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GTD-5® EAX

Cabling Methods

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LIST OF ILLUSTRATIONS

1. GENERAL

1.01 This practice presents methods of running, securing, and terminating cables in the GTD-5® EAX.

1.02 This practice is reissued to incorporate changes and corrections. Remove the previous issue of this practice from the binder or microfiche file and replace it with this issue.

1.03 This practice covers specific GTD-5 EAX cabling methods. For additional information on cabling, refer to the documents listed in Part 9 of this practice.

1.04 The GTD-5 EAX uses cable zoning to minimize interference and noise caused by electromagnetic coupling. Different types of cables are physically separated from each other in these zones.

2. ZONE DESCRIPTIONS

2.01 Six different cable zones are currently used in GTD-5 EAX installations:

(a) Zone 00. DC power, e.g., 50-volt battery feeds. Zone 00 cables are segregated further into subzones:

(1) Common control 50-volt battery and ground feeds.

(2) Outside plant 50-volt battery and ground feeds.

(b) Zone 01. Audio and related signal/control cables, e.g., T&R, Tl &R1, E & SG, M & SB cables.

(c) Zone 02. Transistor-Transistor Logic (TTL) level logic, e.g., coaxial clock and dc link cables.

(d) Zone 03. Surge-carrying cables, e.g., ringing, pad disable coin control, relay sense and control cables.

(e) Zone 04. Group-shielded T1 span cables.

NOTE: Old documentation may show group-shielded Tl cables& zone 02.

(f) Ground Zone. The ground zone is segregated into the following subzones:

(1) Low-Voltage Ground - Common Control (LVG-CC).

(2) Low-Voltage Ground - Outside Plant (LVG-OP).

(3) Safety Ground (SG). These are leads that provide personal safety and equipment protection. The SC group of cables may consist of any of the following lead identities: 31, 40, 41, 54, 57, or 58.

(4) Line Protection Ground (LPG) or Lead 61. The LPG carries high-voltage lightning current.

(5) Facility Test Ground (FTG).

NOTE: When distribution cables are installed, group positions may be transposed to allow for practical cable management.

2.02 Zone numbers for GTD-5 EAX cables in zones 01, 02, 03, and 04 are given in drawing ECD-17007. Zone numbers 'for zones 01, 02, 03, and 04 cables required for a particular site are given in the Cable Running List/Cable Running List Summary (CRL/CRLS) job drawing for that site.

2.03 The different subzones for zone 00 and ground zone cables for each GTD-5 EAX frame are shown in ECD-17005-001.

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3. SEPARATION OF CABLE ZONES

Separation on Runway and Grid

3.01 When cables are run in parallel on runway or grid, zones must be separated from each other. Table 1 shows AGCS-recommended minimum separation guidelines.

3.02 These guidelines are to be used at new sites and where additional equipment is added to an existing system. It is not necessary to update existing sites to these standards.

3.03 Leads commonly used but not listed in the table are not usually routed through the switch area and should, therefore, follow customer guidelines.

3.04 Examples of running cables on various runway and grid configurations are discussed in Part 5 of this practice. For examples, see Figures 1 through 3.

Separation in Trough

3.05 Sheet metal dividers are used to separate the zones in cable troughs. These

Table 1. Minimum Zone Separation Guidelines.

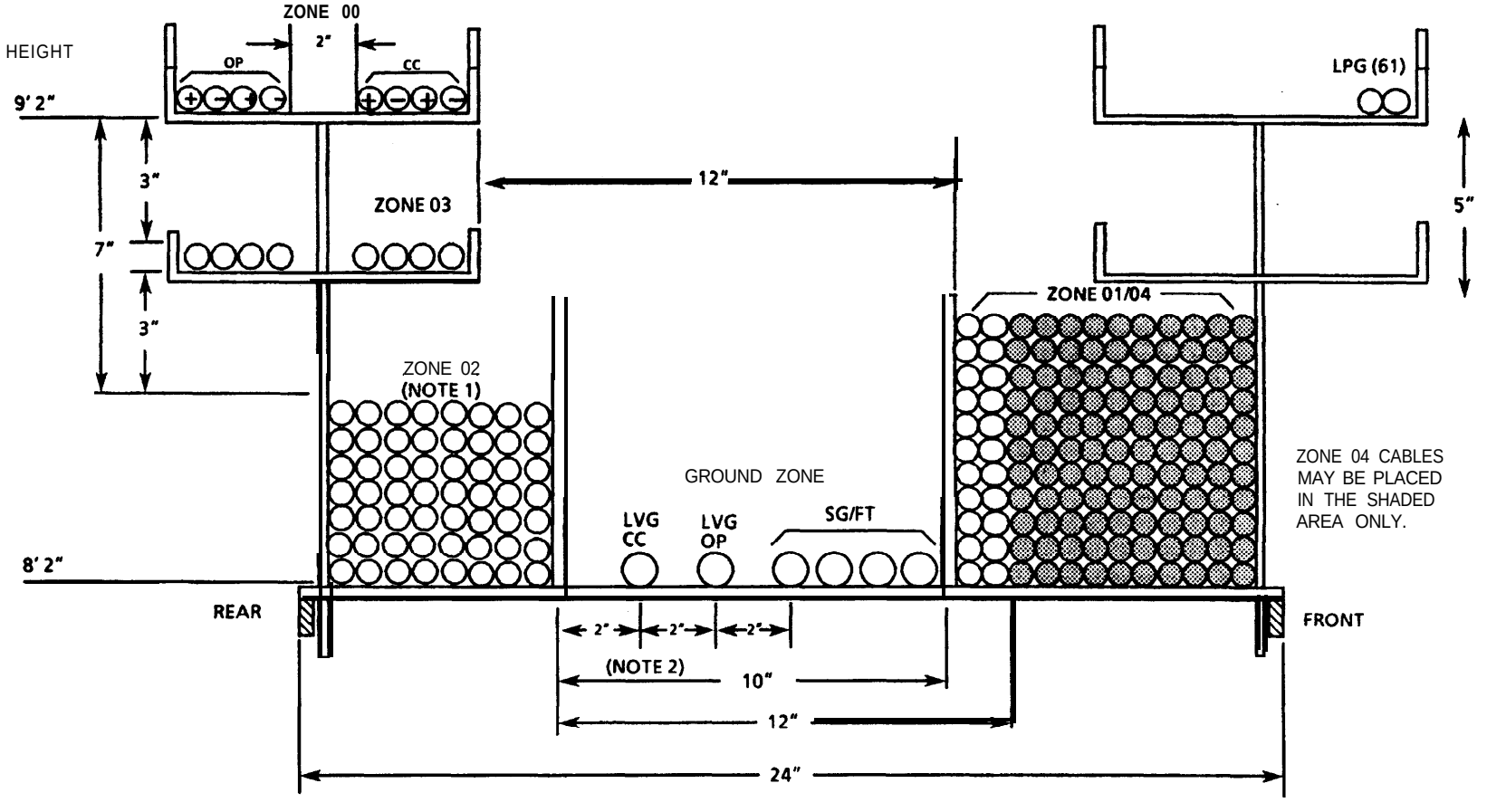
ZONE OR LEAD ID	00 OP	00 CC	01	02	03	04	LVG-OP	LVG-CC	SG	FTG (64)	LPG (61)
oo-OP	X	2"	10"	7"	3"	12"	2"	2"	2"	NR	5"
oo-cc	2"	x	10"	7"	3"	12"	2"	2"	2"	NR	5"
01	10"	10"	X	10"	12"	NR	2"	2"	NR	NR	5"
02	7"	7"	10"	X	3"	12"	2"	2"	2"	NR	5"
03	3"	3"	12"	3"	x	12"	2"	2"	2"	3"	3"
04	12"	12"	NR	12"	12"	x	2"	2"	2"	2"	5"
LVG-OP	2"	2"	2"	2"	2"	2"	x	2"	2"	2"	5"
LVG-CC	2"	2"	2"	2"	2"	2"	2"	x	2"	2"	5"
SG	2"	2"	NR	2"	2"	2"	2"	2"	x	NR	5"
FTG(64)	NR	NR	NR	NR	3"	2"	2"	2"	NR	X	5"
LPG (61)	5"	5"	5"	5"	3"	5"	5"	5"	5"	5"	X

