

ENGINEERING NOTES

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- DEFINED IN AT&T SPEC 802-001-195. (SEE NOTE 88).
70. ALL -48 VOLT RETURN FEEDERS FOR 5ESS AND 3B COMPUTER ARE ISOLATED FROM THE ESS FRAMEWORK. FOR 5ESS EQUIPMENT CABINETS ONLY, ALL '0' BUS RETURNS IN A SWITCHING MODULE ARE MADE COMMON AND ALL '1' BUS RETURNS IN THE SAME SWITCHING MODULE ARE MADE COMMON, FOR ANY SWITCHING MODULE THAT CONTAIN A LINE UNIT. FOR OSPS APPLICATION SEE NOTE 152.
 71. THE SINGLE POINT GROUND (GROUND WINDOW) IS TYPICALLY THE MAIN GROUND SPLICE PLATE LOCATED NEAR THE -48 VOLT GROUND DISTRIBUTION BUS BAR WHICH IS LOCATED ABOVE PCFD 0 OR IS THE GROUND DISTRIBUTION BUS BAR LOCATED WITHIN THE POWER PLANT. (NOTE 60).
 72. FOR TYPICAL METHOD OF MOUNTING SPLICE PLATES ON LADDER RACK SEE H512-137 (A&M ONLY) OR ED-4C471-30.
 73. WHERE A PUBLIC WATER SYSTEM DOES NOT SERVE THE OFFICE OR CANNOT BE RELIED ON FOR USE AS THE GROUND ELECTRODE, A SUPPLEMENTARY GROUND ELECTRODE SYSTEM MUST BE FURNISHED AS DEFINED IN AT&T SPEC 802-001-180 AND AT&T SPEC 802-001-191. (SEE NOTE 100).
 74. THE MCC, BOTH CABINET AND CONSOLE, AND FIRST DATA SET CABINET ARE CONSIDERED PART OF 5ESS AND ARE AT ESS GROUND. IF ADDITIONAL CABINETS OR CONSOLES ARE ADDED AND ARE LOCATED ON BLDG GROUND THE AC SHOULD BE SUPPLIED FROM A PDSC ON BLDG GRD AND NOT RUN THRU THE GRD WINDOW. NO METALLIC PATH SHALL BE RUN FROM THE EQUIPMENT GROUNDS OF THIS MCC TO THE EQUIPMENT GROUNDS OF THE 5ESS SWITCH. IF THIS MCC IS MORE THAN ONE FLOOR AWAY FROM THE GROUND WINDOW, THEN MODEMS OR OPTO-ISOLATING RS-232 TYPE CONNECTIONS SHOULD BE USED.
 75. SEE AT&T SPEC 590-010-201.
 76. THIS DRAWING IS MODIFIED TO SHOW OSPS GROUNDING PER SD-5D135-01.
 77. FOR GROUNDING EQUIPMENT CABINETS TO THE NO. 6 BARE THINNED COPPER WIRE LINE-UP GROUND, USE ONE ED-5D507-17, \$G24\$, G24A CABLE ASSEMBLY FOR ADJACENT CABINETS IN THE LINE-UP. IF THE LINE-UP HAS AN ODD NUMBER OF CABINETS USE ONE HALF OF ED-5D507-17, G24 CABLE ASSEMBLY FOR THE ODD CABINET. (SEE FIGURES 8 AND 11).
 78. A COMPLETE LOOP OF THE HORIZONTAL EQUALIZER 750 MCM SHALL NOT BE MADE. THIS MEANS THAT THE PCFD FRAME SPLICE PLATES SHOULD BE HORIZONTALLY EQUALIZED IN SERIAL FASHION, BUT THAT THE LAST PCFD SHOULD NOT BE LOOPED BACK TO THE FIRST PCFD.
 79. THE 5ESS AND OSPS EQUIPMENT CABINETS CAN NOT BE MORE THAN ONE FLOOR AWAY FROM THE MAIN GROUND BUS BAR (GROUND WINDOW).
 80. EACH LINE INTERFACE CABINET REQUIRES ITS OWN DEDICATED 1/0 RTN WIRE, DIRECT FROM THE LNI TO THE ESS GROUND WINDOW. SEE FIGURE A FOR THE LOCATION OF THE 1/0 LEAD IN THE LINE-UP CABLE RACK. TYPICALLY LN1'S ARE LOCATED AT THE END OF LINE-UPS CLOSEST TO THE MAIN FRAME FOR ANY LINE-UPS CONTAINING LINE UNITS.
 81. CONV OUTLETS ARE LOCATED IN THE END GUARDS. SEE ED-5D508-70.
 82. FURNISHED BY TELCO OR LINE ENGINEER SEE AT&T SPEC 802-001-191, AT&T SPEC 802-001-192 AND AT&T SPEC 820-001-195.
 83. THE FIRST DATA SET CABINET IS POWERED FROM PROTECTED AC. (FROM MISC CABINET MOUNTED INVERTER) AND ALL OTHER DATA SET CABINETS ARE POWERED FROM ESSENTIAL AC. IF THE ESSENTIAL AC PNL IS ON BLDG GRD AND THE ADDITIONAL DATA SET CABINETS ARE ON BLDG GRD THE AC NEED NOT BE ROUTED THRU THE GRD WINDOW.
 84. TERMINATE CABINET GROUND CABLE TO AN EQUIPMENT MOUNTING HOLE ON EITHER REAR UPRIGHT. THIS TERMINATION SHALL BE MADE WITHIN THE TOP FIVE MOUNTING POSITIONS. THE PRIME POSITION BEING THE SECOND MOUNTING DOWN. (SEE FIG. C FOR HARDWARE REQUIRED FOR TERMINATION). ROUTE CABLE ASSEMBLY ALONG THE UPRIGHT TO THE CABLE RACK. \$
 85. EACH MSU REQUIRES TWO SPECIAL 16 AWG QUIET GROUND LEADS DIRECT TO THE ESS GROUND WINDOW. ONE LEAD PER CKT 0 AND ONE LEAD PER CKT 1. THESE LEADS ARE PROVIDED PER GROUPS ON ED-5D500-11. IF THE GROUND WINDOW IS REMOTELY LOCATED FROM THE ESS EQUIPMENT CABINET AREA (NOTE 60) THIS LEAD MAY BE BONDED TO THE PCFD GROUND SPLICE PLATE THAT CONNECTS DIRECTLY TO THE GROUND WINDOW WITH THE 750 MCM HORIZONTAL EQUALIZER. (NOTE 97 & FIG. 30).
 86. THE 5ESS PD CABINETS SHALL BE GROUNDED DIRECTLY TO THE ESS GROUND WINDOW WITH A 1/0 KS-5482-01 WIRE. IF THE GROUND WINDOW IS REMOTELY LOCATED FROM THE ESS EQUIPMENT CABINET AREA (NOTE 60) THIS LEAD MAY BE BONDED TO THE PCFD GROUND SPLICE PLATE THAT CONNECTS DIRECTLY TO THE GROUND WINDOW WITH THE 750 MCM HORIZONTAL EQUALIZER (SEE FIG. 30). PD CABINETS IN VANS SHALL HAVE A 1/0 KS-5482-01 WIRE FROM THE FRAMEWORK DIRECTLY TO THE VAN SINGLE POINT GROUND BUS BAR AND DO NOT HAVE TO BOND DIRECTLY TO
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ENGINEERING NOTES

