg

 Represents Suggested Conduit Entrance Area

 Represents Suggested Conduit Entrance Area for Strip Heater Control Power Source

Dual Dimensions: $\frac{\text{INCHES}}{\text{Millimeters}}$

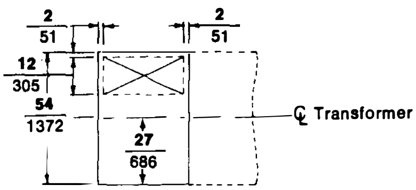
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)

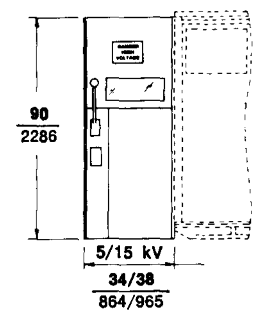
5 & 15 kV

HVL SWITCH CONNECTING TO CAST RESIN TRANSFORMER

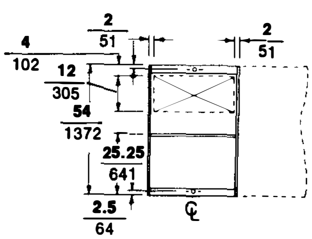
Indoor Equipment



TOP VIEW



FRONT ELEVATION

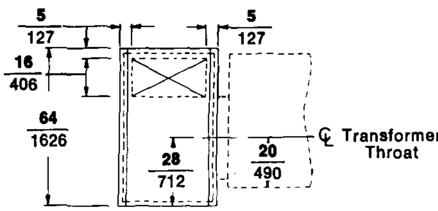


FLOOR PLAN

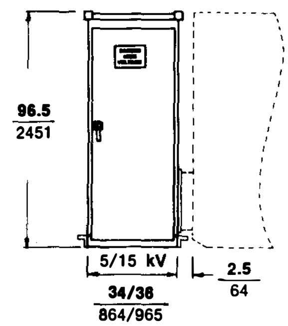
Approximate Weight:
5 kV 1200 lbs./544.3 kg
15 kV 1350 lbs./612.4 kg

HVL SWITCH CONNECTING TO CAST RESIN TRANSFORMER

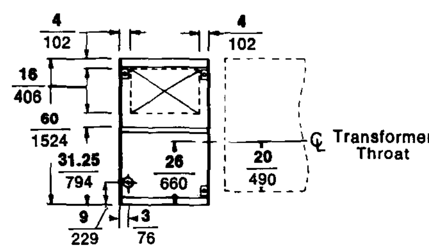
Outdoor Equipment



TOP VIEW



FRONT ELEVATION



FLOOR PLAN

Approximate Weight:
5 kV 1400 lbs./635.0 kg
15 kV 1550 lbs./703.0 kg

Represents Suggested Conduit Entrance Area

Represents Suggested Conduit Entrance Area for Strip Heater Control Power Source

Dual Dimensions: $\frac{\text{INCHES}}{\text{Millimeters}}$

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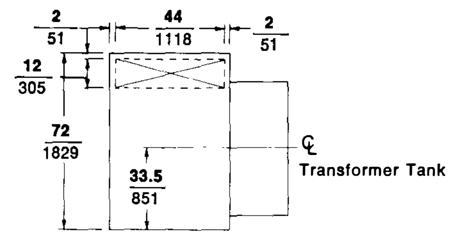
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)

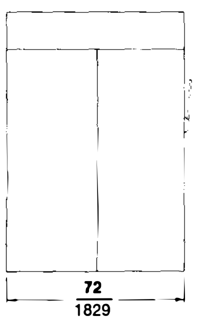
INDOOR EQUIPMENT

25 kV

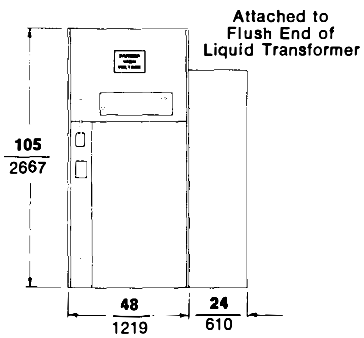
HVL SWITCH CONNECTING TO LIQUID TRANSFORMER



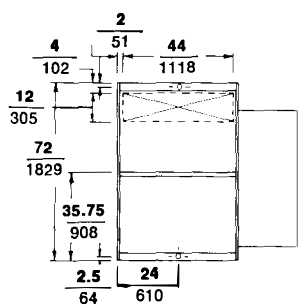
TOP VIEW



LEFT END ELEVATION



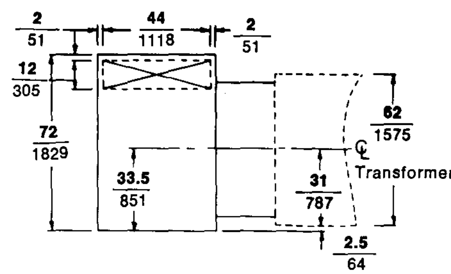
FRONT ELEVATION



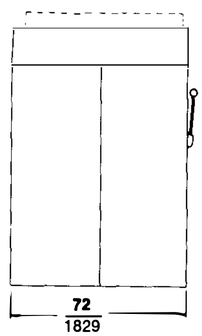
FLOOR PLAN

Approximate Weight:
2200 lbs./997.9 kg

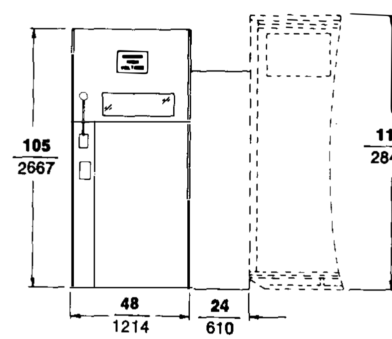
HVL SWITCH CONNECTING TO CAST RESIN TRANSFORMER



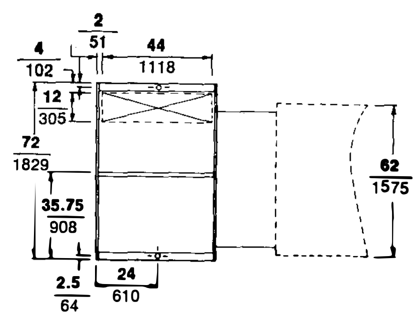
TOP VIEW



LEFT END ELEVATION

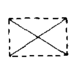


FRONT ELEVATION



FLOOR PLAN

Approximate Weight:
2200 lbs./997.9 kg



Represents Suggested Conduit Entrance Area

Dual Dimensions: $\frac{\text{INCHES}}{\text{Millimeters}}$

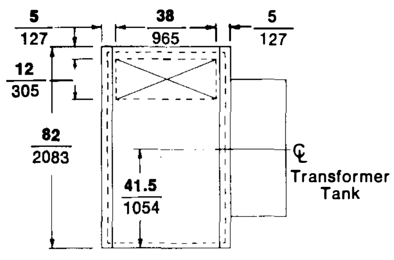
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)

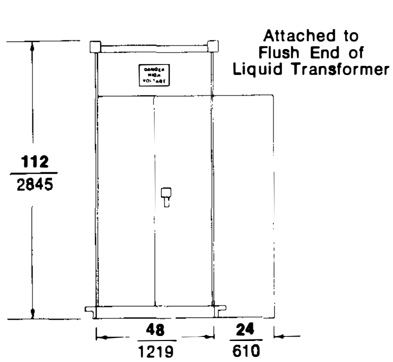
OUTDOOR EQUIPMENT

25 kV

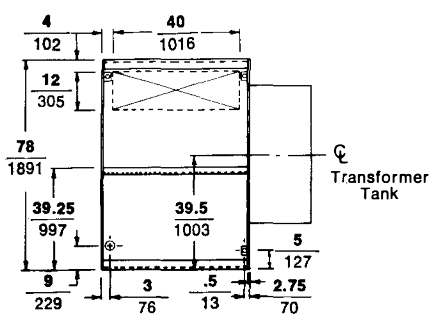
HVL SWITCH CONNECTING TO LIQUID TRANSFORMER



TOP VIEW

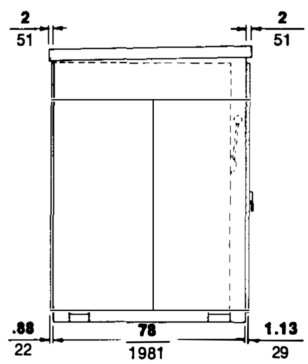


FRONT ELEVATION



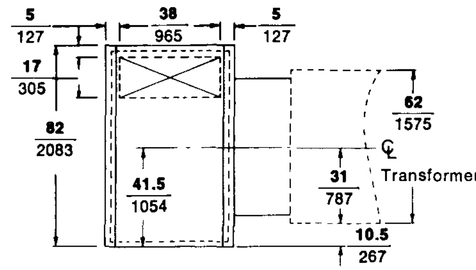
FLOOR PLAN

Approximate Weight: 2400 lbs./1088.6 kg

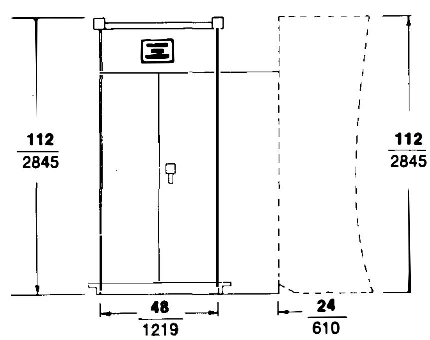


LEFT END ELEVATION

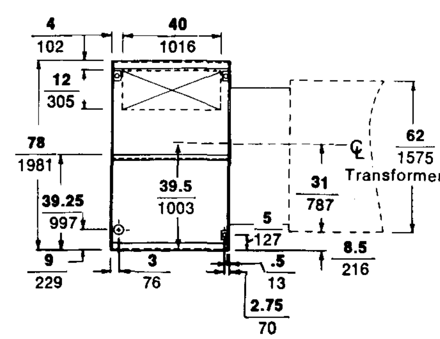
HVL SWITCH CONNECTING TO CAST RESIN TRANSFORMER



TOP VIEW



FRONT ELEVATION



FLOOR PLAN

Approximate Weight: 2400 lbs./1088.6 kg

Represents Suggested Conduit Entrance Area

Represents Suggested Conduit Entrance Area for Strip Heater Control Power Source

Dual Dimensions: $\frac{\text{INCHES}}{\text{Millimeters}}$

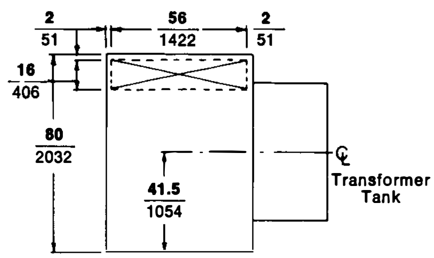
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)