GENERAL NOTES:

1. All separations are given in inches.
2. NR means that separation between zones is not required.

APPLICATION NOTES:

1. These separations are required in the overhead cable runway or grid when cables are run in parallel and zones are separated by air.
2. Where cables cross at 90 degrees (right angles), no separation is required.
3. When zones are separated by a metal divider in a trough, no additional separation is required.



NOTE:

1. Use as much of the runway width as possible (other than the 10 inches of separation) to prevent unnecessary cable buildup in zones 02 and 01/04. Too large of a buildup can cause poor appearance and inadequate separation between zone 02 and zone 03.

2. The 2-inch dimension of ground zone cables is measured center to center.

Figure 1. Typical GTD-5 EAX Equipment Lineup Runway (With Line Frames).

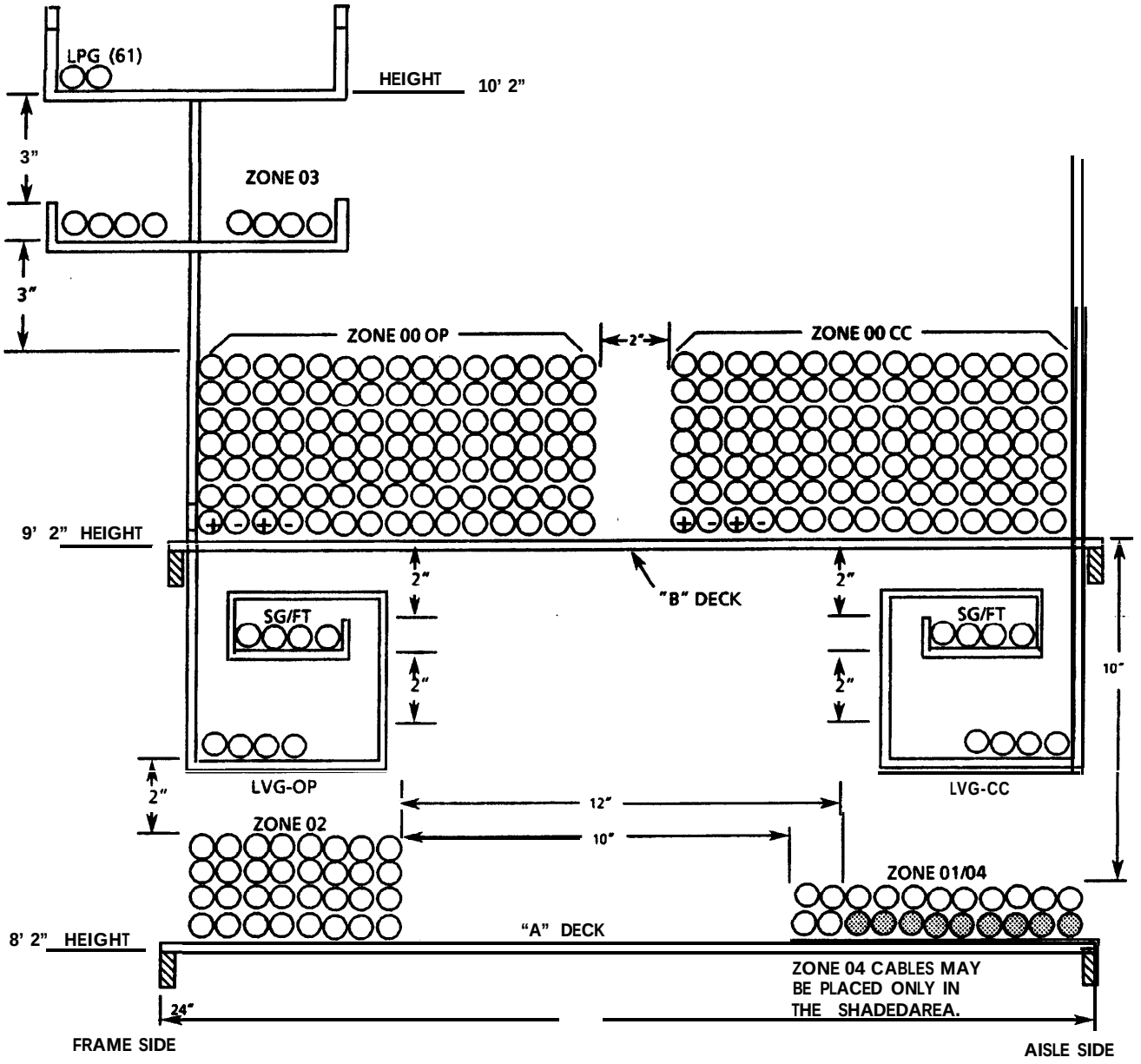


Figure 2. Typical GTD-5 EAX Main Aisle Runway (Ceiling Clearance At Least 10' 6").

dividers act as shields, and no additional separation is required between the zones.