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- AND POSSIBLE LOAD-SHARING WITH OTHER SYSTEMS. USE OF JUNCTION BARS (SPLICE PLATES) IN 5ESS FOR -48 RTN'S IS NOT A REQUIREMENT. FOR SMALL OFFICES CLOSE TO THE POWER PLANT, WITH THE POWER PLANT DISCHARGE BUS BAR USED AS THE GROUND WINDOW, THERE IS NO NEED FOR -48 RTN SPLICE PLATES. THESE FEEDER RTN'S MAY BE RUN DIRECTLY FROM THE POWER PLANT INTO P.D.O. WITHOUT NEED OF SPLICE PLATES, FOR OFFICES WITH THE GROUND WINDOW LOCATED AT P.D.O. SPLICE PLATES WILL BE REQUIRED TO CREATE THE GROUND WINDOW. FOR INSTALLATIONS WHERE THE POWER PLANT IS SOME DISTANCE AWAY, SPLICE PLATES WILL BE REQUIRED TO MAKE PROVISION FOR EITHER LARGER CONDUCTORS OR FOR MULTIPLE CONDUCTORS, TO MEET VOLTAGE DROP CONSTRAINTS. SOME POWER DESIGNERS PREFER TO COMBINE ALL THE -48 RTN'S COMING TO A P.D. CABINET INTO A FEW LARGE CONDUCTORS TERMINATED ON A SPLICE PLATE AT THE P.D.; THIS IS PERMISSIBLE AS LONG AS THE -48 AND RTN'S ARE PAIRED AS WELL AS POSSIBLE ON THE RACKING LEADING TO THE P.D. IF SPLICE PLATES ARE PROVIDED AT TWO OR MORE P.D. CABINETS FOR ANY REASON, THEN THESE SPLICE PLATES SHOULD BE BONDED TOGETHER WITH 750 MCM CABLE. IF THE LOWER NUMBER P.D.'S DO NOT HAVE RTN SPLICE PLATES, THEY DO NOT NEED TO BE INCLUDED IN THIS BONDING ARRANGEMENT. ANY SUCCEEDING P.D.'S WHICH DO HAVE SPLICE PLATES SHOULD BE BONDED TOGETHER. DO NOT ADD SPLICE PLATES MERELY TO BE ABLE TO BOND TOGETHER ALL P.D.'S. THE PURPOSE OF THIS BONDING IS TO PROVIDE A RELATIVELY LOW EQUALIZED IMPEDANCE PATH FOR THE LIGHTNING CURRENTS PLACED IN THE RTN'S BY THE LINE UNITS. IN LARGER OFFICES WITH MORE THAN ONE P.D., THE ADDED DISTANCES AND MAGNITUDES OF LIGHTNING CURRENTS MAKE THIS BONDING IMPORTANT FOR STABLE SYSTEM OPERATION. SMALLER OFFICES HAVING P.D.'S WITHOUT SPLICE PLATES WILL FUNCTION PROPERLY WITHOUT SUCH BONDING.
63. TRUNK AND SUBSCRIBER CABLE METALLIC SHEATHS ENTERING THE BUILDING VIA THE CABLE ENTRANCE FACILITY MUST BE GROUNDED. THE SHEATHS MAY BE TERMINATED IN THE CABLE ENTRANCE FACILITY OR EXTENDED TO THE VICINITY OF THE PROTECTOR OR COMBINED DISTRIBUTING FRAME BEFORE TERMINATION. GROUNDING IS ACHIEVED BY BONDING THE SHEATHS TO THE PROTECTOR OR COMBINED DISTRIBUTING FRAME GROUND POINT WHERE CONTINUITY TO THE OFFICE GROUND ELECTRODE IS PROVIDED VIA THE PROTECTOR OR CDF FRAME GROUNDING BONDS. THE CABLE SHEATHS SHALL BE BONDED TO THE PROTECTOR OR CDF GROUND POINT VIA A NO. 0 AWG CONDUCTOR. INDIVIDUAL SHEATHS SHOULD BE BONDED WITH A CONDUCTOR WITH AN EQUIVALENT CIRCULAR MIL AREA OF A NO. 6 AWG CONDUCTOR. ALTERNATIVELY IN A DIRECT RUN FROM ANY POINT ON THE CABLE METALLIC SHEATHS WILL PROVIDE A SIGNIFICANTLY SHORTER PATH TO THE OFFICE PRINCIPAL GROUND POINT THAN THAT AFFORDED BY THE BOND TO THE PROTECTOR OR CDF FRAME, THEN THIS DIRECT RUN MAY BE PROVIDED. INFORMATION ON CABLE ENTRANCE FACILITY SYSTEM DESIGN IS CONTAINED IN AT&T SPEC-919-240-610.