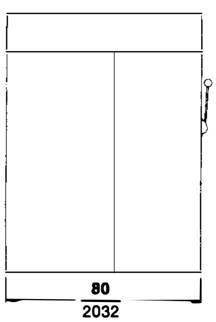
INDOOR EQUIPMENT

38 kV

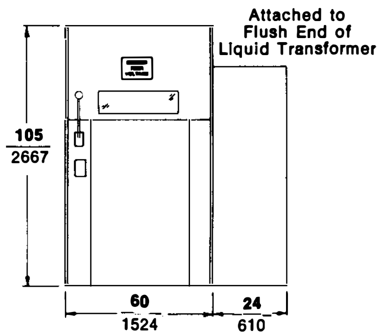
HVL SWITCH CONNECTING TO LIQUID TRANSFORMER



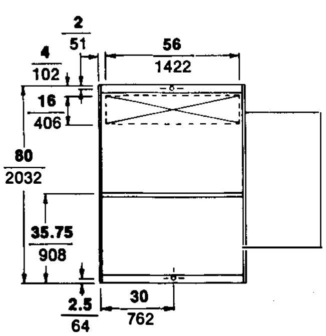
TOP VIEW



LEFT END ELEVATION



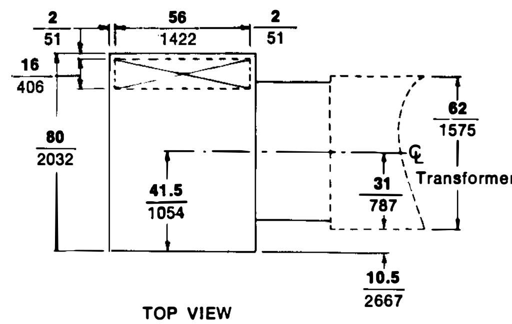
FRONT ELEVATION



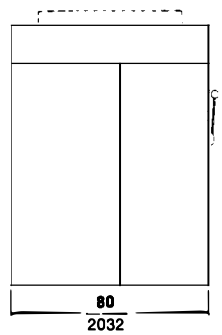
FLOOR PLAN

Approximate Weight:
2450 lbs./1111.3 kg

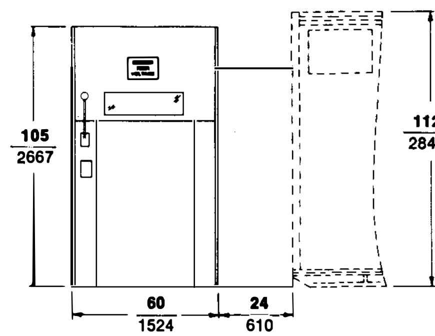
HVL SWITCH CONNECTING TO CAST RESIN TRANSFORMER



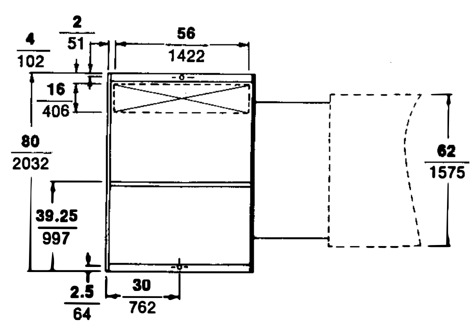
TOP VIEW



LEFT END ELEVATION

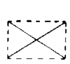


FRONT ELEVATION



FLOOR PLAN

Approximate Weight:
2450 lbs./1111.3 kg

 Represents Suggested Conduit Entrance Area

Dual Dimensions: $\frac{\text{INCHES}}{\text{Millimeters}}$

PRINTED IN U.S.A.

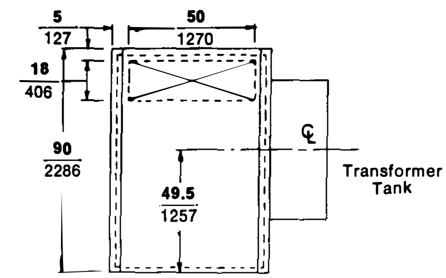
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)

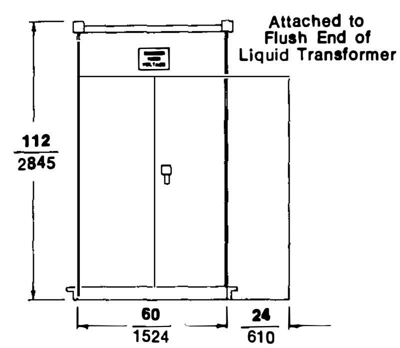
OUTDOOR EQUIPMENT

38 kV

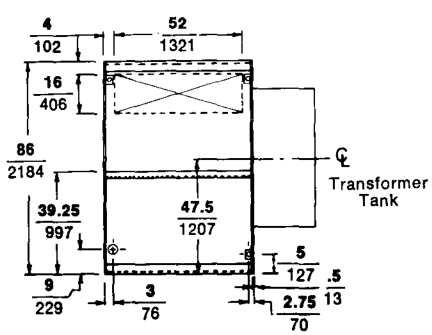
HVL SWITCH CONNECTING TO LIQUID TRANSFORMER



TOP VIEW

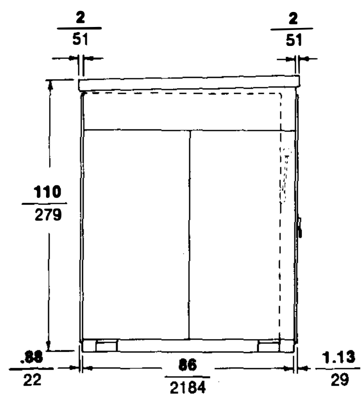


FRONT ELEVATION



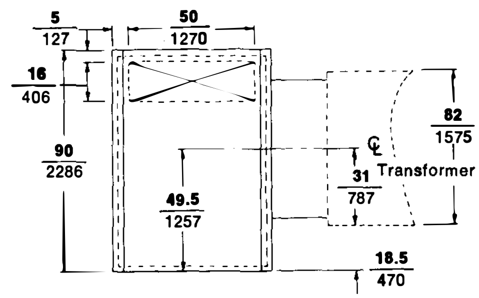
FLOOR PLAN

Approximate Weight:
2700 lbs./1224.7 kg

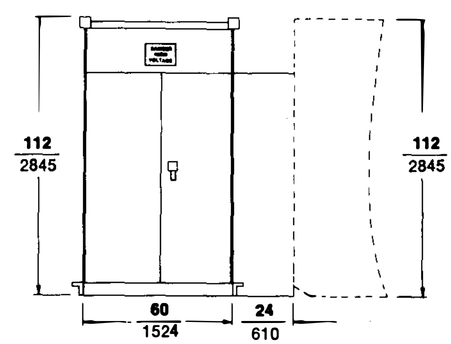


LEFT END ELEVATION

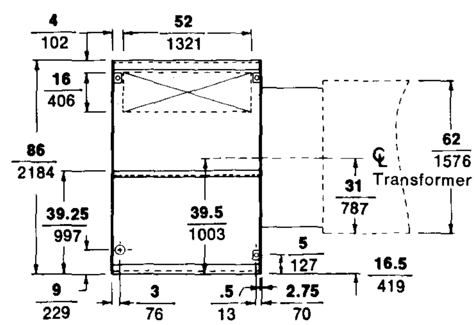
HVL SWITCH CONNECTING TO CAST RESIN TRANSFORMER



TOP VIEW

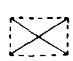


FRONT ELEVATION



FLOOR PLAN

Approximate Weight:
2400 lbs./1088.6 kg

 Represents Suggested Conduit Entrance Area

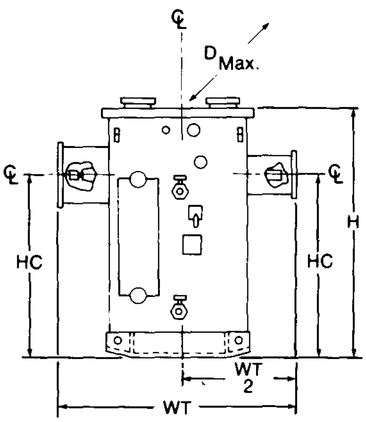
 Represents Suggested Conduit Entrance Area for Strip Heater Control Power Source

Dual Dimensions: $\frac{\text{INCHES}}{\text{Millimeters}}$

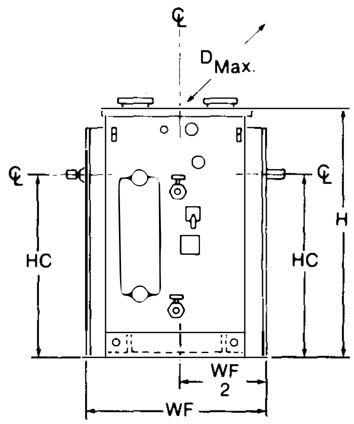
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

DIMENSIONS
(APPROXIMATE DIMENSIONS—NOT FOR CONSTRUCTION)

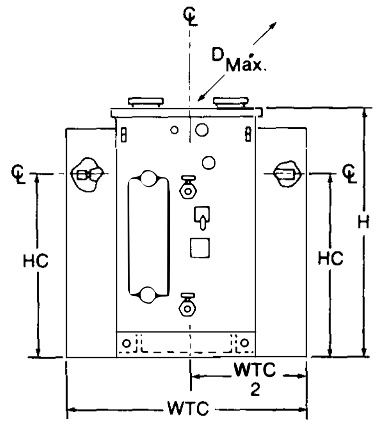
LIQUID FILLED TRANSFORMER
(MINERAL OIL)
5 kV and 15kV



TRANSFORMER WITH
HIGH AND LOW VOLTAGE
THROATS



TRANSFORMER WITH
HIGH AND LOW VOLTAGE
FLUSH END



TRANSFORMER WITH
HIGH AND LOW VOLTAGE
FULL HEIGHT TERMINAL
CHAMBERS

D —Depth —Front to Rear
DT —Depth —Front to Center Line of Transformer Tank
H —Height —Floor to Max. Height
HC —Height —Floor to Electrical Connection Point
WT —Width —Throat to Throat Overall
WF —Width —Flush End to Flush End Overall
WTC—Width —Terminal Chamber to Terminal Chamber

Dimensions are based on 3-phase, oil-filled transformers 65°C. rise, 60 Hz, with NEMA standard taps and accessories, primary volts 13.8KV maximum, secondary volts 600 V maximum with Delta-Delta, Delta wye or wye wye connections.