Separation Within Frames

3.06 Cables do not require the same separations within GTD-5 EAX frames as they do on runway or grid because cable distances within a frame are relatively short.

3.07 To prevent interference, however, the cable zones are still separated within frames. To accomplish this, the GTD-5 EAX uses rear cable management brackets and front cableways. Refer to EC-95500 for part numbers, method of ordering, and installation information on this hardware.

3.08 Examples of running cables within frames are discussed in Part 4 of this practice. (Also, see Figures 4 and 5.)

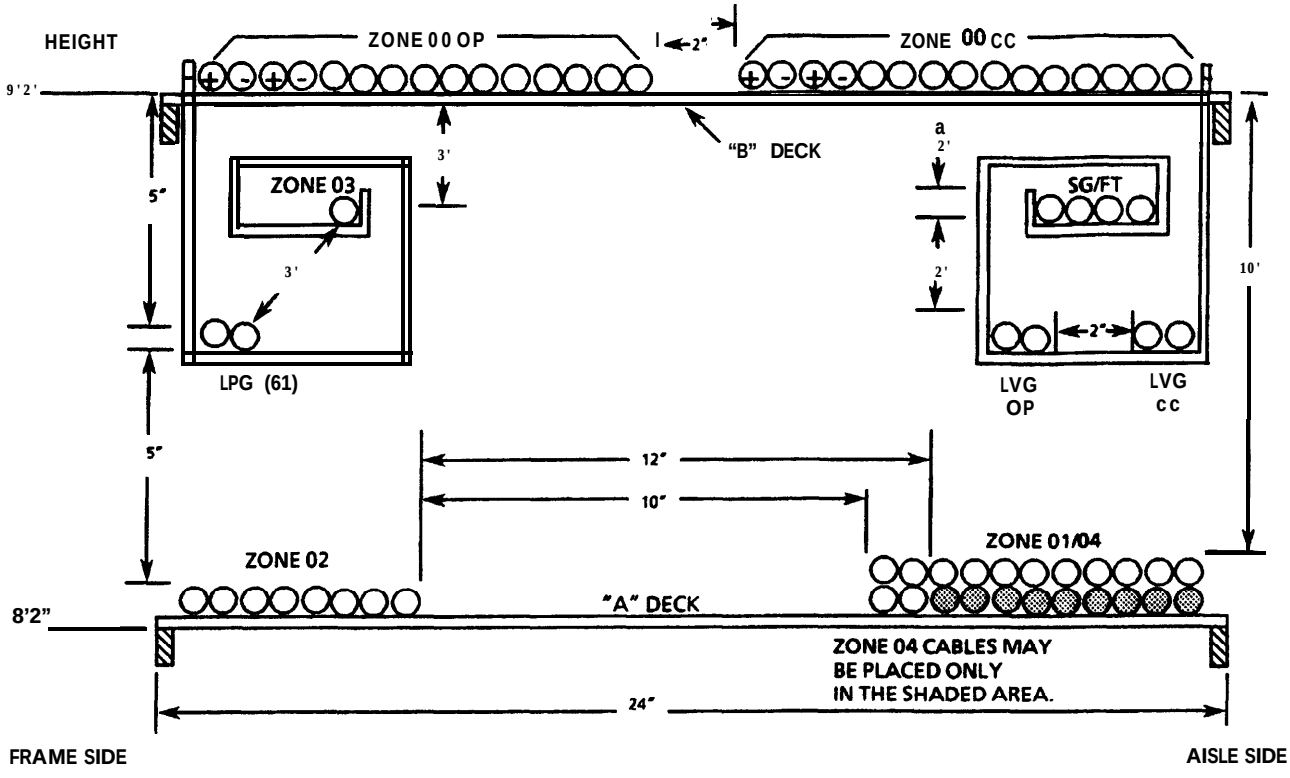


Figure 3. Special CTD-5 EAX Main Aisle Runway (Ceiling Clearance Less Than 10' 6").

Separation of Non-GTD.5 EAX Cables

3.09 When GTD-5 EAX and non-GTD-5 EAX cables are run in parallel, separation should be maintained. (Non-GTD-5 EAX cables include ac power cables for convenience outlets and bay lights, cables from other telephone switching systems, etc.)

3.10 Whenever possible, ac power cables should be kept 12 inches away from any of the GTD-5 EAX cable zones.

3.11 Cables from other systems should be separated from GTD-5 EAX zones by using the separation distances shown for GTD-5 EAX zones. (For example, audio cables from another system should be kept 10 inches from GTD-5 EAX zone 02 cables.)

3.12 Separate dc power feed cables from the same power source to other central office systems by 12 inches.

3.13 Power feeders to the associated transmission systems require a 12-inch separation.

4. RUNNING, SECURING, AND TERMINATING CABLES ON FRAMES

General Rules

4.01 When running, securing, and terminating cables on frames, observe the following rules:

(a) Separate cables of different zones as much as is practical.

(b) Do not tie-wrap different zone cables together in the same bundle.

(c) Verify that all factory-installed wires on the back of frames are dressed away from the frame bus bars and are tied near the corner of the metal designation bars.

(d) Verify that all factory-installed wires are dressed away from the aluminum power card heat sink.

4.02 Figures 4 and 5 ate schematic drawings showing how to run cables in GTD-5 EAX frames. Refer to these drawings for all paragraphs in Part 4 of this practice.

Running, Securing, and Terminating Zone 00 and Ground Zone Cables on Frames

4.03 All zone 00 LVG and LPG frame feeders are run, secured, and terminated within the frames at the factory.

4.04 Frame Ground (FG) leads consist of six-gauge wire and lug assembly EC-95506-A, and terminate on the top of the frame assembly, using predrilled termination holes.