 64. TO MINIMIZE THE POSSIBILITY OF A DIFFERENCE OF POTENTIAL BETWEEN THE PROTECTOR, MDF OR CDF FRAMEWORK AND CROSS AISLE CABLE RACKS AND ESS FRAMEWORK, CAUSING A PERSONNEL HAZARD, A NO. 0 AWG GROUND CONDUCTOR SHOULD BE RUN FROM THE PROTECTOR, MDF OR CDF GROUND BAR TO THE 'GROUND WINDOW' BAR (SEE NOTE 91). THE 1/0 LEAD FROM THE PROTECTOR, MDF OR CDF IS REQUIRED ONLY IF:
 - A). THE PROTECTOR, MDF OR CDF IS ON THE SAME FLOOR AS ANY PORTION OF THE 5ESS, AND THE DISTANCE BETWEEN THE PROTECTOR, MDF OR CDF TO ANY PORTION OF THE 5ESS ISOLATED GROUND PLANE IS SEVEN FEET (7 FT.) OR LESS, AND THE CABLE LENGTH OF THE BOND BETWEEN THE PROTECTOR, MDF OR CDF AND THE GROUND WINDOW BAR IS LESS THAN ONE-HALF THE TOTAL CABLE LENGTH OF THE CABLES BETWEEN THE PROTECTOR, MDF OR CDF TO THE CO BUS BAR AND THE CO BUS BAR TO THE GROUND WINDOW. (SEE FIG. H).
 65. THE POWER DISTRIBUTION CABINET J86334D-1 CAN BE BOTTOM FEED FROM THE POWER PLANT. SPLICE PLATES WHEN REQUIRED SHOULD BE MOUNTED ON FLOOR BELOW. THE PD CABINET CAN ALSO BE BOTTOM DISTRIBUTED TO THE EQUIPMENT CABINETS FOR THE PALLETIZED VERSION OF 5ESS.
 66. THE MMSU AND DCTU REQUIRED SPECIAL QUIET GROUND LEADS DIRECTLY TO THE ESS GROUND WINDOW. THESE LEADS ARE PROVIDED PER GROUPS ON ED-5D500-11. IF THE GROUND WINDOW IS REMOTELY LOCATED FROM THE ESS EQUIPMENT CABINET AREA (NOTE 60) THESE LEADS MAY BE BONDED TO THE PCFD GROUND SPLICE PLATE THAT CONNECTS DIRECTLY TO THE GROUND WINDOW WITH THE 750 MCM HORIZONTAL EQUALIZER. (SEE NOTE 97 & FIG. 30).
 67. REFER TO FLOOR PLAN DATA SD-5D001-01 FOR TYPICAL 5ESS SWITCH FLOOR PLAN LAYOUTS. FOR OSPS APPLICATION SEE SD-5D135-01.
 68. TOLL AND TRANSMISSION EQUIPMENT IS PART OF THE INTEGRATED BUILDING GROUND PLANE, NOT THE ESS SINGLE POINT GROUND PLANE. DO NOT MIX EQUIPMENT WITH THE 5ESS SWITCH (ISOLATED GROUND SYSTEM) THAT USES THE FRAMEWORK AS PART OF THE -48 VOLT RETURN SYSTEM, UNLESS THIS EQUIPMENT IS OTHERWISE INSULATED FROM THE INTEGRATED GROUND PLANE, SUCH AS ANOTHER ESS.
 69. THE DC OR BUILDING GROUND REFERENCE FOR THE SINGLE POINT GROUND IS ESTABLISHED BY RUNNING A NO. 0 WIRE BETWEEN THE MAIN GROUND BUS BAR (GROUND WINDOW) AND THE OFFICE PRINCIPAL GROUND POINT AS
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ENGINEERING NOTES