OIL TRANSFORMER DIMENSIONAL DATA
5,000 and 15,000 Volt Class

KVA Rating	Width												Height				Depth				Weight	
	WF		WF/2		WF		WF/2		WTC		WTC/2		HC		H		D		DT			
	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	Lbs.	Kg.
225	**70**	1778	**35**	889	**51**	1295	**25.5**	648	**74**	1880	**37**	940	**55**	1397	**71**	1803	**42**	1067	**17.5**	444	**3835**	1740
300	**73**	1854	**36.5**	927	**54**	1372	**27**	686	**77**	1956	**38.5**	978	**55**	1397	**71**	1803	**48**	1219	**17.5**	444	**4240**	1923
500	**75**	1905	**37.5**	953	**56**	1422	**28**	711	**87**	2210	**43.5**	1105	**55**	1397	**71**	1803	**50**	1270	**18.5**	470	**5147**	2335
750	**75**	1905	**37.5**	953	**56**	1422	**28**	711	**87**	2210	**43.5**	1105	**55**	1397	**76**	1930	**58**	1473	**18.5**	470	**7465**	3386
1000	**78**	1981	**39**	991	**59**	1499	**29.5**	749	**90**	2286	**45**	1143	**55**	1397	**76**	1930	**60**	1524	**19.5**	496	**8945**	4057
1500	**83**	2108	**41.5**	1054	**64**	1626	**32**	813	**95**	2413	**47.5**	1207	**55**	1397	**88**	2235	**73**	1854	**21**	533	**11653**	5286
2000	**86**	2184	**43**	1092	**67**	1702	**33.5**	851	**98**	2489	**49**	1245	**55**	1397	**88**	2235	**73**	1854	**21**	533	**13669**	6200
2500	**89**	2361	**44.5**	1130	**70**	1778	**35**	889	**101**	2565	**50.5**	1283	**55**	1397	**88**	2235	**76**	1930	**22.5**	572	**15864**	7196

*If station or intermediate class lightning arresters are required in terminal chamber add 32" to WTC, 16" to WTC/2, for 225 and 300 KVA transformers; 24" to WTC, 12" to WTC/2, for all other KVA sizes.

Dual Dimensions: INCHES / Millimeters

Dimensions subject to change without notice.

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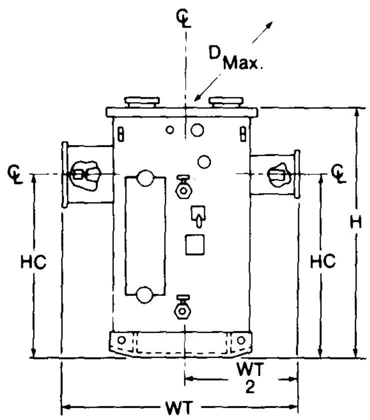
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

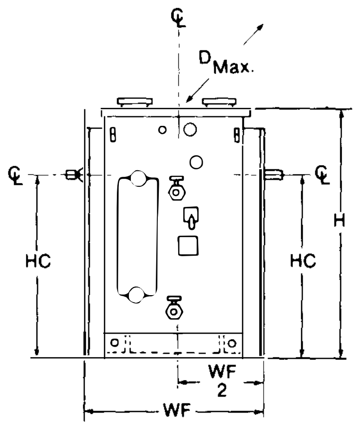
DIMENSIONS
(APPROXIMATE DIMENSIONS—NOT FOR CONSTRUCTION)

LIQUID FILLED TRANSFORMER
(RTEmp)

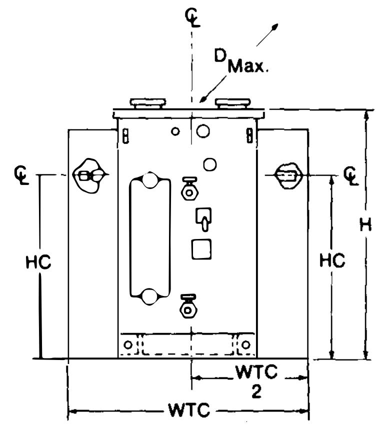
5 kV and 15 kV



TRANSFORMER WITH
HIGH AND LOW VOLTAGE
THROATS



TRANSFORMER WITH
HIGH AND LOW VOLTAGE
FLUSH END



TRANSFORMER WITH
HIGH AND LOW VOLTAGE
FULL HEIGHT TERMINAL
CHAMBERS

D —Depth —Front to Rear
DT —Depth —Front to Center Line of Transformer Tank
H —Height —Floor to Max. Height
HC —Height —Floor to Electrical Connection Point
WT —Width —Throat to Throat Overall
WF —Width —Flush End to Flush End Overall
WTC—Width —Terminal Chamber to Terminal Chamber

Dimensions are based on 3-phase, RTEmp-filled transformers 65°C. rise, 60 Hz, with NEMA standard taps and accessories, primary volts 13.8KV maximum, secondary volts 600 V. maximum with Delta-Delta, Delta-wye or wye-wye connections.

RTEmp TRANSFORMER DIMENSIONAL DATA
5,000 and 15,000 Volt Class

KVA Rating	Width												Height				Depth				Weight	
	WT		WT/2		WF		WF/2		WTC		WTC/2		HC		H		D		DT			
	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	IN.	mm	Lbs.	Kg.
225	**70**	1778	**35**	889	**51**	1295	**25.5**	648	**74**	1880	**37**	940	**55**	1397	**73**	1854	**38**	965	**17.5**	444	**3871**	1756
300	**73**	1854	**36.5**	927	**54**	1372	**27**	686	**77**	1956	**38.5**	978	**55**	1397	**73**	1854	**38**	965	**17.5**	444	**4286**	1944
500	**75**	1905	**37.5**	953	**56**	1422	**28**	711	**87**	2210	**43.5**	1105	**55**	1397	**73**	1854	**50**	1270	**18.5**	470	**5240**	2377
750	**75**	1905	**37.5**	953	**56**	1422	**28**	711	**87**	2210	**43.5**	1105	**55**	1397	**78**	1981	**58**	1473	**18.5**	470	**7623**	3558
1000	**78**	1981	**39**	991	**59**	1499	**29.5**	749	**90**	2286	**45**	1143	**55**	1397	**78**	1981	**73**	1524	**32.5**	826	**9115**	4135
1500	**83**	2108	**41.5**	1054	**64**	1626	**32**	813	**95**	2413	**47.5**	1207	**55**	1397	**90**	2286	**73**	1854	**21**	533	**11989**	5438
2000	**86**	2184	**43**	1092	**67**	1702	**33.5**	851	**98**	2489	**49**	1245	**55**	1397	**90**	2286	**73**	1854	**21**	533	**14004**	6352
2500	**89**	2261	**44.5**	1130	**70**	1778	**35**	889	**101**	2565	**50.5**	1283	**55**	1397	**90**	2286	**76**	1930	**22.5**	572	**16097**	7302

*If station or intermediate class lightning arresters are required in terminal chamber add 32" to WTC, 16" to WTC/2, for 225 and 300 KVA transformers; 24" to WTC, 12" to WTC/2, for all other KVA sizes.

Dual Dimensions: $\frac{\text{INCHES}}{\text{Millimeters}}$

Dimensions subject to change without notice.

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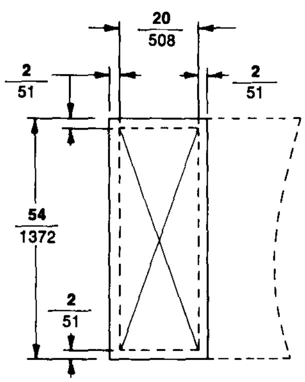
POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)

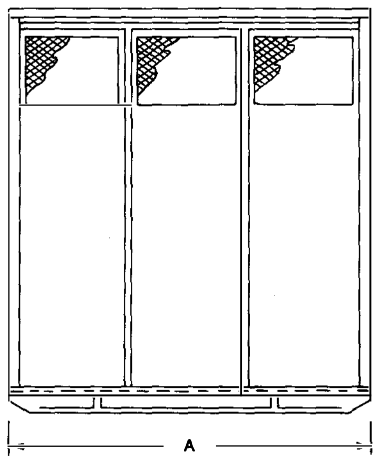
INDOOR CAST RESIN TRANSFORMER

5 kV and 15 kV

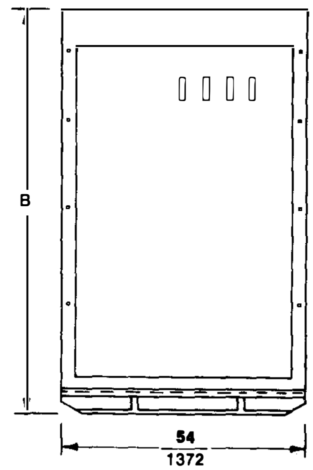
TERMINAL CHAMBER



TOP VIEW

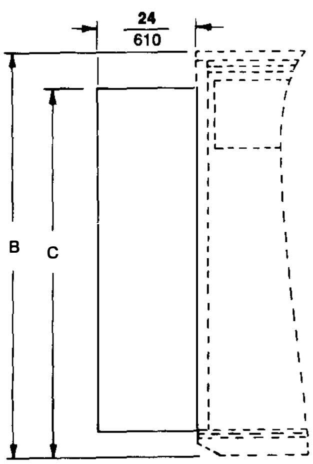


FRONT VIEW

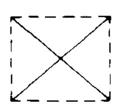


RIGHT END VIEW

Terminal Chamber



FRONT ELEVATION



Represents Suggested Conduit Entrance Area

INDOOR CAST RESIN TRANSFORMER DIMENSIONAL DATA

KVA Rating	5000 and 15000 Volt Class									
	A		B		C		Weight Copper Windings		Weight Aluminum Windings	
	IN.	mm	IN.	mm	IN.	mm	Lbs.	kg	Lbs.	kg
500	**96**	2438	**92**	2337	**92**	2337	**6450**	2926	**4910**	2227
750	**96**	2438	**92**	2337	**92**	2337	**6700**	3039	**5740**	2604
1000	**96**	2438	**92**	2337	**92**	2337	**9000**	4082	**7150**	3243
1500	**107**	2717	**100**	2540	**92**	2337	**10800**	4999	**9080**	4119
2000	**107**	2717	**100**	2540	**92**	2337	**12150**	5511	**11180**	5071
2500	**112**	2845	**100**	2540	**92**	2337	**16200**	7348	**11740**	5325

Available in copper windings (Power Cast®) and aluminum windings (Power Cast II®)

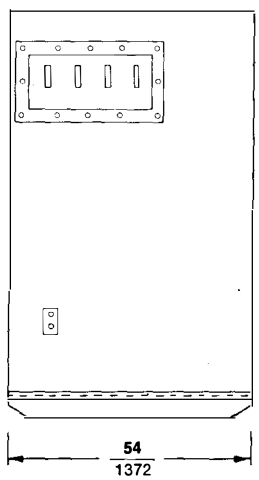
Dimensions subject to change without notice.