Running Zone 01 Cables on Frames

4.05 Run Zone 01 cables between designation and backplane protection mounting bars, where applicable.

4.06 Run Zone 01 cables to their frame connections in order from top to bottom (file T first, then file A, file B, etc).

4.07 Bundle the cables into one or two groups. These bundles should be offset from their frame connections (this makes it easier to remove cables).

4.08 Run rear Peripheral Test Console Frame (PTCF) cables in files G and H between the designation bar and backplane protection mounting bar (where applicable) to the right cable management brackets.

4.09 When the cable terminates on the front of the frame, follow the methods used to run front zone 02 cables.

Securing Zone 01 Cables on Frames

4.10 Cable tie or lace one or two groups of cables to each designation bar down the back of the frames.

4.11 Cable tie or lace one or two groups of cables midway between the top designation bar and the point where the cables enter the overhead cable superstructure.

Terminating Zone 01 Cables (Piggyback Connectors)

4.12 Completely seat piggyback cable connectors and their screws or studs to the backplane connectors and to each other. Use studs to mount piggybacks only when another piggyback is to be mounted on top. Use screws when another piggyback will not be mounted on top.

4.13 Use thick pin alignment strips only between assembled piggyback connectors. Use thin pin alignment strips between piggyback and backplane connectors.

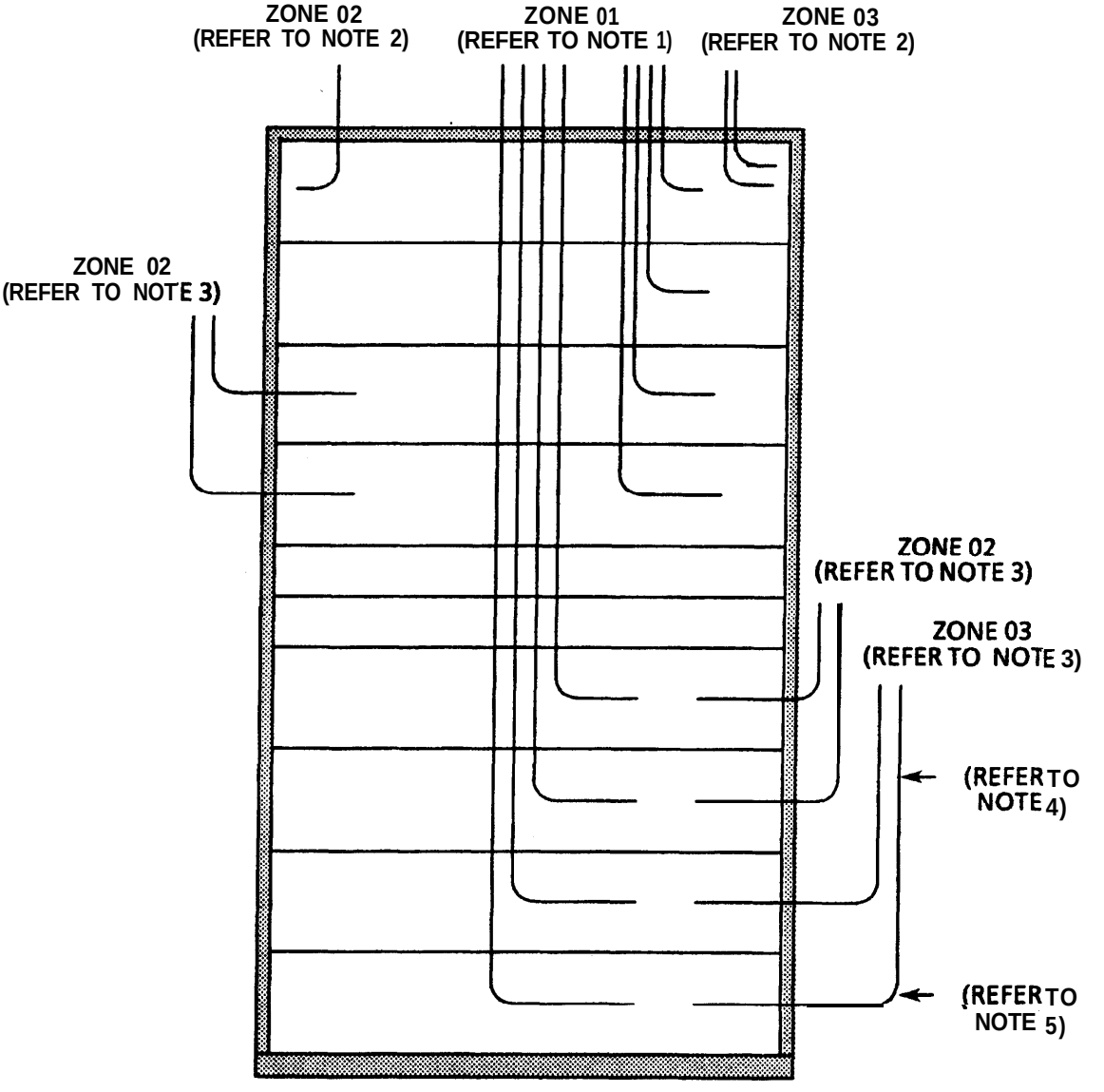
Running Zone 02 Cables on Frames

4.14 Run zone 02 cables straight up from their connectors and between the designation and backplane protection bars. Do not allow them to bulge beyond the outer bar or else the backplane covers may not hang correctly.

4.15 Cables may be run through two sets of bars to meet this requirement. Do not tie or lace cables to the outermost backplane protection mounting bars.

4.16 Route the cables through the designation and backplane protection bars and gradually angle them toward the side of the frame if the cables terminate below file T. Cables terminating in file T should be routed straight up to the overhead cable superstructure.