***** CONTINUED *****

- REQUIRED DEPENDING ON LOCATION AND CONFIGURATION OF THE ELEMENTS OF THE CONDUCTIVE MASS.
- B). ASSEMBLIES THAT ARE NOT MECHANICALLY JOINED TO THE MASS CLOSEST TO THE GROUND WINDOW MAY BE JOINED BY THE ADDITION OF A NO. 6 AWG CONDUCTOR BETWEEN MASSES AS NECESSARY TO INTERCONNECT ALL SUCH ASSEMBLIES INTO A SINGLE MASS.
 - C). AIR DUCTS, PIPES AND OTHER METAL ASSEMBLIES THAT TRAVERSE THE AREA ABOVE AN ESS FRAME INSTALLATION SHOULD ALSO BE INCLUDED IN THE GROUNDED MASS BY A NO. 6 AWG CONDUCTOR WHERE MECHANICAL CONNECTION DOES NOT EXIST.
 - D). MECHANICAL CONNECTION MAY CONSIST OF ANY FORM OF METALLIC JOINING INCLUDING INCIDENTAL CONTACT IF SUCH CONTACT IS SUBSTANTIAL AND FIRM ENOUGH TO MAINTAIN A PERMANENT CONNECTION. THE INCIDENTAL CONNECTION SHOULD BE METAL TO METAL. A PAINTED SURFACE SHOULD BE SCRAPPED.
 - E). ALUMINUM METAL SHALL NOT BE INCLUDED IN AN INCIDENTAL CONNECTION SINCE AN INSULATING OXIDE WILL QUICKLY FORM TO CREATE A DISCONNECTION.
 - F). DOWNSPOUTS THAT EXTEND THROUGH THE MIDDLE OF BUILDINGS ARE HIGHLY SUSCEPTABLE TO LIGHTNING HITS. THEREFORE, THESE DOWNSPOUTS SHOULD BE BONDED TO THE MASS ABOVE THE ESS SYSTEM SINCE IT COULD CREATE A CARRIER IF IT IS NOT CONNECTED INTO THE BUILDING STEEL.
 - G). THE FOLLOWING ITEMS IN CLOSE PROXIMITY TO THE ESS GROUND PLANE NEED NOT BE GROUNDED TO THE MAIN GROUND BUS (GROUND WINDOW). IT IS ASSUMED THAT SUCH EQUIPMENT WILL BE ADEQUATELY GROUNDED BY PERSONS RESPONSIBLE FOR THEIR PROVISION. GROUNDED MEANS ORDINARILY INCLUDE AC EG (GREEN WIRE) GROUNDING OF AC OPERATED EQUIPMENT. WATER PIPE GROUNDING OF FOUNTAINS, AND INCIDENTAL CONNECTION THROUGH CONTACT WITH COMPONENTS. THE C.O. GROUND SYSTEM PROVIDES A INTERFACE BETWEEN SUCH ITEMS OF THE BUILDING GROUND PLANE AND THE GROUNDING SYSTEMS ASSOCIATED WITH COMMUNICATION SYSTEMS. GENERALLY NO OTHER CONSIDERATION FOR GROUNDING COMPONENTS OF THE BUILDING IS NECESSARY EXCEPT IN RADIO ROOMS AS DESCRIBED IN AT&T S 802-001-197.
 1. WATER COOLERS
 2. DRINKING FOUNTAINS
 3. FIRE EXTINGUISHER
 4. FIRE HOSE CABINET
 5. RADIATOR
 6. SOIL PIPE
 7. METAL DOOR FRAME AND WINDOWS
 8. CABLE HOLE SHEATHING
 9. DESIGNATION CARD HOLDER
 10. DESK AND CABINETS
 11. CIRCUIT PACK STORAGE FRAME (NOT IN ESS LINEUP)
 12. AC POWER SERVICE CABINET (NOT ON ESS GROUND PLANE)
 13. THERMOSTATS
 14. VENDING MACHINE.