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

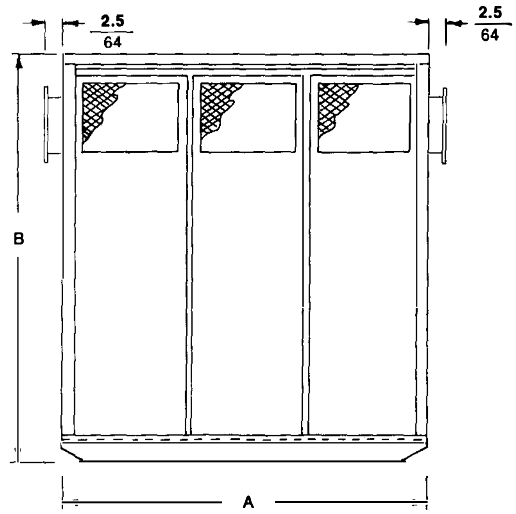
(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)

OUTDOOR CAST RESIN TRANSFORMER

5 kV and 15 kV



LEFT END ELEVATION



FRONT ELEVATION

Available in copper windings (Power Cast®) and aluminum windings (Power Cast II®)

OUTDOOR CAST RESIN TRANSFORMER DIMENSIONAL DATA

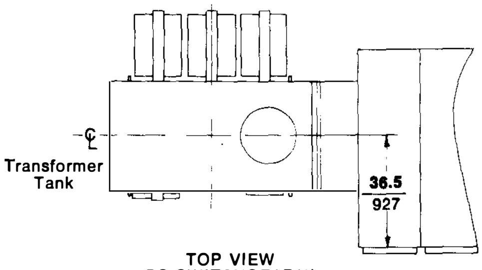
KVA Rating	5000 and 15000 Volt Class							
	A		B		Weight Copper Windings		Weight Aluminum Windings	
	IN.	mm	**IN.**	mm	**Lbs.**	kg	**Lbs.**	kg
500	**96**	2438	**92**	2337	**6450**	2926	**4910**	2227
750	**96**	2438	**92**	2337	**6700**	3039	**5740**	2604
1000	**96**	2438	**92**	2337	**9000**	4082	**7150**	3243
1500	**107**	2718	**100**	2540	**10800**	4899	**9080**	4119
2500	**107**	2718	**100**	2540	**12150**	5511	**11180**	5071
2000	**112**	2845	**100**	2540	**16200**	7348	**11740**	5325

Dimensions subject to change without notice.

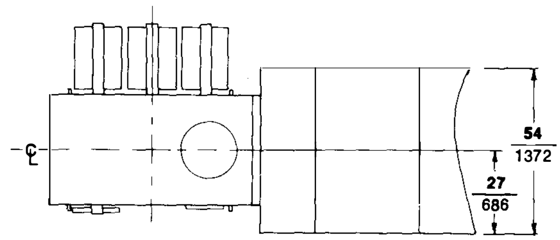
Dual Dimensions: $\frac{\textbf{INCHES}}{\text{Millimeters}}$

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

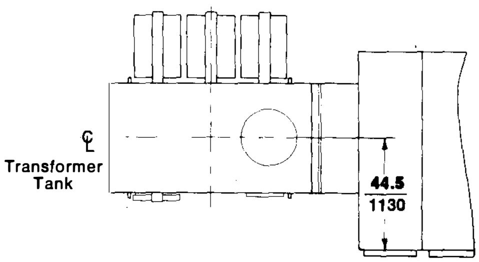
(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)
INDOOR LIQUID TRANSFORMER CONNECTIONS TO LOW VOLTAGE DISTRIBUTION SECTIONS



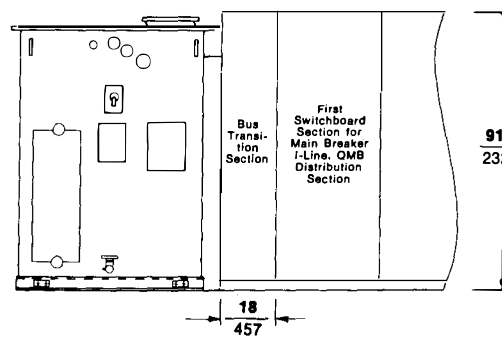
TOP VIEW
DS SWITCHGEAR(1)



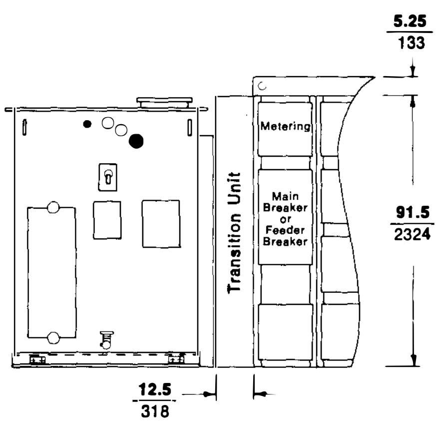
TOP VIEW
SWITCHBOARD(2)



TOP VIEW
DSL SWITCHGEAR(1)



FRONT ELEVATION
SWITCHBOARD(2)



FRONT ELEVATION
DS OR DSL SWITCHGEAR(1)

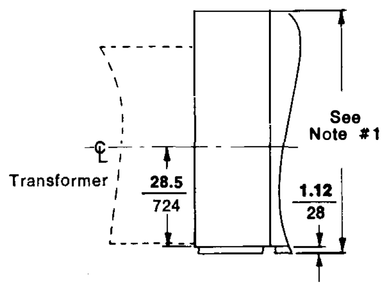
NOTE:
(1) For dimensional data on DS and DSL switchgear see Catalog Class 6030.
(2) For dimensional data on Power Style switchboards, see Catalog Class 2760.
For dimensional data on MCDO switchboards, see Catalog Class 2770.
For dimensional data on MCDO II switchboards, see Catalog Class 2775.
(3) For low voltage terminal chamber, see Catalog Class 6020, page 26 or 27.

All dimensions subject to change without notice.

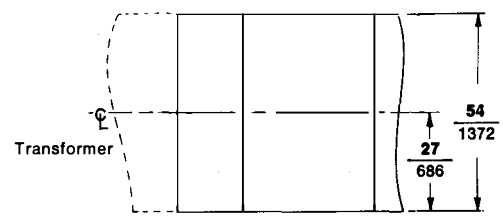
Dual Dimensions: $\frac{\textbf{INCHES}}{\text{Millimeters}}$

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

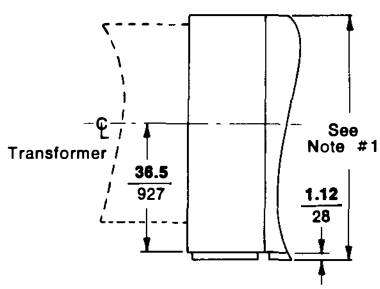
(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)
INDOOR STANDARD DRY TYPE TRANSFORMER CONNECTIONS TO LOW VOLTAGE DISTRIBUTION SECTIONS



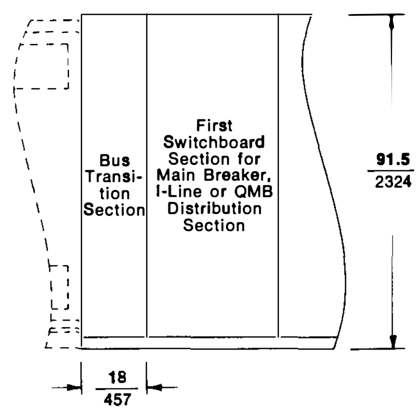
TOP VIEW
DS SWITCHGEAR(1)



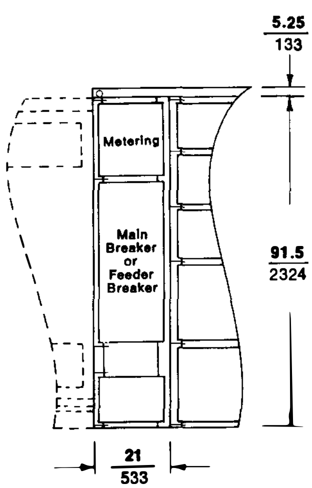
TOP VIEW
SWITCHBOARD(2)



TOP VIEW
DSL SWITCHGEAR(1)



FRONT ELEVATION
SWITCHBOARD(2)
(Transition Section Only Required if Connecting to MCDO Construction)



FRONT ELEVATION
DS OR DSL SWITCHGEAR(1)

NOTE:
(1) For dimensional data on DS and DSL switchgear see Catalog Class 6030.
(2) For dimensional data on Power Style switchboards, see Catalog Class 2760.
For dimensional data on MCDO switchboards, see Catalog Class 2770.
For dimensional data on MCDO II switchboards, see Catalog Class 2775.
(3) For low voltage terminal chamber, see Catalog Class 6020, page 24.

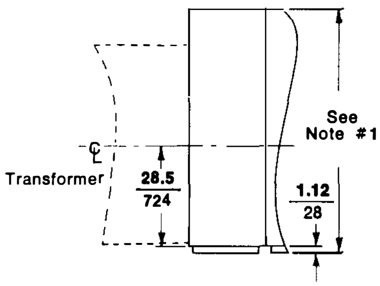
All dimensions subject to change without notice.

Dual Dimensions: $\frac{\textbf{INCHES}}{\text{Millimeters}}$

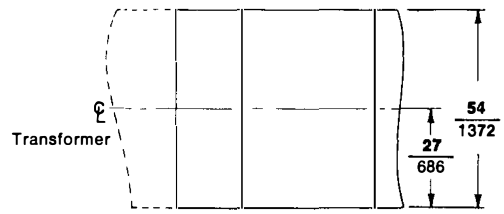
PRINTED IN U.S.A.

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

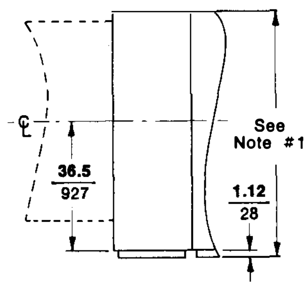
(APPROXIMATE DIMENSIONS — NOT FOR CONSTRUCTION)
INDOOR POWER CAST TRANSFORMER CONNECTIONS
TO LOW VOLTAGE DISTRIBUTION SECTIONS



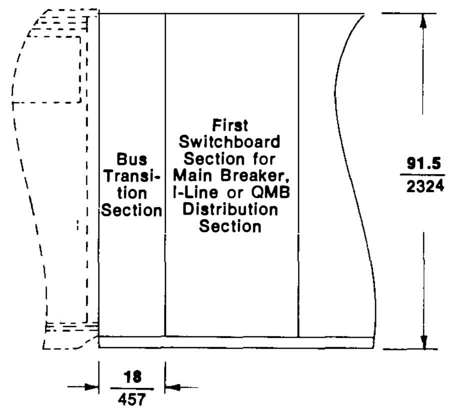
TOP VIEW
DS SWITCHGEAR



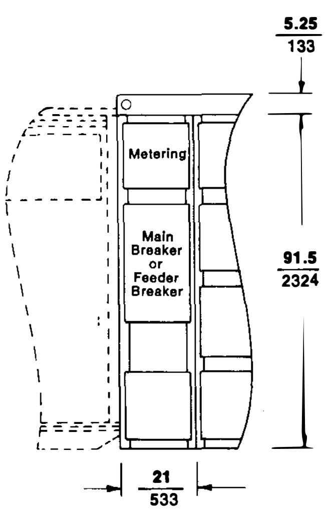
TOP VIEW
SWITCHBOARD



TOP VIEW
DSL SWITCHGEAR



FRONT ELEVATION
SWITCHBOARD
(Transition Section Only
Requred if Connecting
to MCDO Construction)



FRONT ELEVATION
DS OR DSL SWITCHGEAR

NOTE:
(1) For dimensional data on DS and DSL switchgear see Catalog Class 6030.
(2) For dimensional data on Power Style switchboards, see Catalog Class 2760.
For dimensional data on MCDO switchboards, see Catalog Class 2770.
For dimensional data on MCDO II switchboards, see Catalog Class 2775.
(3) For low voltage terminal chamber, see Catalog Class 6020, page 28.

