KS-15696, KS-15698, KS-21861, AND KS-21862
BUS DUCTS
APPLICATION AND MAINTENANCE PROCEDURES

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1. GENERAL

1.01 This section covers the application and maintenance of the KS-15696, KS-15698, KS-21861, KS-21862 bus ducts and their associated plug-in units.

1.02 This section is reissued for the following reasons:

(1) To revise Table R to include additional extension ducts with openings on 6-inch centers.

(2) To add a warning to paragraph 3.03 concerning plug-ins.

(3) To add information on Feeder Bus Ducts and Horizontal and Vertical Elbows.

Revision arrows have been used to indicate significant changes. This reissue does not affect the Equipment Test List.

1.03 The equipment covered by this section (Tables A through V) is used to supply commercial power to motor-generator sets, rectifiers and associated equipment. Arrangements are provided for distributing 3-phase 3-wire and 3-phase 4-wire power service up to 480-volts. A separate grounding conductor is provided in all equipment. Cable tap boxes are provided for connecting power to the duct bus bars. Covered openings at regular intervals in the bus duct enclosure provide access to the bus bars for making electrical connections by means of contact fingers on the plug-in units. The plug-in units consist of a housing for a protective device which may be either a switch and fuse or circuit breaker type. Clamping devices are provided for attaching plug-in units to the bus duct and the bus duct to the auxiliary framing.

1.04 The KS-21861 (copper) and KS-21862 (aluminum) bus ducts are improved units for replacement of KS-15696 and KS-15698 bus ducts on initial installations. The KS-15696 bus duct has been rated Mfr Disc. except for plug-in units (Tables L and O) which are available to permit growth usage of existing bus duct installations. KS-21861 extension ducts and joint covers for use with existing KS-15696 are listed in Tables R and S.

1.05 The bus ducts are designed for use on the No. 100, 300, and 700 type plants having more than three charging units. For additional information, refer to Section 802-005-150.

TABLE A

BUS DUCT — KS-21861 AND KS-21862

LIST NO.				AMPERE RATING
12" PLUG-IN OPENING		6" PLUG-IN OPENING		
3ϕ-3W	3ϕ-4W	3ϕ-3W	3ϕ-4W	
301		601		400
302		602		600
303		603		800
304		604		1000
305	405	605	705	400
306	406	606	706	600
307	407	607	707	800
308	408	608	708	800
309	409	609	709	400
310	410	610	710	600
311	411	611	711	800
312	412	612	712	1000

See Fig. 1 for typical Bus Duct.

TABLE B

BUS DUCT — KS-15698

LIST NO.				AMPERE RATING
3W	4W	3W - W/GRD	4W - W/GRD	
1	201	1G	201G	400
2	202	2G	202G	600
3	203	3G	203G	800
4	204	4G	204G	1000
5	205	5G	205G	400
6	206	6G	206G	600
7	207	7G	207G	800
8	208	8G	208G	1000
9	209	9G	209G	400
10	210	10G	210G	600
11	211	11G	211G	800
12	212	12G	212G	1000

TABLE C

END CLOSURE — KS-21861

LIST NO.		AMPERE RATING
COUPLING END	OPEN END	
61 62	63 64	400 & 600 800 & 1000

See Fig. 2 for typical End Closure.

TABLE D

END CLOSURE — KS-21862

LIST NO.		AMPERE RATING
COUPLING END	OPEN END	
61 62 63	64 65 66	400 600 & 800 1000

See Fig. 2 for typical End Closure.

TABLE E

CENTER TAP BOX — KS-21861 AND KS-21862

LIST NO.		AMPERE RATING	ASSOC. DUCT. AMPERE RATING
3ϕ-3W	3ϕ-4W		
331 332 333 334	431 432 433 434	800 1200 1600 2000	400 600 800 1000

See Fig. 3 for typical Center Tap Box.

TABLE F

END TAP BOX — KS-21861 AND KS-21862

OPEN END DUCT		COUPLING END DUCT		
LIST NO.		LIST NO.		
3ϕ—3W	3ϕ—4W	3ϕ—3W	3ϕ—4W	AMPERE RATING
341	441	345	445	400
342	442	346	446	600
343	443	347	447	800
344	444	348	448	1000

See Fig. 4 for Typical End Tap Box.