 60. IN SOME INSTALLATIONS THE LOCATION OF THE MAIN GROUND BUS (GRD WINDOW) IN THE VICINITY OF PCFD POWER DISTRIBUTION CABINETS, MAY PRODUCE A CONDITION REQUIRING EXTENSIVE AC RACEWAY RUNS OR MAY SUBSTANTIALLY INCREASE THE LENGTH OF GROUND CONDUCTORS WHICH MUST BE BONDED TO THE MGB BEFORE PROCEEDING TO A NON-ESS ENTITY SHARING THE SAME POWER PLANT. IN THIS INSTANCE THE MGB MAY BE RELOCATED WITHIN THE ESS AREA SO THE RACEWAY RUNS AND/OR NON-ESS ENTITY GROUND CONDUCTOR LENGTHS MAY BE MINIMIZED. IF THIS IS DONE THE AC RACEWAYS MUST BE ISOLATED FROM THE INTEGRATED GROUND PLANE FROM THE GROUND WINDOW TO THE POINT OF CONNECTION AS WELL AS IN THE ESS AREA.
 61. IN SOME INSTALLATIONS IT MAY BE EXPEDIENT TO SUPPLY DC POWER TO THE ESS PD FRAME FROM THE FLOOR BELOW THROUGH NON-METALLIC SHEEVES IN THE FLOOR. THE -48 AND GRD BUS BAR ASSEMBLIES THROUGH WHICH POWER IS SUPPLIED TO THE PD FRAMES ARE LOCATED AT THE CEILING OF THE FLOOR BELOW. IF THE GROUND WINDOW BUSBAR IS LOCATED ON THE FLOOR BELOW THE ESS, THE METALLIC RACEWAYS CONTAINING AC CIRCUIT CONDUCTORS FOR CIRCUITS IN THE ESS COMPLEX MUST BE BONDED TO THE MGB BEFORE CONTINUING THROUGH THE SLEEVES IN THE FLOOR INTO THE ESS COMPLEX. AFTER BONDING TO THE MGB THESE METALLIC RACEWAYS MUST NOT TOUCH THE INTEGRATED GROUND PLANE AT ANY POINT, SINCE THEY ARE A PART OF THE ISOLATED GROUND PLANE (ESS GROUND). AC EG (GREEN), IF RUN MUST ALSO BE BONDED TO MGB. (SEE FIG. 18).
 62. THERE ARE MANY VARIOUS CONFIGURATIONS IN BRINGING -48 RTN FEEDER LEADS INTO 5ESS POWER DISTRIBUTION CABINETS. DEPENDING UPON OFFICE SIZE, THE NUMBER OR POWER DISTRIBUTION CABINETS, DISTANCE TO THE POWER PLANT, LOCATION OF THE GROUND WINDOW, OFFICE LAYOUT,
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- SEE PROPRIETARY NOTICE ON SHEET ONE
- BT13

5ESS SWITCHING EQUIPMENT
GROUNDING METHODS AND
REQUIREMENTS
(6'-0" CABINETS)

DWG SIZE C2 ISSUE 14

SHEET A2 OF 44

ENGINEERING NOTES

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EXCEPTION 2

AN AC EG (GREEN WIRE) CONDUCTOR IS NOT REQUIRED WHEN BRANCH CIRCUIT PHASE CONDUCTORS ARE RUN IN CONTINUOUS METALLIC RACEWAY APPROVED AS A GROUNDING CONDUCTOR THAT DOES NOT EXCEED 25 FEET IN LENGTH FROM THE ENCLOSURE OF THE UNIT CONTAINING THE CIRCUIT OVER CURRENT (FUSE OR CIRCUIT BREAKER) DEVICE TO THE ENCLOSURE OF THE UNIT SERVED BY THE BRANCH CIRCUIT.