All dimensions subject to change without notice.

PRINTED IN U.S.A.

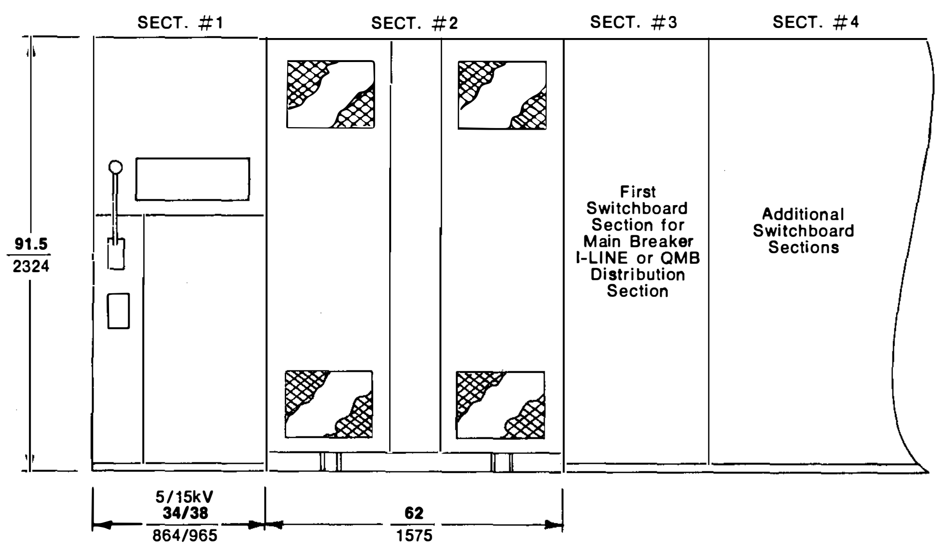
Dual Dimensions: $\frac{\text{INCHES}}{\text{Millimeters}}$

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

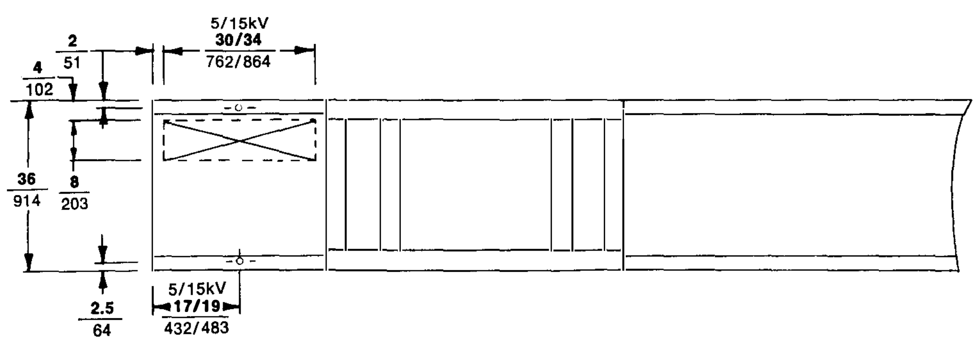
DIMENSIONS
(APPROXIMATE DIMENSIONS—NOT FOR CONSTRUCTION)

INDOOR COMPACT SECTIONAL UNIT SUBSTATIONS
5 & 15 kV Class — 225 thru 750 kVA

TOP VIEW



FRONT ELEVATION



FLOOR PLAN

Dual Dimensions: $\frac{\textbf{INCHES}}{\text{Millimeters}}$

*NOTE:
(1) For dimensional data on 36" Deep Switchboards, see Catalog Class 2720.

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

SUGGESTED SPECIFICATIONS

Unit Substation — General

These specifications and the associated drawings describe one (indoor) (outdoor) ______ KVA, 3 phase, 60 cycle, unit substation complete from the ______ volt incoming line connection to the ______ volt outgoing feeder connections. Any items not specifically mentioned but obviously necessary for proper operation are implied in this description.

The Unit Substation shall be a Square D POWER-ZONE® Unit Substation or approved equal, designed, manufactured and tested in accordance with applicable standards of NEMA, ANSI and IEEE. It shall consist of a high voltage incoming line section, a transformer section and a low voltage section each separated from the others by steel barriers but electrically connected and physically joined to form a single, metal enclosed structure. The enclosure frame and internal barriers shall be fabricated of code gauge steel and finished with medium gray (ANSI #49) paint applied over a rust inhibiting phosphate primer. Construction shall prevent entry of rodents into the substation interior.

The equipment shall be totally adjusted and tested at the factory and sectionalized for shipment so that the largest section does not exceed ______ inches wide, ______ inches deep, and ______ inches high to enable installation at the job site. Installation and connection of the unit substation shall not require removal or disassembly of any factory mounted stationary high voltage devices (except potheads). Prominent nameplates bearing equipment ratings, tap changing information, manufacturer identification and reference serial numbers shall be mounted on the front of the unit substation.

The sound level of the unit substation shall not exceed ________ db when the transformer is self-cooled and ______ db when cooling fans are running as measured in accordance with latest NEMA test procedures. Over-all floor space dimensions shall not exceed ______ long and ______ deep.

Equipment construction shall allow movement of the unit substation on rollers through a doorway ______ high and ______ wide, and shall allow installation and operation in an area having a ceiling height of ______ inches.

High Voltage Incoming Line Section

The incoming line section shall terminate the incoming (and outgoing) ______ volt feeder. This section and all components therein shall be designed and coordinated to have a single short circuit rating, comprising any switch fault closing rating, short time ratings and fuse interrupting rating, of not less than ______ amperes Asymmetrical or ________ MVA Symmetrical at the system voltage. The basic insulation impulse level (BIL) of the entire assembly shall be not less than (60) (75) (95) (125) (150) kV per NEMA testing procedure. The incoming line section shall consist of an air insulated steel enclosure separated from the transformer section by steel barriers and containing: (select A or B)

A) Air Terminal Chamber

(1) (2) — (Set of lugs) (pothead) to terminate (1) (2), 3 phase, ______ conductor, cable feeders entering from the (top) (bottom).

3 — Lightning arresters — (distribution) (intermediate) (station) type for (grounded) (ungrounded) system, connected to the incoming cable terminals.

B) Load Break Air Interrupter Switch (select 1 or 2)

1) 1 — Load break air interrupter switch, 3 pole, 2 position — open/closed, 600 amperes continuous current and suitable for interrupting 600A. A stored energy spring mechanism shall provide quick closing and opening of the switch independent of the handle speed. The fault closing and short time ratings of the switch (with fuses) shall not be less than the high voltage section short circuit rating.

2) 1 — Load break air interrupter duplex switch, consisting of two 3 pole, 2 position — open/closed air interrupter switches with the load sides connected together, 600 amperes continuous current and suitable for interrupting 600A. A stored energy spring mechanism shall provide quick closing and opening of the switch independent of the handle speed. The fault closing and short time ratings of the switch (with fuses) shall not be less than the high voltage section short circuit rating. Supply key interlocks between the two switches (and the fuse compartment door) so only one switch can be closed at any time (and access to the fuses can be gained only when both switches are open).

3) Fuses with continuous current rating to best coordinate with transformer and secondary devices. Fuse interrupting capacity shall not be less than the high voltage section short circuit rating. (Select 1 or 2)

1 — Fuses shall be current limiting type which do not produce hot gas, flame, noise or pressure. Fuses shall be applied so that indication of a blown fuse shall be visible without opening the enclosure.

2 — Fuses shall be replaceable boric acid refill type mounted so as to direct any flame or gas downward away from the components and away from the front of the equipment.

High voltage fuses shall be connected to the load side of the switch and de-energized when the switch is open. They shall be located to prevent their accidentally falling into energized parts during replacement.

SUGGESTED SPECIFICATIONS

The high voltage fuses and fuse mountings shall be completely visible and easily accessible through a door (mechanically interlocked with the high voltage switch to insure that the switch is open when the fuses are accessible). No energized parts shall be within normal reach of the opened doorway. Construction shall allow convenient fuse replacement with a fuse handling tool.

Four single full length track resistant polyester interphase barriers shall isolate the 3 phases of the switch (and fuse combination) from each other and from the enclosure.

A viewing window shall be provided in the high voltage switch enclosure of sufficient size and located to enable visible inspection from outside the enclosure of all open or closed switch poles and installed fuses, within the enclosure.

The handle of the high voltage switch shall be permanently mounted and operable from the front of the unit substation. Design shall allow the handle to project no more than 6" from the enclosure when switch is in the open or closed position. An upward motion of the handle shall close and a downward motion shall open the switch. The handle position in conjunction with prominent nameplates shall clearly indicate whether the switch is open or closed. The handle shall be located on the front of the switch (and fuse) enclosure.

Convenient and positive means for padlocking the switch in the open (and) (but) not closed position shall be supplied. (Padlocking means for the fuse compartment door shall be provided.)

Transformer Section
(Ventilated Dry) — Conventional

The transformer shall be 3-phase, 60 hertz, air cooled dry type mounted in a suitable ventilated enclosure and barriered from the high voltage and low voltage sections. Self cooled capacity shall be ______ KVA: primary voltage ______ volts delta; secondary voltage ______ (delta) (wye) (3) (4) wire. Primary taps shall be full capacity, with a minimum of 2-2½% above and below rated voltage.

The transformer shall have a 150°C ambient, (or 115°C temperature rise above a 40°C ambient) (or 80°C temperature rise above 40°C ambient). 115°C transformers shall be capable of carrying a 15% continuous overload without exceeding 150°C rise in a 40°C ambient. 80°C rise transformers shall be capable of carrying a 30% continuous overload without exceeding a 150°C rise in a 40° ambient. All insulating materials used shall be in accordance with NEMA ST20 or NEMA TR27 Standards for a 220°C insulation system. The temperature rise shall be designated on the transformer nameplate.

Two types of coil design are used in the manufacture of our high voltage transformers, either may be specified.

1. The standard modified disc winding to provide the most efficient, reliable, and compact type of coil in this type of design.

2. The special barrel-type winding for areas where greater than normal amounts of non-conductive dust, dirt or lint might be encountered. This winding with its vertical air ducts and smooth surface would require less maintenance than a disc type winding.

The completed coils shall be pre-heated, vacuum-impregnated with non-hygroscopic, thermosetting insulating varnish, and then thoroughly baked. This process shall completely seal the coils against moisture, and eliminate any voids which could create hot spots, or cause corona formation.

The transformer cores are to be constructed of high grade, non-aging silicon steel laminations with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be clamped together with heavy, structural steel angles.

The basic impulse levels (BIL) shall be a minimum of 60 KV for the 15 KV class, 45 KV for the 8.66 KV class, 30 KV for the 5 KV class, and 20 KV for the 2.5 KV class.

The enclosure shall be constructed of heavy gauge sheet steel. All ventilating openings shall be in accordance with NEMA and National Electrical Code standards for ventilated enclosures. Large enclosures are to be provided with lifting devices bolted or welded to the base structure, and shall have jacking pads designed to be flush with the enclosure. The base is to be constructed of structural steel members to permit skidding or rolling in any direction. The enclosure is to be cleaned, phosphatized, primed and finished with medium gray (ANSI #49) paint.