TABLE G

FEED THROUGH TAP BOX — KS-15698

LIST NO.				BOX CAP AMP	BUS CAP AMP
3W	4W	3W-W/GRD	4W-W/GRD		
71	271	71G	271G	600	600
72	272	72G	272G	1500	600
73	273	73G	273G	1500	800
74	274	74G	274G	2000	800
75	275	75G	275G	2000	1000

TABLE H

SECTION TAP BOX — KS-15698
(LUGS NEAR FORMED END OF BUS BAR)

LIST NO.				BOX CAP AMPS	BUS CAP AMPS
3W	4W	3W-W/GRD	4W-W/GRD		
31	231	31G	231G	1200	400
32	232	32G	232G	1200	600
33	233	33G	233G	1200	800
34	234	34G	234G	1200	1000

TABLE I

SECTION TAP BOX — KS-15698
(LUGS NEAR STRAIGHT END OF BUS BAR)

LIST NO.				BOX CAP AMPS	BUS CAP AMPS
3W	4W	3W-W/GRD	4W-W/GRD		
35	235	35G	235G	1200	400
36	236	36G	236G	1200	600
37	237	37G	237G	1200	800
38	238	38G	238G	1200	1000

TABLE J

END TAP BOX — KS-15698

LIST NO.								AMPERE RATING
FORMED END				STRAIGHT END				
3W	4W	3W-W/GRD	4W-W/GRD	3W	4W	3W-W/GRD	4W-W/GRD	
41	241	41G	241G	46	246	46G	246G	600
42	242	42G	242G	47	247	47G	247G	800
43	243	43G	243G	48	248	48G	248G	1000

TABLE K

CIRCUIT BREAKER PLUG-IN UNITS
KS-21861 AND KS-21862

LIST NO.	RATING		CIRCUIT BREAKERS	
3ø-3W	VOLTS	AMPS	NO.	AMPS (EA.)
351	240	100	4	15
353	240	100	4	30
354	240	200	4	50
355	240	200	2	90
356	240	200	2	100
357	480	100	4	15
358	480	200	4	30
359	480	100	2	50
360	480	200	2	100
361	240	450	1	225
362	240	450	2	225

See Fig. 5 for typical Circuit Breaker Plug-in Unit.

TABLE L

CIRCUIT BREAKER PLUG-IN UNITS — KS-15696

LIST NO.	RATING		CIRCUIT BREAKER	
	VOLTS	AMPS	QTY	AMPS (EA.)
361A	480	450	1	225
362A	480	450	2	225
363A	480	200	2	100
451A	250	100	4	15
452A	250	100	4	30
453A	250	200	4	50
454A	250	200	2	90
455A	480	100	4	15
456A	480	100	2	50
457A	480	200	4	30

TABLE M

CIRCUIT BREAKER PLUG-IN UNITS — KS-15698

LIST NO.		FIG. NO.	RATING		CIRCUIT BREAKER	
NO. GRD	WITH GRD		VOLT	AMP	NO.	AMP (EA.)
501	501G	5	250 EQB	100	4	25
502	502G					
503	503G					15
504	504G					
505	505G		480 EH			
506	506G					
507	507G					10
508	508G					
509	509G					30
510	510G					
511	511G			200		
512	512G		250 EQB			
513	513G					50
514	514G					
551	551G				2	90
552	552G					
553	553G		480 EH	100		45
554	554G					

TABLE N

SWITCH AND FUSE PLUG-IN UNITS KS-21861 AND KS-21862

LIST NO.		RATING	
3ø-3W	3ø-4W	VOLTS	AMPS
371	—	240	30
372	—	240	60
373	—	240	100
374	474	240	200
375	475	240	400
376	—	480	30
377	—	480	60
378	—	480	100
379	—	480	200
380	—	480	400

See Fig. 6 for typical Switch and Fuse Plug-in Unit.

TABLE O

PLUG-IN SWITCH UNITS KS-15696

LIST NO.	RATING	
	VOLTS	AMPS
471A	250	30
472A	250	60
473A	250	100
474A	250	200
475A	250	400
476A	600	30
477A	600	60
478A	600	100
479A	600	200
480A	600	400

TABLE P

PLUG-IN SWITCH UNITS — KS-15698

LIST NO.				LIST NO.				LIST NO.				LIST NO.				AMPERE RATING	HP RATING	
3 WIRE				4 WIRE				3 WIRE PLUS GRD				4 WIRE PLUS GRD						
250V	480V	250V	480V	250V	480V	250V	480V	250V	480V	250V	480V	250V	480V	250V	480V		NOM	LABEL
51		351		251		651		51G		351G		251G		651G		30	3	7-½
	151		451		751		851		151G		451G		751G		851G		5	15
52		352		252		652		52G		352G		252G		652G		60	7-½	15
	152		452		752		852		152G		452G		752G		852G		15	30
53		353		253		653		53G		353G		253G		653G		100	15	30
	153		453		753		853		153G		453G		753G		853G		25	60
54		354		254		654		54G		354G		254G		654G		200	25	60
	154		454		754		854		154G		454G		754G		854G		50	100
55		355		255		655		55G		355G		255G		655G		400	50	100
	155		455		755		855		155G		455G		755G		855G		100	—