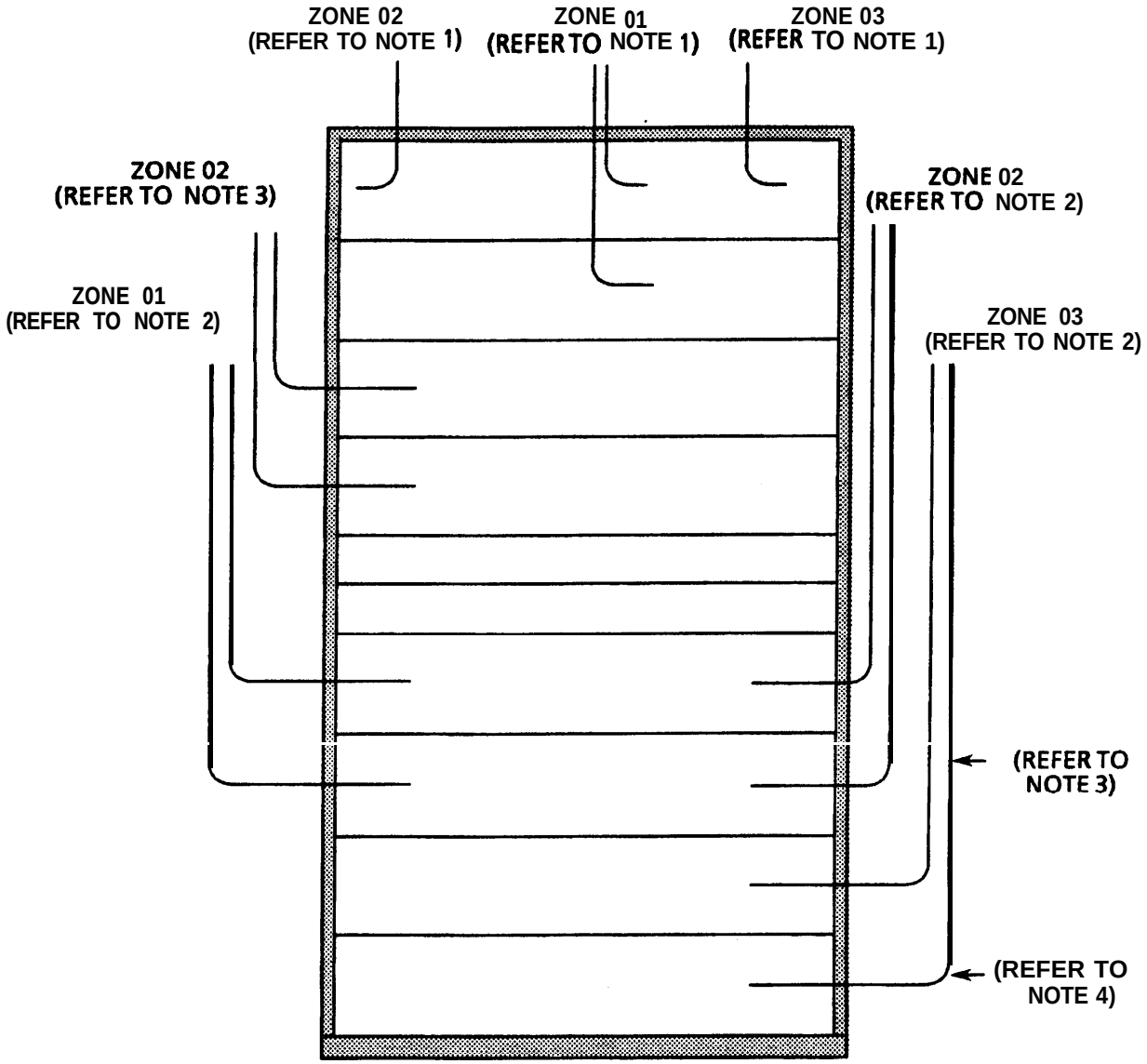
4.17 Assemble cable management brackets, as needed, on the left or right side of



NOTES:

1. All zone 01 cables waterfall.
2. Zone 02 and 03 cables terminate in file T waterfall.
3. Zone 02 and 03 cables below file T run in brackets at the sides of the frames. Run cables down the same side where they terminate.
4. Do not tie cables from different zones together.
5. Maintain proper bending radius for the size of cable being run.

Figure 4. Running Cable on Rear of Frame.



NOTES:

1. All cables that terminate in file T waterfall.
2. Run all cables terminating below file T in cableways at the sides of the frames. Run cables down the same side where they terminate.
3. Do not tie cables from different zones together.
4. Maintain proper bending radius for the size of cable being run.

Figure 5. Running Cable on Front of Frame.

each applicable frame described in order to permit the cable routing discussed in the previous paragraphs. The location of the brackets on the frames should be consistent within 'each lineup. Recommended file and left or right locations are shown in EC-95510.

4.18 Route cables terminating on the right side of each frame in the right cable management brackets between frames; route cables terminating on the left in the left cable management brackets between frames.

4.19 Insert front cables running to files other than file T into the cableway through the slot directly above, and not adjacent to where the cables are terminated, including cables where both ends terminate in the same frame. Cables terminating in file T should waterfall straight to their front-edge card connector.

Securing Zone 02 Cables on Frames

4.20 Cable tie the rear cables from each file between their connectors and the point where they attach to the other cables in the cable management brackets (at least once). Cable tie the rear cables from each file at the point where they join the other cables in the brackets.

4.21 When four or more front cables enter a cableway slot, cable tie them at one or more places, depending on length, before they enter the slot.

4.22 For Digital Trunk - Facility Interface Units (DT-FIUs), group the eight cables from each file in a 3 x 3 x 2 configuration and route them through the bottom of the present cableway slots. This allows cards in the file above to be extracted without excessively disturbing cable connections in the file below.

4.23 When applicable, tie wrap cables in the cableway so that the full weight of the cables is not on the cards.

Terminating Zone 02 Cables

4.24 Use the locking 60-degree connectors to terminate zone 02 cables to the front and rear frame connectors.

4.25 Use cable extractor tool FD-1083-CK to remove front and rear connectors.

Running Zone 03 Cables on Frames

4.26 Zone 03 cables generally terminate on the quick-connect terminal block at the top of the frame and are not routed on the frame.

4.27 When the cable terminates at the rear of the frame in files T-H, follow the methods used to run zone 01 cables.

Securing Zone 03 Cables on Frames

4.28 Secure these cables with cable ties or lacing to every designation bar (where applicable) and in several places from the last designation bar to where the cables enter the overhead cable superstructure.