FOR 5ESS PURPOSES, ALWAYS INSTALL THE GREEN WIRE EG LEAD FOR ALL OFFICES INSTALLED FROM NOW ON. THIS CHANGE IS NOT RETROACTIVE, AND THEREFORE EXISTING OFFICES SHOULD NOT BE CHANGED, UNLESS THE TELEPHONE COMPANY ORDERS THE CHANGE AND WILL PAY FOR IT.

NOTE THAT THE USE OF EMT CONDUIT (THINWALL) IS NOT APPROVED WITHIN 5ESS SWITCH BECAUSE OF ITS CONSTRUCTION AND REDUCED METALLIC CONTENT. THE USE OF KS-5351 CONDUIT WITH KONDU COMPRESSION FITTINGS OR KS-5351 THREADED FITTINGS IS THE APPROVED STANDARD RACEWAY.

WHERE LOCAL CODES REQUIRE IT, OR WHEN TELCO REQUESTS IT, THE AC EG GREEN WIRE SHOULD BE PROVIDED. AT&T PRACTICE 802-001-198 PARAGRAPH 4.07 WILL BE CHANGED TO ALWAYS REQUIRE THE EG GREEN WIRE, PER EIMP88NJ0010.

THE RECEPTACLE IN THE END GUARD SHALL BE A KS20201, L8, EQUIPPED WITH AN AUTOMATIC GROUNDING CLIP.

95. THE FOLLOWING GUIDELINES SHOULD BE USED IN DETERMINING WHEN AND IF NO-OX-ID COMPOUND SHOULD BE USED ON 5ESS SWITCH AND OSPS POWER AND GROUND CONNECTIONS:

DEFINITIONS:

UNPROTECTED METAL-DEFINED AS ANY OF THE FOLLOWING:

- UNPLATED COPPER
- UNPLATED COPPER ALLOY
- UNPLATED STEEL
- ALUMINUM
- LEAD OR PLATED LEAD
- ANY METAL WITH EXPOSED SURFACE OF COPPER/COPPER ALLOY PLATE.

UNPROTECTED METAL COMBINATIONS-DEFINED AS ELECTRICAL CONTACT SURFACES THAT MAKE UP A SINGLE CONNECTION IN WHICH ONE OR MORE OF THE CONTACTING SURFACES IS AN UNPROTECTED METAL.

PROTECTED METAL-DEFINED AS METAL CONSISTING OF OR PLATED WITH ONE OF THE FOLLOWING MATERIALS:

TIN	SOLDER	NICKEL	SILVER	GOLD
CHROMIUM	ZINC	CADIUM	PLATINUM	

- A. UNPROTECTED METAL ELECTRICAL CONNECTIONS MADE BY CRIMPED OR MECHANICAL SCREW/NUT CONNECTIONS SHALL BE PROTECTED AGAINST OXIDATION BY APPLYING NO-OX-ID TO THE UNPROTECTED SURFACE. USE THE METHODS AND PROCEDURES OF AT&T PRACTICE 802-005-180 ONLY WHEN THE FOLLOWING UNPROTECTED METAL COMBINATIONS ARE FOUND:

- A. UNPROTECTED METAL IS CONNECTED OR FASTENED TO UNPROTECTED METAL.
- B. UNPROTECTED METAL IS CONNECTED OR FASTENED TO PROTECTED METAL.
- C. NONE OF THE ABOVE APPLY IF THE PRODUCT DOCUMENTATION SPECIFICALLY STATES NO-OX-ID APPLICATION REQUIREMENTS.
- B. THE FOLLOWING ELECTRICAL CONNECTION COMBINATIONS SHALL NOT REQUIRE THE APPLICATION OF NO-OX-ID:
 - A. PROTECTED METAL IS CONNECTED OR FASTENED TO PROTECTED METAL.
 - B. THE ABOVE DOES NOT APPLY IF THE PRODUCT DOCUMENTATION SPECIFICALLY STATES NO-OX-ID APPLICATION REQUIREMENTS.
- C. IN ALL CASES, WHERE SOME DOUBT EXISTS, THE INHIBITING COMPOUND SHOULD BE USED.
- D. IF THERE IS ANY QUESTION AS TO THE TYPE OF METALS BEING CONNECTED, NO-OX-ID SHOULD BE USED.

THE FOLLOWING IS AN EXAMPLE WHICH MAY HELP TO EXPLAIN THE NEW APPLICATION REQUIREMENTS:

EXAMPLE: A TIN PLATED COPPER CONNECTOR CRIMPED ON A TIN PLATED COPPER WIRE REQUIRES NO INHIBITING COMPOUND, BUT WHEN THE TIN PLATED COPPER CONNECTOR TANG IS CONNECTED TO AN UNPLATED COPPER BAR, THIS CONNECTION REQUIRES NO-OX-ID INHIBITING COMPOUND.