TABLE Q

CHANNEL SPACER KIT — KS-15698

LIST NO.	APPLICATION
250	For 800 Amp and Larger Bus Ducts

→ TABLE R ←

KS-21861 EXTENSION DUCTS FOR USE WITH KS-15696 DUCTS

LIST NO.						DUCT LGTH.	AMP	NO. PLUG-IN OPENINGS		CONN. END	CONNECTING KS-15696 DUCTS LIST NO.		
3W		3W-W/GRD		4W									
6-INCH*	12-INCH*	6-INCH*	12-INCH*	6-INCH*	12-INCH*	(FT)	RATING	6-INCH*	12-INCH*	TYPE	3W	3W-W/GRD	4W
3056 HC	305 HC	3056 GC	305GC	4056 NC	405 NC	8	400	13	7		1PH 5PH 9PH	1PG 5PG 9PG	201PH 205PH 209PH
3096 HC	309 HC	3096 HC	309GC	4096 NC	409 NC	5	400	7	4				
3066 HC	306 HC	3066 GC	306 GC	4066 NC	406 NC	8	600	13	7	COUPLING END	2PH 6PH 10PH	2PG 6PG 10PG	202PH 206PH 210PH
3106 HC	310 HC	3106 GC	310 GC	4106 NC	410 NC	5	600	7	4				
3076 HC	307 HC	3076 GC	307 GC	4076 NC	407 NC	8	800	13	7		3PH 7PH 11PH	3PG 7PG 11PG	203PH 207PH 211PH
3116 HC	311 HC	3116 GC	311 GC	4116 NC	411 NC	5	800	7	4				
3086 HC	308 HC	3086 GC	308 GC	4086 NC	408 NC	8	1000	13	7		4PH 8PH 12PH	4PG 8PG 12PG	204PH 208PH 212PH
3126 HC	312 HC	3126 GC	312 GC	4126 NC	412 NC	5	1000	7	4				
3056 HO	305 HO	3056 GO	305 GO	4056 NO	405 NO	8	400	13	7		1PH 5PH 9PH	1PG 5PG 9PG	201PH 205PH 209PH
3096 HO	309 HO	3096 GO	309 GO	4096 NO	409 NO	5	400	7	4				
3066 HO	306 HO	3066 GO	306 GO	4066 NO	406 NO	8	600	13	7	OPEN END	2PH 6PH 10PH	2PG 6PG 10PG	202PH 206PH 210PH
3106 HO	310 HO	3106 GC	310 GO	4106 NO	410 NO	5	600	7	4				
3076 HO	307 HO	3076 GO	307 GO	4076 NO	407 NO	8	800	13	7		3PH 7PH 11PH	3PG 7PG 11PG	203PH 207PH 211PH
3116 HO	311 HO	3116 GO	311 GO	4116 NO	411 NO	5	800	7	4				
3086 HO	308 HO	3086 GO	308 GO	4086 NO	408 NO	8	1000	13	7		4PH 8PH 12PH	4PG 8PG 12PG	204PH 208PH 212PH
3126 HO	312 HO	3126 GO	312 GO	4126 NO	412 NO	5	1000	7	4				

* Plug-in Opening Centers

TABLE S

KS-21861 JOINT COVERS

LIST NO	DUCT AMP	DUCT TYPE
21A	400 & 600	3W & 4W
22A	800 & 1000	3W & 4W
23A	400 & 600	3W-W/GRD
24A	800 & 1000	3W-W/GRD

TABLE T

KS-21861 AND KS-21862 FEEDER BUS DUCTS

LIST NO.			DIMENSIONS		
			HEIGHT IN.		LENGTH
3Ø 3W	3Ø 4W	AMP	KS-21861	KS-21862	IN.
301F	401F	400	4⅛	4⅛	120
302F	402F	600		6⅛	
303F	403F	800	6⅛		
304F	404F	1000		8⅛	
305F	405F	400	4⅛	4⅛	96
306F	406F	600		6⅛	
307F	407F	800	6⅛		
308F	408F	1000		8⅛	
309F	409F	400	4⅛	4⅛	60
310F	410F	600		6⅛	
311F	411F	800	6⅛		
312F	412F	1000		8⅛	

See Fig. 7 for Details.