Terminating Zone 03 Cables

4.29 Terminate zone 03 cables to the frame quick-connect blocks by using the TRW-IOM type connectors.

NOTE: Once seated, a moderate tug on the connector is required to ensure proper mating of the connector to the terminal block.

Running Zone 04 Cables on Frames

4.30 Zone 04 cables are run in the rear of a frame by using cable management brackets at the sides of the frame. Refer to the previous paragraphs on zone 02 cables for information.

Securing Zone 04 Cables on Frames

4.31 Zone 04 cables are secured to the frames the same way as zone 02 cables. Refer to the previous paragraphs on zone 02 cables for information.

Terminating Zone 04 Cables (CXP-5 Connectors)

4.32 Zone 04 cables terminate on GTD-5 EAX frames using CXP-5 connectors. Plastic covers and metal retaining clips must be used after the connectors are assembled to the frame.

5. CABLE ZONING AND SEPARATION ON RUNWAY

5.01 The GTD-5 EAX uses special cable management hardware to maintain proper zoning and separation of cables on runway.

5.02 Part numbers and the method of ordering runway cable management hardware are shown in H-440000 drawings and Practice 237-050-206, Erection Methods - Runway, Cable and Trough.

(a) Runway cable retaining brackets are used to contain cables in their area of the runway. The brackets should be run straight down the runway, not staggered.

(b) The spacing of brackets can be varied to allow the most efficient use of the runway. However, the minimum zone separations must be maintained (refer to Table 1).

(c) Runway goal posts and/or rings are mounted on the cable runway. Ensure that the post lock notch is secured in its clip to avoid slippage.

(d) The goal posts or rings should be run straight down each runway and aligned (not staggered) when looking across the runways.

(e) Goal posts and rings should be spaced at approximate 18-inch intervals.

5.03 Use the configuration shown in Figure 1 when running cable on aisle runway. This configuration was used for the main aisle runway for certain Remote Switching Units (RSUs) and Remote Line Units (RLUs) in the past. For new main aisle runway, refer to paragraph 5.04.

5.04 Use the configuration shown in Figure 2 or Figure 3 for main aisle runway for Base Unit (BU), RSU, and RLU application with ceiling clearance of 10 feet 6 inches or more. Figure 2 shows the preferred configuration. Figure 3 shows a special application main aisle runway. Use this special application only where the ceiling is too low to use the preferred configuration (Figure 2). Use the main aisle runway shown in Figure 5 for small offices, including RSUs, RLUs, and BUs (when the ultimate BU size is less than 10,000 lines).

6. RUNNING AND SECURING CABLES ON RUNWAY

Running All Cables on Runways Without Dropoffs

6.01 When running cable, the following precautions must be observed:

(a) Exercise caution when walking on central office cable racking and grid. Never step, sit, or kneel on cables because the direct pressure could cause damage to cable conductors. When there is a need to enter a cable area, use plywood or other supportive materials to distribute any weight. Be aware that cables may be dislodged or damaged when contact is made with the cables.

(b) Use care in pulling any cables through cable rack openings or along the rack itself. Rough or

sharp areas of the rack, or threaded rod supports in the rack, can shave off part of the cable insulation.

(c) Use threaded rod protective covers and grommet material (found in the Miscellaneous Installation Kit) to cover the sharp edges on frames and cable hole cutouts.

6.02 Each cable in the bottom layer must be parallel to the adjacent cables with a maximum separation between cables of one-half inch at each supporting slat.

6.03 No excess cable length should be visible when an observer looks up at the cable runway.

6.04 No gaps can exist that allow an observer to look through the center of a group of cables and see the ceiling.

6.05 None of the cables can sag below the lower edge of the cable runway.

6.06 None of the cables can drop over or extend more than one full cable diameter over the side of the runway.

Running Zone 01 Cables on Runway

6.07 The best looking and most orderly method of running GTD-5 EAX audio cables in the cable racks is achieved by running cable in sequence from the distributing frame to the frame lineups and in sequence within each frame lineup.

6.08 Run cables to the frame lineup farthest from the distributing frame first to create a base of straight cables on the runway. This hides cables feeding frame lineups closer to the distributing frame.

6.09 Run cables from the distributing frame to the next farthest frame lineup on top of the base cables, etc.

6.10 Similarly, within a lineup, run cables from the distributing frame to the farthest frame within a lineup first. Run cables from the distributing frame to the next farthest frame in the same lineup, etc.

Running Zone 02 Cables on Runway

6.11 Run cables from the Time Switch and Peripheral Control Unit Frame (TCUF) in a lineup to the frames closest to that TCUF in the same lineup first, etc., out to both ends of the lineup. In this way, cables will not go through other cables to drop down to the frames.

6.12 Run interbay cables, such as those from the Space Switch Unit Frame (SSUF), to each TCUF by running the longest cables first (to the farthest lineups) to create a base of straight cables on the runway. This is similar to running audio cables from the distributing frame to each lineup.

Securing Cable on Runway

6.13 Cable tie or lace any looped cables stacked upon each other to prevent cables from becoming scattered and not meeting separation requirements, or falling over the side of the runway. (Cable tying or lacing is optional.) Make certain to adhere to cable radius requirements.

6.14 Secure cables to every goal post bracket or ring by lacing or using cable ties.

Cable Dropoffs

6.15 Individual cables in cable runs with dropoffs and the dropoffs themselves must be dressed as compactly as possible to avoid cables that appear scattered.

6.16 The bottom layer of the runs with dropoffs do not have to be composed of individual cables that are parallel to each other and do not have to be laced to the runway, but the cables must run in the same general direction.

6.17 Bundle together front cables running from the runway to the top frame file;

route and secure them directly to the outside part of the cable runway sidebar. Route rear cables through the runway.

6.18 Zone 00 frame power feeders are run as pairs, i.e., MB1 and MG1 are paired. Cable tie or lace them approximately every six inches.

6.19 Run the zone 00 and ground zone cables vertically from the frames to their associated aisle distribution cables in accordance with the Equipment Power Distribution and Grounding (EPDG) job drawing for the site.

6.20 Refer to Practices 256-050-206, Cabling Methods - Central Office Power Cable - Running and Securing; 256-050-207, Cabling Methods - Central Office Power Cable - Terminating Using Compression Connectors; and 795-805-071, Central Office Grounding Systems - Engineering Applications, for additional information.