96. THE 845620996 CO-AX FEED-THRU BUS BAR ASSEMBLY IS PROVIDED WITH CABLE GROUP 85 OF ED-5D500-11, MUST BE INSTALLED WITHIN AND BONDED TO THE MAIN GROUND BUS BAR (GROUND WINDOW) AND MUST BE ISOLATED FROM BUILDING GROUND. THE MOUNTING MATERIAL SHOWN IN FIG F IS NOT PROVIDED WITH ED-5D500-11 GROUP 85 AND MUST BE ORDERED BY THE LINE ENGINEER AS REQUIRED. THE MATERIAL SHOWN IS A TYPICAL AND CAN BE CHANGED TO MEET JOB CONDITIONS.

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ENGINEERING NOTES

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CALCULATIONS MAY BE PERFORMED TO DETERMINE IF THE EFFECT OF THE GIRDLING WILL BE EXCESSIVE. A REASONABLE GUIDELINE WOULD BE THAT THE GIRDLING WOULD NOT INCREASE THE SELF-INDUCTANCE BY MORE THAN 10%, OR THAT THE PROPOSED SHORTER PATH WITH GIRDLING WOULD NOT HAVE MORE SELF-INDUCTANCE THAN THE LONGER PATH WITHOUT GIRDLING. USE THE FOLLOWING EQUATION TO FIND THE SELF-INDUCTANCE OF A GROUND WIRE WITH NO GIRDLING:

$$L = .061 L_1 (L \ln(4L/D) - .95) \text{ WHERE}$$

L=SELF INDUCTANCE IN MICROHENRIES
L1=LENGTH OF GROUND CONDUCTOR IN FEET
D=CONDUCTOR DIAMETER IN FEET (USE .031 FEET FOR #1/0 WIRE)
L1N=NATURAL LOGARITHM

TYPICAL VALUES WOULD BE:

LENGTH OF #1/0	SELF INDUCTANCE	LENGTH OF 750 MCM	SELF INDUCTANCE
10 FEET	3.8 MICROHENRIES	10 FEET	3.2 MICROHENRIES
25 FEET	10.7 MICROHENRIES	25 FEET	9.4 MICROHENRIES
50 FEET	23.9 MICROHENRIES	50 FEET	20.9 MICROHENRIES
75 FEET	37.6 MICROHENRIES	75 FEET	33.1 MICROHENRIES
100 FEET	52.0 MICROHENRIES	100 FEET	49.9 MICROHENRIES
125 FEET	66.6 MICROHENRIES	125 FEET	59.1 MICROHENRIES
150 FEET	81.6 MICROHENRIES	150 FEET	72.6 MICROHENRIES
175 FEET	96.9 MICROHENRIES	175 FEET	86.4 MICROHENRIES
200 FEET	112.3 MICROHENRIES	200 FEET	100.3 MICROHENRIES
250 FEET	143.8 MICROHENRIES	250 FEET	128.8 MICROHENRIES
300 FEET	175.9 MICROHENRIES	300 FEET	157.9 MICROHENRIES

TO CALCULATE THE EFFECT OF GIRDLING, USE THE FOLLOWING EQUATION:

$$L = .061 L_1 (L \ln(4L/D) - .95 + (P L_1 N(O/R))) \text{ WHERE}$$

L=SELF-INDUCTANCE IN MICROHENRIES
L1=LENGTH OF THE GIRDLING, IN FEET
(THIS WILL BE A VERY SMALL NUMBER)
D=CONDUCTOR DIAMETER IN FEET (USE .031 FOR #1/0 WIRE)
O=OUTER RADIUS OF GIRDLING METAL
R=INNER RADIUS OF GIRDLING METAL
L1N=NATURAL LOGARITHM

TYPICAL VALUES WOULD BE:

LENGTH OF GIRDLING	SELF INDUCTANCE	REMARKS
.041 FEET (.50 INCH)	.33 MICROHENRIES	STEEL CABLE CLAMP 1/2 IN. LONG
.032 FEET (1.00 INCH)	.68 MICROHENRIES	STEEL CABLE CLAMP 1 IN. LONG
.083 FEET (1.00 INCH)	.22 MICROHENRIES	12 IN. LADDER RACK HUNG 12 IN. BELOW ANOTHER 12 IN. LADDER RACK
.083 FEET (1.00 INCH)	.06 MICROHENRIES	12 IN. LADDER RACK HUNG 6 FT. BELOW A UNISTRUT SUPPORT CHANNEL USING 5/8 IN. THREADED RODS.