TABLE U

KS-21861 AND KS-21862 HORIZONTAL ELBOWS

LIST NO.		AMP	TYPE	DIMENSIONS	
3Ø 3W	3Ø 4W			A	B
31 RL	41 RL	400	Right Hand	To Be Specified In Order (Min-1'6")	
32 RL	42 RL	600			
33 RL	43 RL	800			
34 RL	44 RL	1000			
31 LL	41 LL	400	Left Hand		
32 LL	42 LL	600			
33 LL	43 LL	800			
34 LL	44 LL	1000			

See Fig. 8 for Details.

TABLE V

KS-21861 AND KS-21862 VERTICAL ELBOWS

LIST NO.		AMP	TYPE	DIMENSIONS	
3Ø 3W	3Ø 4W			A	B
31 UL	41 UL	400	Vert Up	To Be Specified In Order (Min-1'6")	
32 UL	42 UL	600			
33 UL	43 UL	800			
34 UL	44 UL	1000			
31 DL	41 DL	400	Vert Down		
32 DL	42 DL	600			
33 DL	43 DL	800			
34 DL	44 DL	1000			

See Fig. 9 for Details.

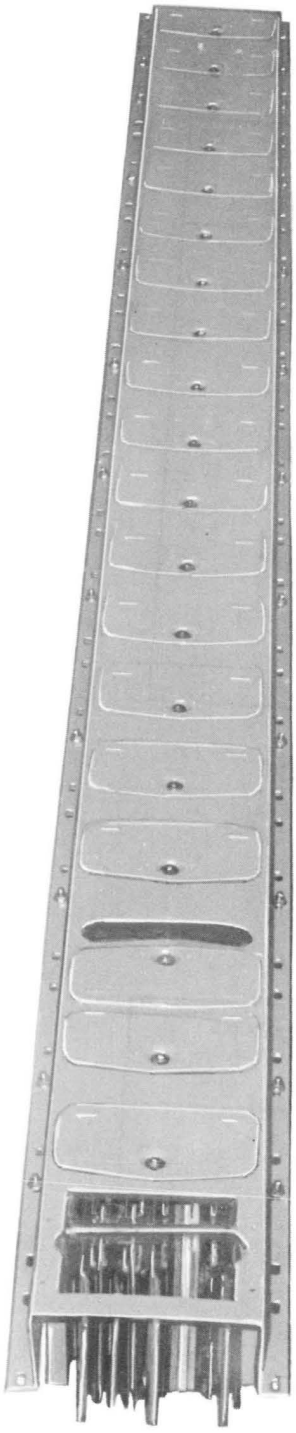

Fig. 1—KS-21861 and KS-21862 Bus Duct

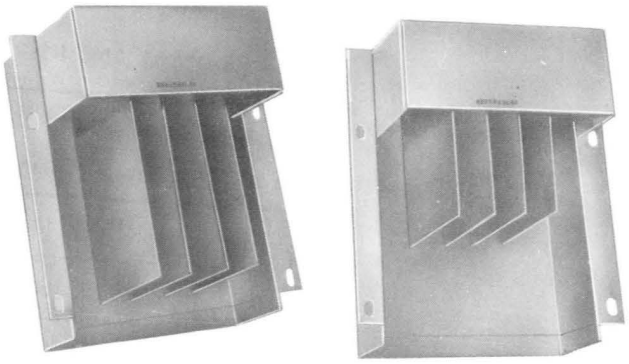

Fig. 2—End Closures

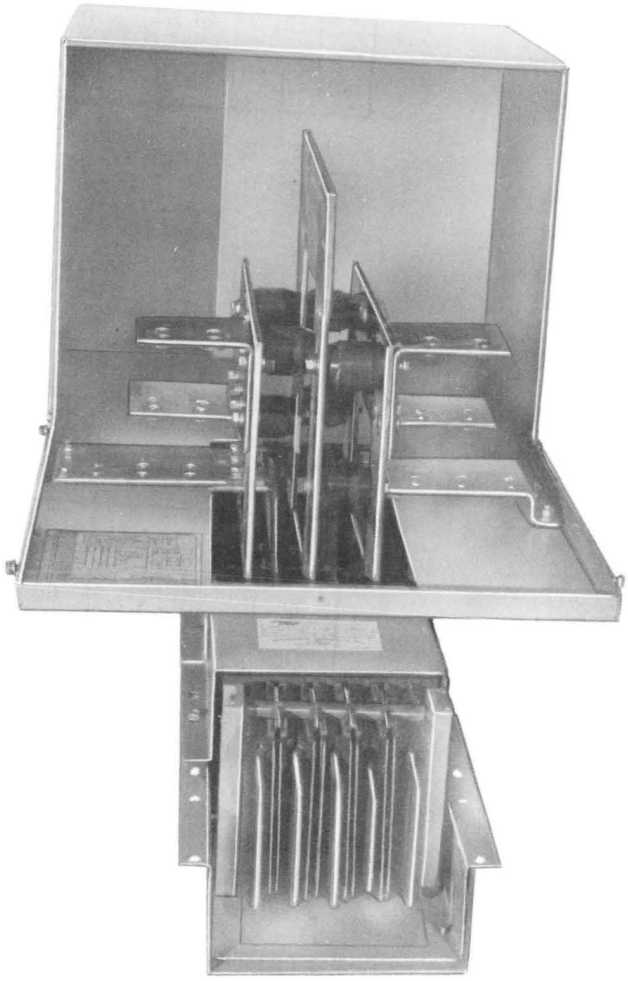

Fig. 3—Center Tap Box—Internal View

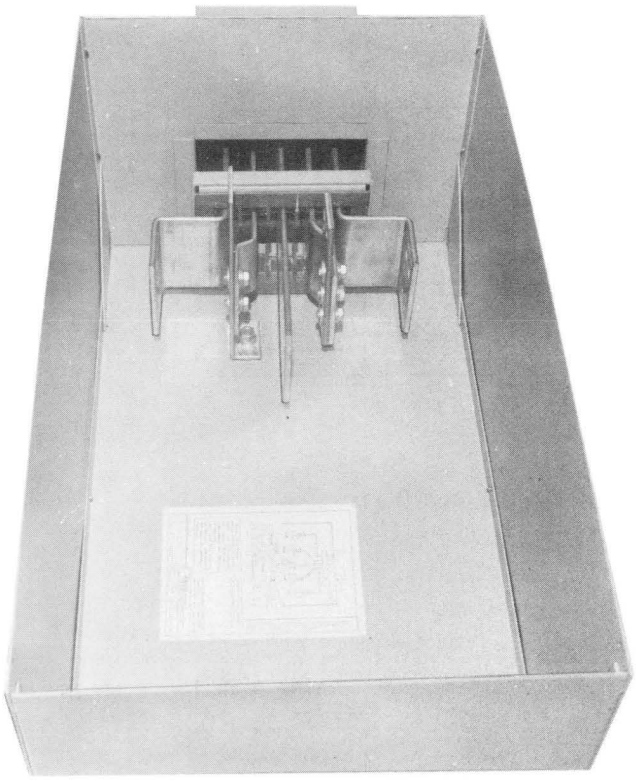

Fig. 4—End Tap Box—Internal View

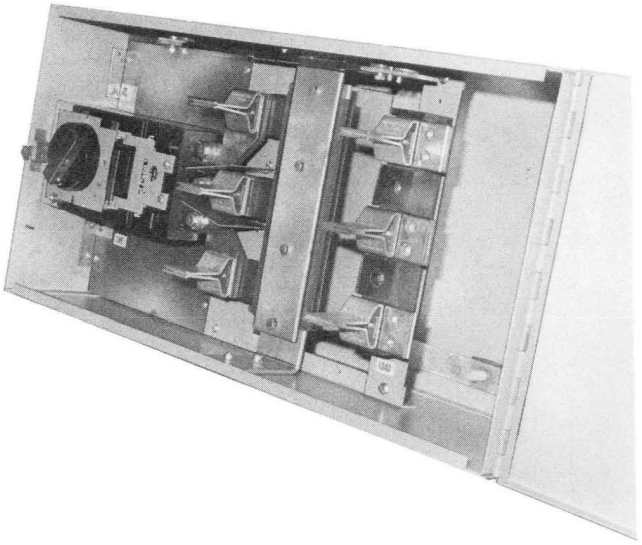

Fig. 6—Switch and Fuse Plug-in Unit—Internal View

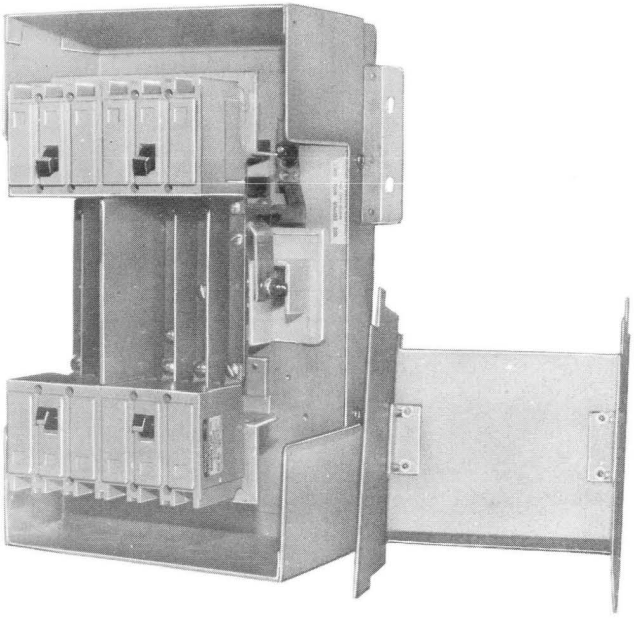

Fig. 5—Circuit Breaker Plug-in Unit—Internal View

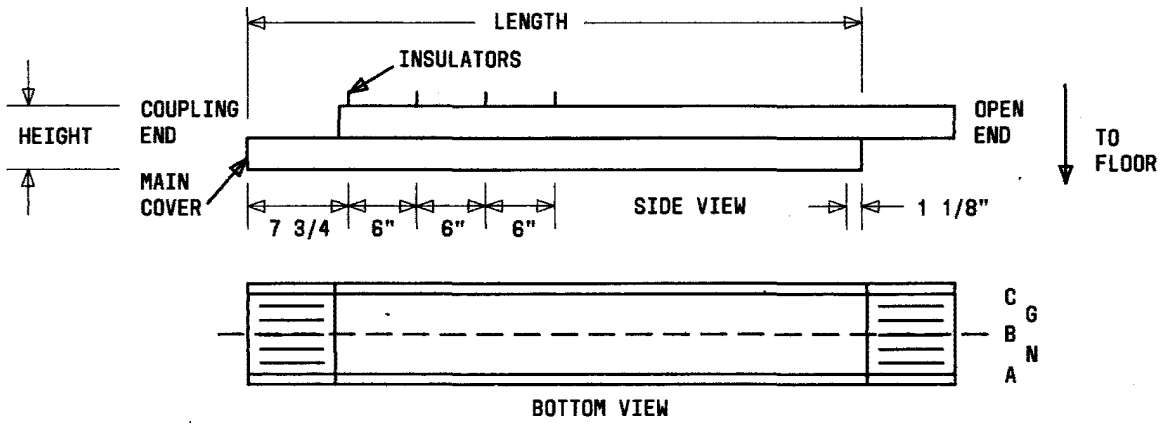

Fig. 7—KS-21861 and KS-21862 Feeder Bus Ducts