Cable Bends

6.21 Secure cable at the runway slat before the bend and at the stat after the bend. Cable must also be secured in the center if it is not supported by runway slats.

6.22 Cables with one to six conductors require a minimum cable bend radius of one-half inch. A one-inch minimum radius is required for cables with eight to 44 conductors. Cables with 50 to 102 conductors require minimum three-inch radius bends. Minimum three-inch radius bends are required for the 102 conductor cables commonly used for zone 01 cables. A minimum six-inch radius is required for 202, 302, and 402 conductor cables.

NOTE: All bends are measured as the inside radius of the bend.

7. CABLE GRID

Cable Zoning and Separation on Grid

7.01 The same cable separations must be used for cable on grid as for cable on runways. Do not run cables diagonally across the switchroom from point to point. Follow cable paths similar to those used in offices with runways. This permits preferred cable separations and ensures that cables of different zones cross each other at 90 degrees.

7.02 Use the following guidelines when running cablesoverequipment lineups:

(a) Place zone 01 and zone 04 cables on the grid toward the front of frames in one lineup, and toward the back of frames in the next lineup. Place zone 02 cables on the grid in reverse order. Using this method avoids cable quantity buildup and prevents heat problems.

(b) Run zone 00 and 03 cables in goal posts located over the side of the frame closest to the zone 02 cables. (This is similar to the method used for runway; see Figure 1.)

(c) Run Producer Ground (PG) cables in goal posts located over zone 01 (see Figure I).

(d) Locate ground zone cables directly over the frames as is done when running cables on runway (see Figure I).

7.03 Follow the methods shown in Figures 2 and 3 for main aisle cable runs.

Running and Securing Cable on Grid

7.04 In general, cables should be run and secured on grid as they are on runway.

7.05 No cables should sag below the channel braces that support the grid.

7.06 Do not route rear aisle cables into the aisle before they enter the backplane or rings.

8. RUNNING CABLES IN TROUGH

Cable Zones For Troughs

8.01 Cabinetized versions of the GTD-5 EAX use a trough to route cables.

8.02 The GTD-5 EAX cable trough uses sheet metal dividers to separate cable zones. Since the dividers act as shields, the separation distances required for runway or grid are not required for trough.

8.03 Two trough types are currently available:

(a) EC-95601A through EC-95601C (older series of trough). See Figure 6.

(b) EC-956011 through EC-95601 L (newer series of trough). See Figure 7.

8.04 The newer trough series (EC-9560lJ, K, and L) is provided for new lineups and provides superior cable zoning. However, the old and the new trough types cannot be mixed within a lineup; therefore, the old trough series (EC-95601A, B, and C) is still provided where required.

8.05 Figure 6 is a cable management schematic for the EC-95601A, B and C trough series. See Figure 6 for the following paragraphs (a) through (d).

(a) Zone 00 and ground zone.

(1) At this time, no provisions are made to separate zone 00 and ground zone cables.

(2) At this time, no provisions are made to separate various sub-zones of zone 00 and the power zone.

(3) Run these cables together in the upper front area of the trough.

(4) DC power cables should be run as pairs (refer to ECD-17005-001).

(b) Zone 01. Run these cables in the lower front area of the trough.

(c) Zone 02. Run zone 02 cables in the lower rear of the trough.

(d) Zone 03. These cables are run in the upper rear of the trough.

8.06 Figure 7 is a cable management schematic for the EC-95601 J, K and L trough series. Cables should be run in this trough as they are shown in Figure 7.

8.07 Do not pull any cables through cable trough openings or along the trough itself. The sharp cable trough edges can shave off part of the cable insulation. The cables should be laid into the trough.

8.08 Verify that no cables are routed in front of the alarm circuit board at the top of the Analog Trunk Unit Frame (ATUF) or other frames.

8.09 Verify that no frame cables touch the cabinet doors while they are open or closed.

8.10 Assemble grommet material around all rough cutouts used to route cables, and around other sharp edges where cables'are routed.

8.11 Cables run outside of the trough must follow the cable separation guidelines provided in Part 3 and Table 1 of this practice.