MOV type Distributor Class lightning arresters, or equivalent, shall be installed by the manufacturer on the high voltage side of the transformer to provide additional protection against high voltage lightning or switching surges.

When fan cooling is specified, provide a Sorgel Model 80, solid state, temperature control system with factory calibrated and pre-set thermistors in each phase of the transformer. These thermistors are to be installed in the transformer windings to continuously monitor the hot-spot temperature. If the temperature rises beyond normal, a relay is activated to start the fans. If the temperature continues to rise, a second relay operates to sound an audible alarm and lights a red warning light. The fan control panel is to consist of a green "Power On" light, an amber "Fans On" light with a manual/automatic selector switch, and a red "High Temperature" light with an audible alarm. An alarm silencing button is to be provided to silence the alarm, but allow the red light to remain on until the temperature decreases to normal. Necessary fusing and transformers for higher than 120 volts are to be provided as part of the complete package. Multiple cooling fans are to be installed at the bottom of each coil with a minimum of six for 3 phase, and four for single phase transformers.

SUGGESTED SPECIFICATIONS

If visual temperature indication is required a temperature indicator shall be provided and mounted on the front panel of the transformer.

The sound levels shall be guaranteed by the manufacturer not to exceed the following values:

151 to 300 KVA — 58DB; 301 to 500 KVA — 60DB;
501 to 700 KVA — 62DB; 701 to 1000 KVA — 64DB;
1001 to 1500 KVA—65DB; 1501 to 2000 KVA—66DB;
2001 to 3000 KVA — 68DB.

(NOTE: Lower sound levels may be desirable for critical areas such as hospitals, schools, or office areas. Contact your local Square D field sales office for recommendations.)

Provisions shall be made to completely isolate the core and coil from the enclosure. There shall be no metal-to-metal contact. Rubber vibration isolating pads shall be installed by the manufacturer between the core and coil and the enclosure. The core shall then be visibly grounded to the ground bus or ground pad by means of a flexible grounding conductor sized in accordance with applicable NEMA, ANSI, and NEC Standards.

(NOTE: For Compact Sectional Unit Substations specify barrel-type windings only. 115°C temperature rise and 80°C temperature rise are available thru 500 KVA in the compact design.)

Transformer Section
(Ventilated Dry) — Cast Resin

The transformer(s) shall be of Dry-Type, Cast-Resin construction; mounted in a suitable, ventilated enclosure.

The transformer(s) shall be rated ________ KVA; Primary voltage ________ volts, delta; Secondary voltage ________ volts (Wye) (delta), (3) (4) wire 60Hz. Primary taps shall be full capacity, with two 2.5% above and below rated voltage.

Impedance shall be (______%) (Manufacturer's Standard Impedance) Sound level shall not exceed (______db) (NEMA Standard maximum db for the applicable KVA size of Dry-Type transformers as set forth in NEMA publication TR 1-1980).

(Select A or B)

A) **Power Cast Construction**

Both HV and LV windings shall be of copper conductors.

The average temperature rise of the transformer windings shall not exceed 80°C, when the transformer is operated at full nameplate rating. The transformer(s) shall be capable of carrying 100% of nameplate KVA rating in a 40°C maximum ambient temperature.

Impulse rating of the low voltage winding must be (at least 25KV for LV 1.2KV class and below), (45KV for 2.5KV secondaries), (60KV for 5KV secondaries).

Forced Air Cooling (Optional)

Shall increase the continuous self cooled rating of units as follows:

SELF COOLED RATING	PER CENT INCREASE
500 — 750 KVA	33⅓%
1000 — 5000 KVA	50%

The above indicated increase shall be possible with forced cooling without exceeding the maximum design temperatures at 40°C maximum ambient.

B) **Power Cast II Construction**

Both HV and LV windings shall be of aluminum conductors.

The average temperature rise of the transformer windings shall not exceed 115°C, when the transformer is operated at full nameplate rating. The transformer(s) shall be capable of carrying 100% of nameplate KVA rating in a 40°C maximum ambient temperature.

Forced Air Cooling (Optional)

Shall increase the continuous self cooled rating of units as follows:

SELF COOLED RATING	PER CENT INCREASE
500 — 750 KVA	33⅓%
1000 — 5000 KVA	50%

The above indicated increase shall be possible with forced cooling without exceeding the maximum design temperatures at 40°C maximum ambient.

General:

The forced air cooling shall be regulated automatically by sensors placed in the LV air ducts. Forced air cooling shall include: thermal sensors, fan(s), control wiring, control box with test switch, current limiting fuses, indicating lights, alarm, alarm silencing relay and push buttons.

Provisions for future forced air cooling on all units shall be optional. Provisions for future forced air cooling shall include mounting provisions only for fan(s) and busing sized to the fan-cooled rating.

HV and LV windings shall each be separately cast as one rigid tubular coil, and arranged coaxially. Each cast coil shall be fully reinforced with glass cloth, and cast under vacuum to assure complete, void-free resin impregnation throughout the entire insulation system. Coils shall be supported by cast epoxy bottom supports and spacer blocks and spring loaded top blocks, and shall have no rigid mechanical connection between them.

SUGGESTED SPECIFICATIONS

The windings must not absorb moisture, and shall be suitable for both storage and operation in adverse environments, including prolonged storage in 100% humidity at temperatures of from −40°C to +40°C, and shall be capable of immediately being switched on after such storage without predrying.

The transformer(s) must be free of partial discharge up to at least 1.2 times the rated line-to-ground voltage. Each coil shall be subjected to a partial discharge test to verify its partial discharge.

Impulse rating of the high voltage winding must be equal to the Basic Impulse Level specified by ANSI for Oil Filled Transformers of the same voltage class, without the use of supplemental surge arresters.

The transformer core shall be constructed of high grade, grain oriented silicon steel laminations, with high magnetic permeability. Magnetic flux density is to be kept well below the saturation point. The cores shall be cruciform in shape, with mitered joints to keep core losses, exciting current and noise level at a minimum. The outside surfaces of the core shall be protected against corrosion by a resin coating not less than 1mm thick.

The enclosures shall be constructed of heavy gauge sheet steel. All ventilating openings shall be in accordance with NEMA and the National Electrical Code standards for ventilated enclosures. Large enclosures shall have jacking pads designed to be flush with the enclosure. The base shall be constructed of structural steel members, to permit skidding or rolling in any direction.

The core shall be visibly grounded to the frame by means of a flexible grounding strap in accordance with applicable NEMA and NEC standards.

Transformer Section (Non-Ventilated Dry)

The transformer shall be ______ KVA, 3 phase, 60 cycles. Primary taps shall be full capacity taps, with a minimum of 2-2½ % above and below rated voltage.

Transformer shall be 115°C rise above a 40°C ambient. (Transfomer shall be capable of carrying a 15% continuous overload without exceeding a 150°C rise.) All insulating materials used shall be in accordance with NEMA TR 27 — 1965 Standards for 220°C insulation system.

The basic impulse level (BIL) shall be a minimum of 94kV for the high voltage winding for units in the 15kV insulation class.

The enclosure shall be constructed of heavy gauge sheet steel and meet the requirements of NEMA Type 12 for indoor and NEMA Type 3R for an outdoor enclosure to make it dust-tight and rainproof respectively. The enclosure should be provided with lifting devices secured to the base structure and have jacking pads designed to be flush with the enclosure. The base is to be constructed of structural steel members to permit skidding or rolling in any direction. The enclosure is to be cleaned, phosphatized, primed and finished with medium gray (ANSI #49) paint.

The enclosure is to have adequate surface area to limit the maximum temperature rise of the enclosure to 50°C above a 40°C ambient at full load and rated voltage.

Low flash-over, rotating machinery type or equivalent lightning arresters shall be installed by the manufacturer in the high voltage compartment to provide additional protection against high voltage lightning or switching surges.

The transformer shall be designed to deliver rated KVA without benefit of internal fans to circulate the air.

An internal fan cooling system shall be provided to increase the KVA rating by a minimum of 25%. The fan cooling system shall consist of a solid state, temperature controlled system. This system is to consist of calibrated and preset thermistors installed in the windings of each phase to continuously monitor the hot-spot temperature. Pilot lights are to indicate power on (green), fans operating (amber), high temperature (red). An alarm and alarm silencing button shall also be included. Necessary fusing and transformers for higher than 120 volts are to be provided. The necessary fans should be located at the base of each coil to direct the air flow through the interior of the coil. The control panel is to be mounted on the front exterior of the transformer and factory wired.

Provisions shall be made to completely isolate the core and coil from the enclosure. There shall be no metal-to-metal contact. Rubber vibration isolating pads shall be installed by the manufacturer between the core and coil and the enclosure. The core should then be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA and NEC Standards.

Transformer Section (Liquid Filled)

(1)(2) Transformer section(s) (each) containing:

______ KVA 3 phase, 60 Hertz, (oil) (RTEmp®) (silicone) immersed transformer, suitable for (indoor) (outdoor) application, self-cooled (55) (55/65) (65) degree C. temperature rise, primary ______ volts (delta) (wye), ______ wire ______ BIL, secondary ______, volts (delta) (wye), ______ wire ______ BIL, four 2½ % full capacity taps in primary winding, two above and two below rated primary voltage, including standard ANSI and NEMA accessories. Transformer to have (provisions only for future forced air cooling) (forced air cooling from top of liquid temperature) (forced air cooling from winding temperature indicator) (complete provisions for forced air cooling less fans and motor(s).

Forced air cooling (optional) shall increase the continuous self-cooled rating of units as follows:

SELF-COOLED RATING	FORCED AIR COOLING PER CENT INCREASE
2500 KVA	15%
750, 1000, 1500, 200 KVA	25%

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SUGGESTED SPECIFICATIONS

Provisions for future forced air cooling shall be standard on all units with self-cooled ratings of 750 KVA and larger.

The transformer shall meet all of the latest applicable NEMA, ANSI, and IEEE Standards for power transformers.

SELECT A or B:

A) Oil or RTEmp® Immersed Transformer

Transformers shall be built with a five-legged wound core. The five-legged core design shall eliminate tank enclosure heating which results from ferro resonance and enable the transformer to be used in a wye-wye connected configuration.

Transformer cores are to be constructed from accurately cut, burr free, low loss, high electrical grade, grain oriented silicon steel. Core laminations shall be coated, insulated and rigidly clamped to provide a low loss symmetrical flux path.

The transformer tank enclosure(s) are to be of welded construction using plate steel. Tanks shall be equipped with lifting lugs and jacking pads welded to the tank. Tank base must be capable of skidding or rolling in all directions. Tank covers shall be welded in place to provide insulating fluid protection from contamination. Radiators of the panel type shall be used.

Transformer(s) shall be designed to withstand 7½ PSI pressure per ANSI and NEMA Standards.

Finish on transformer tank(s) shall be a three stage wash consisting of steam cleaning, phosphatizing wash and rinse. Units shall be painted with a long lasting vinyl paint.