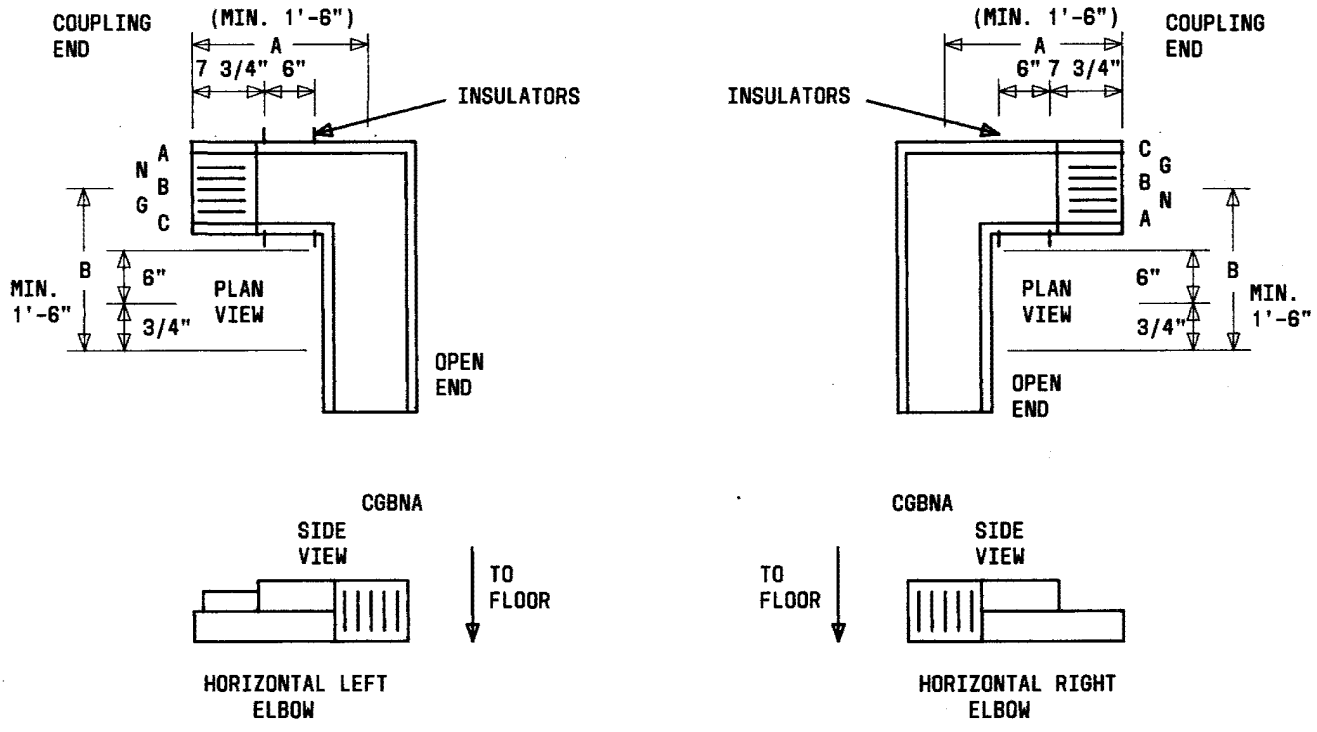

Fig. 8—KS-21861 and KS-21862 Horizonal Elbows

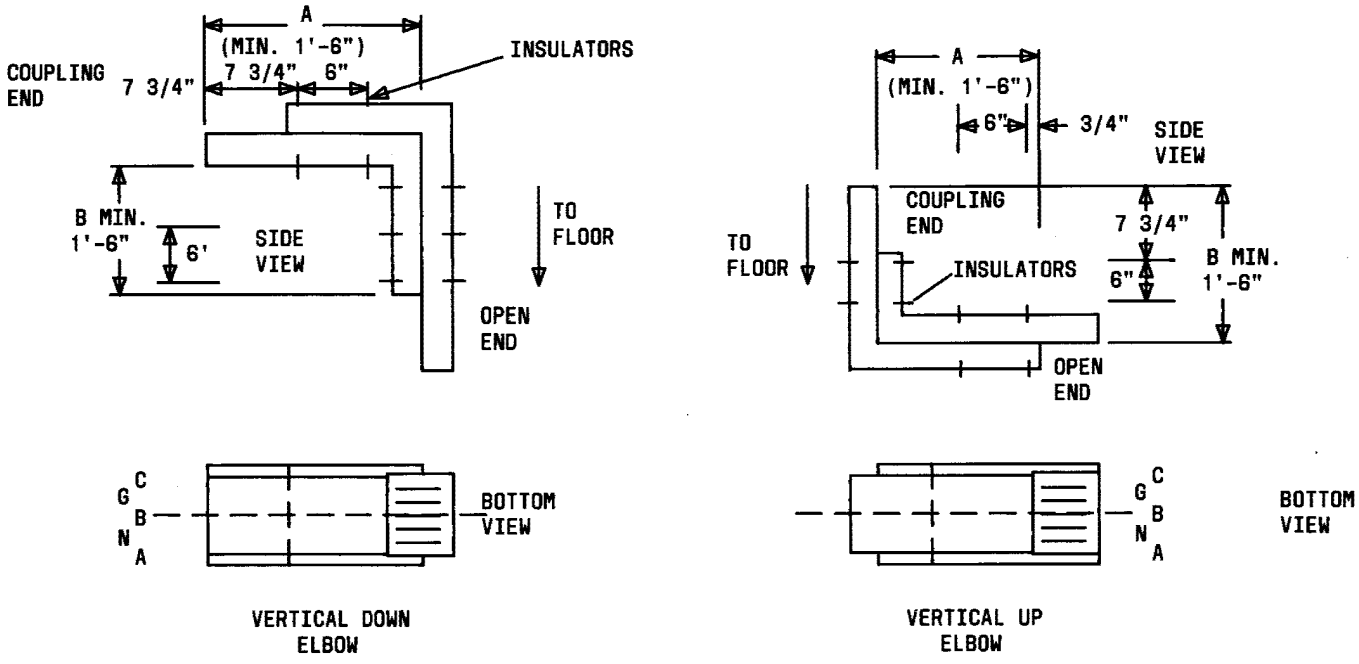

Fig. 9—KS-21861 and KS-21862 Vertical Elbows

2. APPARATUS

2.01 *List of Tools, Materials, and Test Equipment*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-2993	Brush (or equivalent)
KS-14377, L5	Vacuum cleaner (or equivalent) equipped with a KS-14377, L30 flexible nozzle (or equivalent)
MATERIALS	
KS-2423	Twill Cloth
—	NO-OX-ID Grade A Compound
TEST EQUIPMENT	
—	Megger (500-volts)

3. INSPECTION AND MAINTENANCE

3.01 Although bus ducts are built for long, trouble-free service, they should be given periodic check-outs. An annual maintenance check is recommended, but more frequent inspections may be necessary under adverse environmental conditions.

BUS DUCTS

3.02 Inspection and maintenance procedures for bus ducts are as follow:

(a) Remove appreciable accumulations of dust or dirt using a brush, vacuum cleaner, or lint-free rags. Do not use blowers or compressed air for cleaning.

(b) Inspect all visible or accessible electrical joint connections for evidence of overheating.