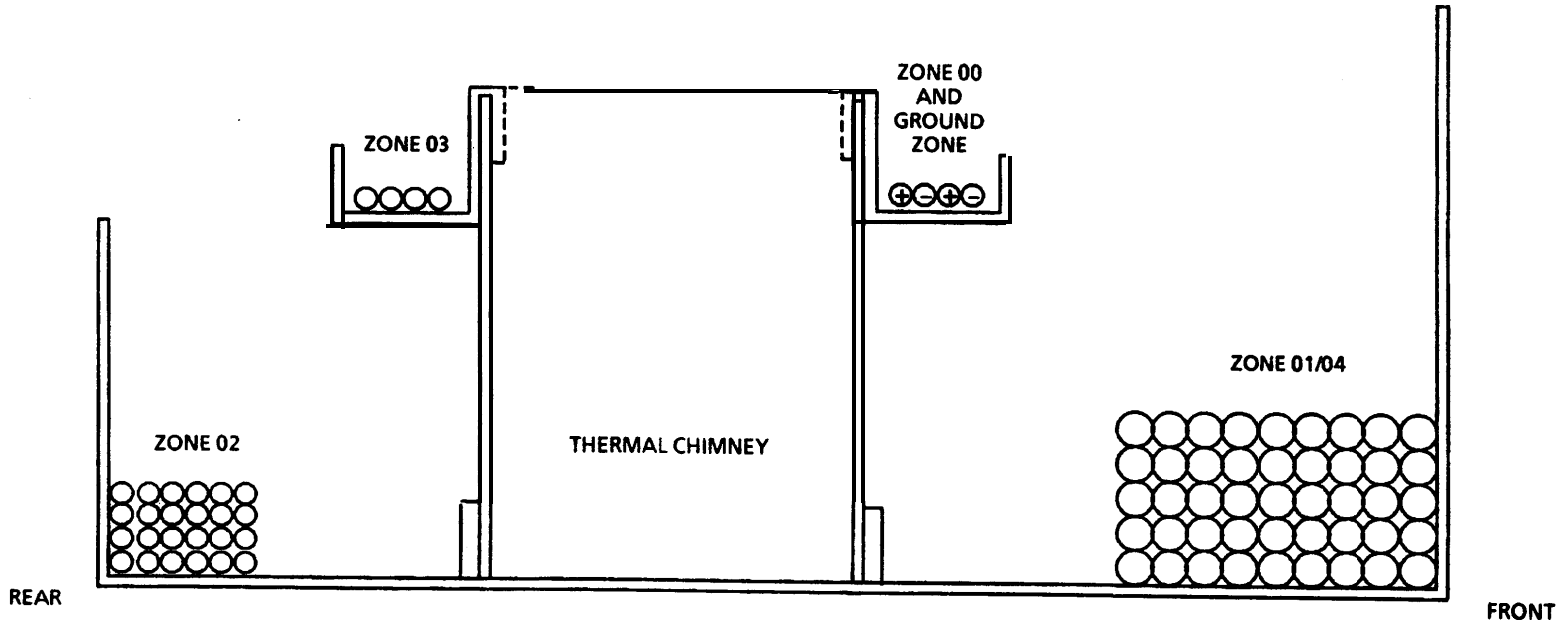


Figure 6. **EC-95601A-C (SERIES) TROUGH CABLE ZONING.**

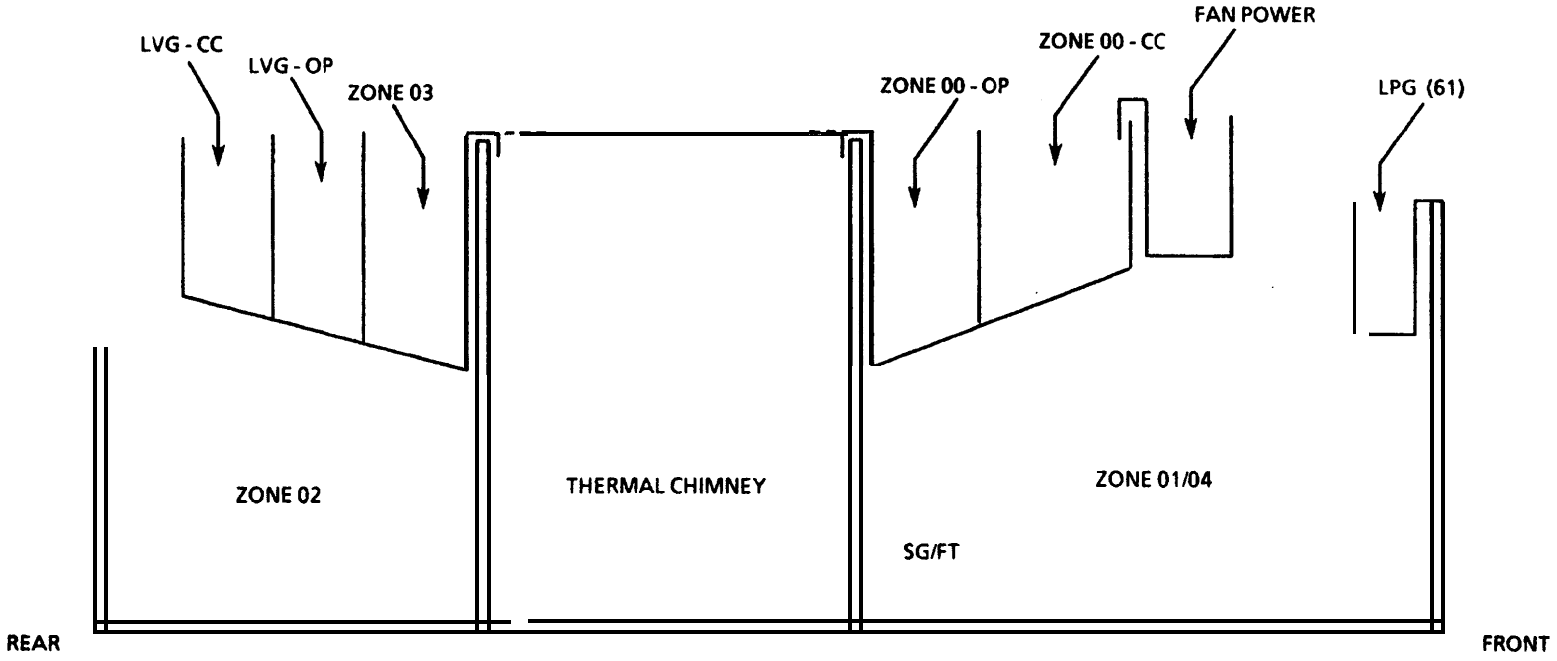


Figure 7. EC-95601J-L (SERIES) TROUGH CABLE ZONING.

9. REFERENCES

9.01 The following documents supplement or complement the information provided in this practice:

DOCUMENT	NUMBER	DESCRIPTION
GTE Practices:	237-050-204	Erection Methods - Central Office Bay and Frame Uprights
	237-050-206	Erection Methods - Runway, Cable, and Trough
	237-050-207	Erection Methods - Central Office Cable Grid
	256-050-206	Cabling Methods - Central Office Power Cable - Running and Securing
	256-050-207	Cabling Methods - Central Office Power Cable - Terminating Using Compression Connectors
	256-050-208	Cabling Methods - Switchboard Cable Connecting (Wrap and Solder Methods)
	256-050-210	Cabling Methods - Plastic Cable Color Code
	256-150-201	Cabling Methods - Central Office Distributing Frames
	795-805-071	Central Office Grounding Systems - Engineering Applications
AGCS Practices:	237-050-210	Erection Methods - Mounting Unit Type Equipment
	256-050-202	Switchboard Cable Tags and Labels
Method of Assembly Drawings:	EC-95500	GTD-5 EAX Method of Ordering Frame and Installation Hardware
	EC-95510	GTD-5 EAX Method of Ordering Rear Cable Management Hardware
	EC-95601	Exploded View Method of Assembly - Cabinetized GTD-5 EAX Frames Within a Lineup (Trough Hardware Included)
Engineering Configuration Drawings:	ECD-17005-001	Equipment Power Distribution and Grounding Equipment
	ECD-17007	Frame Cable Statistics
Part Number:	H-440000	Cable Runway and Grid Details - For All Drawing Systems