B) Silicone Immersed Transformer

Transformers shall be built with a three-legged wound core.

Transformer cores are to be constructed from accurately cut, burr free, low loss, high electrical grade, grain oriented silicon steel. Core laminations shall be coated, insulated and rigidly clamped to provide a low loss symmetrical flux path.

Transformer tank enclosure(s) are to be of welded construction using steel plate. The tank is to be equipped with lifting lugs and jacking pads welded to the tank. Tank base must be capable of skidding or rolling in all directions. Tank covers shall be welded in place to provide insulating fluid protection from contamination. Radiators of the tube type shall be used.

Transformer(s) shall be designed to withstand 7½ PSI pressure per ANSI and NEMA Standards.

Finish on tank(s) shall consist of a cleaning, phosphatizing wash and rinse, a primer coat to inhibit rust formation, an intermediate coat of finished color, and a final coat for attractive appearance.

Low Voltage Section
(With Low Voltage Drawout Switchgear)

The Low Voltage Section shall be POWER-ZONE® II Metal-Enclosed Drawout Switchgear, as manufactured by the Square D Company, or approved equal, designed, manufactured and tested in accordance with applicable NEMA, ANSI and IEEE Standards for power circuit breakers and metal-enclosed switchgear. The enclosure shall be finished with medium gray ANSI #49 enamel applied over a rust inhibiting phosphate primer. Equipment shall be equipped with (service entrance label) (and) UL label for Metal-Enclosed Low Voltage Power Circuit Breaker type Switchgear Assemblies when UL recognized components are specified.)

Enclosure

The enclosure and internal barriers shall be fabricated of steel members in accordance with NEMA and ANSI Standards. A lifting bar is to be provided with each shipping group for lifting the structure from the top with a crane. Supply a wooden skid to permit the use of pipe rollers for moving the switchgear to its final location inside the building.

The enclosure construction shall prevent the entry of rodents into the switchgear interior. Ventilation openings on the front of the switchgear breaker compartments are to be located in such a way as to preclude the possibility of metal objects being inserted through them and easily contacting energized parts.

The equipment shall be assembled, adjusted and tested at the factory and shall be sectionalized, if required, for shipment as requested or approved. The largest section is not to exceed ______ inches wide, ______ inches deep, and ______ inches high to enable installation at the job site.

The structure is to consist of three basic compartments from front to rear: the Front Breaker Compartment, the Center Bus Compartment, and the Rear Cable Compartment.

Front Breaker Compartment

The front compartment is to contain the drawout circuit breaker elements, each mounted in its own barriered cell. Active or future use cells equipped to accept circuit breakers are to be complete with the circuit breaker drawout mechanism and all current-carrying parts. Provide each breaker cell with a hinged door equipped with a flush satin chrome finish handle and an external trip button. No large opening shall be allowed in the door. When equipped with a breaker, a double steel barrier will exist between operating personnel and the breaker mechanism and live part. The breaker will be safe to operate with the outer steel door open.

SUGGESTED SPECIFICATIONS

Center Bus Compartment

The bus compartment is to contain the section riser and main cross bus which is to be rated for a 65 degree Centigrade temperature rise. The main cross bus shall be rated for ______ continuous amperes. All main and riser bus is to be (welded aluminum) (bolted copper) and be adequately braced to withstand the short circuit of ______ symmetrical amperes. All contact surfaces at bolted joints shall be plated and the joint bolts are to be of high strength grade 5 steel equipped with Belleville type spring washers. All electrical clearances are to be for 600 volts ac. (An isolated neutral bus is to be supplied rated at (50) (100) percent of the phase current.)

Rear Cable Compartment

Size the cable compartment to accommodate all incoming and outgoing cables required within each vertical switchgear section. Cable lugs are to be mounted on the load side (or line side as applicable) run-back bus which is extended into this compartment from the bus compartment. Run-back bus for main or feeder breakers to be insulated from the section riser and cross bus. This compartment shall also contain a plated (aluminum) (copper) ground bus bolted directly to the switchgear frame. (Extend a neutral stud into the cable compartment in each vertical section for connection of neutral conductors. A bus connection shall be provided for connecting the neutral to the ground bus with a removable isolating link). Clamp type cable lugs suitable for use with aluminum or copper cable are to be supplied as shown on the plans.

As a safety precaution to prevent accidental contact with the main bus during maintenance procedures, the center bus compartment containing the section riser bus and main cross bus shall be segregated from the rear cable compartment by means of grounded metal barriers.

Circuit Breakers

The circuit breakers shall be of the drawout type, manually or electrically operated type DS (DSL) as shown on the associated drawings or as listed in the equipment tabulation. The breakers are to mount on a rigid, self-aligning drawout mechanism with "connected", "test", "disconnected", and "remove" positions. The front door shall be capable of being closed in the "connected", "test" or "disconnected" positions. Provide interlocks to insure the breaker is open before it can be moved from any position or when it is between positions. Include an interlock to discharge the stored energy spring before the breaker element can be withdrawn from its cell. In the "test" and "connected" positions, provide a positive ground contact between the breaker element and the structure. The circuit breaker trip device is to be of a solid-state design which requires no external power connections and is provided with an adjustable long-time delay, instantaneous and (short-time delay) over-current/short circuit protection. (Include ground fault tripping as an integral part of the solid-state trip device.) Settings are to be continuous between calibrated points. Provisions for testing and calibrating shall be provided. (Indicators for overload, short circuit, or ground trip shall be provided.) (Breakers are to have U.L. label.)

The breaker operating mechanism is to be of the two-step stored energy quick-make, quick-break type. One stroke of the operating handle or one operation cycle of the breaker motor is to charge the closing springs and operation of a local "close" button is to close the breaker contact. Closing of the breaker contacts shall automatically charge the opening springs to insure quick-break operation.

Padlocking provisions shall be furnished to receive up to three padlocks when the breaker is in the open position, positively preventing unauthorized closing of the breaker contacts. A manual trip button and position indicator shall be furnished.

(Include the following only when type DSL breakers are specified:) (Circuit breakers shall be equipped with current limiters. Current limiters shall be integrally mounted on 800A. and 1600A. frame sizes and separately mounted on 3200A. and 4000A. frame sizes. Equip each breaker with a blown limiter indicator visible from the front of the breaker, and with an anti-single phase device which will trip the breaker when any limiter blows, and which will prevent reclosing the breaker on a single phase condition resulting from blown or missing limiters.)

The following equipment shall be provided:

(1)(2) — Type DS-______ main breaker(s), ______ ampere frame (2) (3) pole, (manually) (electrically) operated. Set trip at ______ amperes.

— Type DS-______ tie breaker, ______ ampere frame, (2) (3) pole, (manually) (electrically) operated. Set trip at ______ amperes.

— Type DS-______ feeder breaker(s), ______ ampere frame, (2) (3) pole, (manually) (electrically) operated. Set trip at ______ amperes.

— Type DS-______ feeder breaker(s), ampere frame, (2) (3) pole, (manually) (electrically) operated. Set trip at ______ amperes.

Metering Components (Main Bus)

(1)(2) — Voltmeter and 3-phase selector switch with OFF position.

(1)(2) — Ammeter and 3-phase selector switch with OFF position.

(1)(2) — Watthour meter, (2) (2½) (3) element type, (with) (without) (15 minute) (30 minute) demand register.

— Current transformer, suitable ratio.

— Potential transformer, suitable ratio.

Feeder Circuits

— Ammeter and 3-phase selector switch with OFF position.

— Current transformer, suitable ratio.

A portable testing and calibration device shall be provided.

* — ( ) indicates a selection is to be made for quantity or applicability.

POWER-ZONE® LOAD CENTER UNIT SUBSTATIONS

SPECIFICATIONS

Low Voltage Section (With MCDO II Switchboards)

General

The specifications and associated drawings describe the indoor Low Voltage Metal-Enclosed Drawout Switchboard Assembly. The assembly is to be designed for use on a ______ volt, (single) (3) phase, ______ wire, (50) (60) Hz. system, with ______ amperes symmetrical fault current available.

The switchboard shall be MCDO II Drawout Insulated Case Circuit Breaker Switchboard, as manufactured by the Square D Company, or approved equal, designed, manufactured and tested in accordance with UL 891 and NEMA PB 2 Standards for circuit breakers and metal-enclosed switchboards. (Equipment shall be equipped with (UL) (service entrance) label where qualified. Front and rear accessibility shall be required.

Enclosure

The enclosure and internal barriers shall be fabricated of steel members in accordance with UL and NEMA Standards. The enclosure construction shall prevent the entry of rodents into the switchgear interior. Ventilation openings on the swichboard are to be located in such a way as to preclude the possibility of metal objects being inserted through them and easily contacting energized parts. The enclosure shall be finished with medium gray ANSI #49 enamel applied over a rust inhibiting phosphate primer.

The structure is to consist of three basic compartments from front to rear: the Front Breaker Compartment, the Center Bus Compartment, and the Rear Cable Compartment.

The front compartment is to contain the drawout circuit breaker elements, each mounted in its own barriered cell. Active or future use cells equipped to accept circuit breakers are to be complete. Provide each breaker cell with a hinged steel door equipped with a flush chrome finish handle and an external trip operator. Horizontal steel barriers shall separate breakers in a common section.

The bus compartment is to contain the section riser and main cross bus which is to be rated for a 65° Centigrade temperature rise. The main cross bus shall be rated for ______ continuous amperes. All main and riser bus is to be (aluminum) (copper) and be adequately braced to withstand the short circuit of ______ symmetrical amperes. When the cross bus is split for shipping purposes, all contact surfaces at the joint shall be plated and the joint bolts are to be of high strength grade 5 steel equipped with Belleville type spring washers. All electrical clearances are to be for 600 volts ac. (An isolated neutral bus is to be supplied rated at (50) (100) percent of the phase current.)

Size the cable compartment to accommodate all incoming and outgoing cables required within each vertical switchboard section. Cable lugs are to be mounted on the load side (or line side as applicable) phase (and neutral) run-back bus which is extended into this compartment from the bus compartment. This compartment shall also contain a plated (aluminum) (copper) ground bus. The incoming line and center bus compartments shall be barriered from the rear cable compartment.

Circuit Breakers

The circuit breakers shall be of the drawout type, manually or electrically operated type as shown on the associated drawings or as listed in the equipment tabulation. The breakers are to mount on a rigid, self-aligning drawout mechanism with "connected", "test/disconnected" and "remove" positions. The front door shall be capable of being closed in all positions. Secondary control connections shall be through a multi-point semi-automatic control connector. Provide interlocks to insure the breaker is open before it can be moved from any position or when it is between positions.

The circuit breaker trip device is to be of a solid-state design and is provided with an adjustable long-time delay, instantaneous (and short-time delay) over-current/short circuit protection. (Include ground fault tripping as an integral part of the solid-state trip device where shown.) Provisions for testing shall be provided. (Indicators for overload, short circuit, or ground trip shall be provided.)