(c) Check tightness of all joint fasteners. (KS-21861 and KS-21862 bus duct joint fasteners are not "live" and may be checked without turning off power).

(d) Disassemble and replace or clean joints or terminations which are badly discolored, corroded, or pitted, or show evidence of having been subjected to high temperatures.

Caution: Do not remove plating on aluminum parts in joints or terminations. Damaged aluminum parts should normally be replaced.

(e) Perform insulation resistance test as follows:

(1) Turn OFF all tap-off and/or plug-in devices.

(2) Isolate the bus by disconnecting all connections to transformers, switchboards, meters, etc.

(3) Using megger (at least 500-volts) check for short circuits and grounds.

Note: Megger (megohm) readings vary inversely with the length of run and width or number of bars per phase. Readings will also vary with humidity. Readings of less than 1 megohm for a 100-foot run should be investigated.

PLUG-IN UNITS

Danger: Remove entire circuit breaker plug-in, or shut bus down during breaker replacement. Fuse plug-in units may be serviced, provided the switch is in the "OFF" position and a check made, with a meter, to confirm that no potential is on the fuse terminals.

3.03 Inspection and maintenance procedures for plug-in units are as follows:

(a) Examine fuse clips for signs of overheating and looseness. Replace fuse clips if spring pressure is insufficient.

(b) Examine insulating materials for signs of deterioration and sealing compounds for signs of melting. Replace insulating parts and assemblies when the sealing compound has melted.

(c) Examine all contact areas for evidence of contamination or corrosion. Sand contaminated or corroded areas lightly and coat with NO-OX-ID Grade A compound.

(d) Check the operation of all mechanical components as follows:

Note: Verify that spares are available prior to the removal of any defective devices.

(1) Check all switch operator mechanisms and external operators of circuit breakers. Make sure each operator mechanism quickly and positively throws contacts fully ON and fully OFF.

WARNING: Verify that circuit breakers which have been tripped due to violent operation are operating properly (contacts not welded together).

(2) Check the mechanisms of all electrical and mechanical interlocks and padlocking means.

(3) Check for missing or broken parts, proper spring tension, free movement, rusting or corrosion, dirt, and excessive wear.

(4) Examine all readily accessible arc chutes and insulating parts for cracks or breakage and for arc spatter, sooty deposits, oil or cracking.

(5) Clean off arc spatter, oil and sooty deposits. Replace the device if appreciable material has burned away or if parts are charred or cracked.

(e) Lubricate the operating parts of switch mechanisms, etc.

(1) Use clean, nonmetallic, light grease or oil as instructed.

(2) Do ***not*** oil or grease parts of molded case circuit breakers.

(3) Sliding copper contacts, operating mechanisms and interlocks may be lubricated with clean, light grease.

(4) Wipe off excess lubrication to avoid catching dirt.

(f) Operate each switch or circuit breaker several times to make sure that all mechanisms are free and in proper working order.

(g) Retighten all wire connections.

(h) Check fuses to make sure they have the proper ampere rating and interrupting rating. Make sure that noncurrent-limiting fuses are never used as replacements for current-limiting fuses. Never attempt to defeat rejection mechanisms which are provided to prevent the installation of the wrong type of fuses.

(i) Check the insulation resistance of devices prior to their reinstallation on the busway.