The breaker operating mechanism is to be of the two-step stored energy quick-make, quick-break type. First step operation of the charging handle or breaker motor is to charge the closing springs. A second step operation of a local "close" button is to close the breaker contacts. Closing of the breaker contacts shall automatically charge the opening springs to insure quick-break operation. Padlocking provisions shall be furnished to receive up to three padlocks when the breaker is in the open position, positively preventing unauthorized closing of the breaker contacts.

(A portable testing device shall be provided.)

(A top monted travelling breaker listing device shall be provided.)

SPECIFICATIONS

Low Voltage Section (With MCDO Switchboards)

General

Furnish and install the circuit breaker distribution switchboard as herein specified and shown on the associated electrical drawings. The switchboard(s) shall meet the latest requirements of Underwriters' Laboratories Standard #891, NEMA PB-2 and the National Electrical Code. The switchboard(s) shall be furnished with an Underwriters' Laboratories Label.

Enclosure Construction

The switchboard shall be dead front with front and rear accessibility required. The switchboard framework shall consist of a completely self-supporting structure with steel channels welded or bolted to the frame to rigidly support the entire shipping section for moving on rollers or floor mounting. The framework is to be of formed code gauge steel, rigidly welded and bolted together to support all cover plates, bussing, and component devices during shipment and installation.

Each switchboard section shall have an open bottom and an individually removable top plate for installation and termination of conduit. Top and bottom conduit areas are to be clearly shown and dimensioned on the shop drawings.

All front covers over the circuit breakers shall be hinged with removable hinge pins. All closure plates shall be screw removable and small enough for easy handling. The paint finish shall be medium gray ANSI #49 enamel over a rust inhibiting phosphate pre-treatment.

Bussing

The switchboard bussing shall be (tin plated aluminum) (plated copper) of sufficient cross sectional area to continuously conduct rated full load current without exceeding the maximum temperature rise limits set by Underwriters' Laboratories Dead-Front Switchboard Standard, #891.

The main horizontal bussing shall consist of vertically stacked conductors in a plane parallel to the front of the switchboard. Vertical and horizontal bussing compartment shall be isolated. With all insulation barriers in place, there shall be free air space between horizontal and vertical bussing. Bussing connection and support bolts shall be accessible for periodic maintenance. Vertical bussing bolts shall have captive heads with break-away torque caps.

The main horizontal bus bar shall be located in the middle of the switchboard section vertically stacked with ABC bus arrangement top to bottom. The main bus compartment will be completely barriered from the rest of the switchboard. Switchboards of more than one shipping section shall be provided with spliced bars of a rating equivalent to the main bus rating with Grade 5 hardness bolts, nuts, Belleville washers and installation instructions.

The maximum short circuit current rating shall be 100,000 RMS symmetrical amperes of fault current at 600 VAC.

A ground bus and lug shall be firmly secured to each switchboard section and shall extend the entire length of the switchboard.

Load side bus bars shall extend to the rear of the switchboard and shall be fully insulated. The load side lug compartment shall be designed so that it is not necessary to reach across or near any line side bus bars or connections. Load side lugs shall be marked with appropriate phase identification.

The main lug compartment, where furnished, shall be barriered from the line side bussing and circuit breaker compartment. Lug pads shall be tin plated and shall be suitable for either copper or aluminum (mechanical) (crimp) lugs mounted on the pads.

(Provisions shall be available when busway is used as the incoming service.)

Circuit Breaker Compartment

Each circuit breaker shall be individually isolated in its own compartment. All circuit breakers shall be draw-out mounted with standard trip on removal. There shall be no exposed live components in the circuit breaker compartment. Line and load connections up to 800A will utilize LoRes™ connectors.

NOTE: When more than one option or feature is available, the choice can be made by selecting the appropriate word(s) or number(s) in the parentheses and crossing out the rest.

POWER-ZONE®
LOAD CENTER UNIT SUBSTATIONS

SPECIFICATIONS

Low Voltage Section
(With Power Style Switchboards)

The low voltage section shall terminate the outgoing feeder cables and contain the circuit protective devices, metering equipment, and auxiliary components described herein and on the drawings.

All low voltage bussing, devices, and connections shall be braced to withstand the maximum short circuit current available from the transformer.

Short Circuit Current Rating

Each switchboard as a complete unit, shall be given a single short circuit current rating by the manufacturer. Such rating shall be established by actual tests by the manufacturer, in accordance with UL specifications, on equipment constructed similarly to the subject switchboard.

Enclosure Construction

The switchboard shall be dead-front with (front and rear accessibility) (front accessibility) required. The switchboard framework shall consist of steel channels bolted to the frame to rigidly support the entire shipping section for floor mounting or moving on rollers. The framework is to be formed of code gauge steel, rigidly welded and bolted together to support all cover plates, bussing and component devices.

Each section shall have an open button and an individual removable top plate for installation and termination of conduit. Top and bottom conduit areas are to be clearly shown and dimensioned on the shop drawings. The wireway front covers shall be hinged to permit easy access to the branch fusible switch load side terminals. The paint finish shall be medium light gray, ANSI #49.

(A NEMA 3R enclosure for the switchboard shall be provided.)

Bussing

The switchboard bussing shall be sufficient cross-sectional area to meet UL Standard 891 on temperature rise. Through bus shall be (plated copper) (plated aluminum) (extruded aluminum plated by the Alstan 70 or 80* process) the through bus shall have an ampacity of (1200) (2000) (3000) (4000) (5000) (copper only) amperes and shall be braced to have a short circuit rating of (50,000) (100,000) (200,000) RMS symmetrical amperes. (The through bus shall have provisions for the addition of future sections.) The through bus supports, connections and joints are to be bolted with hex head bolts and belleville washers to minimize maintenance requirements.

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Select appropriate device specification, as listed below:

Protective Devices

DEVICE	CIRCUIT BREAKER	FUSIBLE SWITCH
Main Devices	A, B	C
Tie	A, B	C
Branch Feeder	B, D	C, E

A) Stored Energy Solid State Trip Circuit Breakers (main or tie only).

The circuit breaker shall be of the (fixed mounted) (drawout type), (manually) (electrically) operated as shown on the associated drawings or as listed in the equipment tabulation. The breaker operating mechanism is to be of the two-step stored energy quick-make, quick-break type. First step operation of the charging handle or breaker motor is to charge the closing springs. A second step operation of a local "close" button is to close the breaker contacts. Closing of the breaker contacts shall automatically charge the opening springs to insure quick-break operation. The trip unit shall be provided with (L,S) (L,S,I) (L,I) (L,S,G) (L,S,I,G) (L,I,G) adjustable parameters.

B) Molded Case Circuit Breakers (main, tie or feeder).

The circuit breakers shall be individually mounted with a (thermal magnetic) (electronic) trip device. Each breaker is to be furnished with an externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the circuit breaker trip mechanism to operate as well as to exercise the circuit breaker operating mechanism. The electronic trip version shall be provided with (L,S,I) (L,S,I,G) trip parameters.

C) Bolted Pressure Contact Switches (Main or Tie)

The (main switch) (main and branch switches) shall be of the fusible bolted pressure contact type with ratings as shown on the associated drawings.

Pressure contacts are to be made by firmly bolting blades to both top and bottom stationary contacts. The switches shall have quick-break kinematic-action mechanisms, inter-phase barriers and arcing equipment. (Switches shall be manually operated and have an electric trip mechanism which is piloted by the output of ground fault sensing circuitry. Power for the electric trip circuit shall be obtained from a control transformer connected from phase to phase on the line side of the switch. The electric trip coil shall be designed to operate at 55% of rated voltage.

In accordance with UL Standard 977, switches shall have an interrupting rating of 12 times the continuous rating. The operating mechanism shall permit closure of the switch only after the opening mechanism has

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SPECIFICATIONS

been charged, to assure that the electrical tripping means shall immediately be in a condition to open the switch. Switches shall be Bolt-Loc as manufactured by Square D Company.

D) Circuit Breakers (Feeder Only)

Group mounted molded case circuit breakers are to be totally front accessible. The circuit breakers are to be mounted in the switchboard to permit installation, maintenance and testing without reaching over any line side bussing. The circuit breakers are to be removable by the disconnection of only the load side cable terminations and all line and load side connections are to be individual to each circuit breaker. No common mounting brackets or electrical bus connectors will be acceptable. Line side circuit breaker connections are to be jaw type plug-on.

Each circuit breaker is to be furnished with an externally operable mechanical means to trip the circuit breaker, enabling maintenance personnel to verify the ability of the circuit breaker trip mechanism to operate as well as exercise the circuit breaker operating mechanisms.

E) Fusible Switches

The fusible switches shall be quick-make, quick-break and shall be group mounted in panel-type construction. Switches of 30-200 amperes shall have plug-on line side connections and shall have built in fuse pullers (30-100A units). Each switch is to be contained in a separate steel enclosure. The enclosure will employ a hinged cover for access to the fuses which will be interlocked with the operating handle to prevent opening the cover when the switch is in the "On" position. This interlock shall be constructed so that it can be released with a standard electrician's tool for testing fuses without interrupting service. The units shall have padlocking provisions in the "Off" position and the operating handle position shall give positive indication, ie.: red for "On" and black for "Off". Switches shall pass industry standard I^2t withstandability tests and fuse tests as described elsewhere in the specifications.

F) Ground Fault Relays (applies to device specifications B — thermal magnetic only, C and D, as stated above.)

The ground fault protection system shall include a current sensor and appropriate relaying equipment. The current sensor shall enclose all phase (and neutral, if present) conductors of the circuit to be monitored. The current sensor shall be so constructed that one leg can be opened to allow removal of the sensor without disturbing the cables or requiring drop-links in the bussing. A test winding shall be provided to simulate the flow of ground fault current through the current sensor, in order to test the complete system, including sensor pick-up, relaying equipment and electric trip mechanism of the switch.

The ground fault relay shall be solid state construction and have adjustable pick-up for ground fault currents from 200 amperes to 1200 amperes. Settings for individual relays shall be (as shown on the plans) (______ amperes). Time delay provided by the ground fault relay circuitry shall be nominally (.1 second) (.2 second) (.3 second) (.5 second) and shall be permanently calibrated to preclude tampering with after installation.

The following secondary equipment shall be provided:

______ Type (MA) (ME) (MH) (PA) (PC) (PE) (PH) (SE) main circuit breaker, ________ ampere frame (2) (3) pole: interrupting capacity _____ A. Symmetrical at system voltage.

______ Type (FA) (FH) (KA) (KH) (LA) (LH) (MA) (ME) (MH) (PA) (PC) (PE) (PH) (SE) feeder circuit breaker, ________ ampere frame, (2) (3) pole: interrupting capacity ______A. Symmetrical at system voltage.

______ ______A/(2) (3) pole (main) (feeder) bolt-loc bolted-pressure contact fusible switch.

______ ________A/(2) (3) pole feeder QMB fusible switch.

METERING COMPONENTS

(1)(2) — Voltmeters and 3-phase selector switch with "Off" position.

(1)(2) — Ammeter and 3-phase selector switch with "Off" position.

(1)(2) — Watthour meter (2) (2½) (3) element type (with) (without) demand register.

______ ______ Current transformer, suitable ratio.

______ ______ Potential transformer, suitable ratio.

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