TO DETERMINE THE NET TOTAL EFFECT OF GIRDLING, ADD THE SELF-INDUCTANCE OF THE WIRE WITHOUT GIRDLING, TO THE SELF-INDUCTANCE OF THE GIRDLING ALONE. ANALYSIS SHOULD THEN BE MADE PER THE GUIDELINES ABOVE.

92. AT&T SPEC 802-001-195 FIGURE 1 SHOWS A TYPICAL GROUND WINDOW SPLICE PLATE WITH DISCHARGE GROUND LEADS 'D' PASSING THROUGH THE GROUND WINDOW BUT NOT BONDED TO THE MGB. IT IS PREFERABLE BUT NOT A REQUIREMENT THAT THE -48V AND RETURN FEEDERS FROM THE POWER PLANT TO THE P.D. CABINETS PASS THROUGH THE GROUND WINDOW, EVEN THOUGH THEY ARE NOT BONDED THERE, TO MINIMIZE THE AREA OF THE LARGE GROUND LOOP FORMED IF NOT ROUTED THROUGH THE GROUND WINDOW. THE AREA OF GROUND LOOP IS SHOWN AS CROSS HATCHED IN FIGURES 28A AND 28B. THE GROUND LOOP MAY BE OF PARTICULAR IMPORTANCE IF THE INSTALLATION IS IN CLOSE PROXIMITY TO HIGH POWER AM, FM, TV OR RADAR TRANSMITTERS.

93. IN GENERAL, TWO HOLE CRIMP LUGS ARE PREFERRED TO ONE HOLE CRIMP LUGS, BECAUSE OF ADDED RELIABILITY (MOVING THE CABLE SIDEWAYS DOES NOT LOOSEN THE CABLE CONNECTION WITH TWO HOLE LUGS). USE OF ONE HOLE LUGS IS RESTRICTED TO ONLY THOSE AREAS WHERE THE HOLE PATTERN AVAILABLE DOES NOT ALLOW TWO HOLE LUGS. IF TWO HOLES FOR LUGS EXIST, THEY SHOULD BE USED.

94. THE REQUIREMENT OF WHEN AN AC EG (GREEN WIRE) FOR 5ESS SWITCH APPLICATIONS SHALL BE PER AT&T SPEC 802-001-198 PAR. 4.07 USING EXCEPTION 1 OR EXCEPTION 2. THE EXCEPTIONS PER THE SPEC ARE AS FOLLOWS:

EXCEPTION 1

AN AC EG (GREEN WIRE) CONDUCTOR IS NOT REQUIRED WHEN A BRANCH CIRCUIT OVER CURRENT PROTECTION DEVICE (FUSE OR CIRCUIT BREAKER) RATING DOES NOT EXCEED 20 AMPERES AND THE CONDUCTORS ARE RUN IN CONTINUOUS METALLIC RACEWAY APPROVED AS A GROUNDING CONDUCTOR.

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ENGINEERING NOTES

***** CONTINUED *****

THE OFFICE GROUND WINDOW. FOR MISCELLANEOUS CABINETS (RSM APPLICATION) WHICH FUNCTION AS A P.D. CABINET, BECAUSE THEY CONTAIN A P.D. LOAD PANEL FEED BY A 200 AMPERE OR LESS CIRCUIT BREAKER, THIS GROUND WIRE GAUGE MAYBE REDUCED FROM A NO 1/0 AWG TO NO. 6 AWG, AND MAYBE CONNECTED TO THE NO. 6 AWG FRAME BONDING RUN. NOTE 97. FOR OSPS APPLICATION SEE NOTE 154.

87. WHEN THE RETURN BUS BAR OF THE POWER PLANT IS USED AS THE MAIN GROUND BUS (GROUND WINDOW) THE ENTIRE RETURN BUS BAR IS THE GROUND WINDOW. ALL EFFORT MUST BE MADE TO TERMINATE ALL BONDS NEAR THE 5ESS FEEDER RETURN CONNECTIONS ON THE POWER PLANT RETURN BUS BAR. TWO HOLE CRIMP TYPE CONNECTORS MUST BE USED FOR ALL ESS GROUND TERMINATIONS. IF MULTIPLE POWER PLANTS HAVE THEIR RETURN BUS BARS STRAPPED OR BUSED TOGETHER, ONLY THE BUS BAR OF THE POWER PLANT FEEDING THE 5ESS IS CONSIDERED AS THE MGB GROUND WINDOW. THE GROUND WINDOW CAN ONLY BE ON ONE FLOOR AND CAN NOT BE MORE THAN ONE FLOOR AWAY FROM THE 5ESS.

88. THE LEAD FROM THE MAIN GROUND BUS (GROUND WINDOW) TO THE C.O. GROUND BUS BAR IS SPECIFIED AS 1/0 AWG FOR 5ESS SWITCH AND OSPS APPLICATION BUT A LARGER SIZE MAY BE SPECIFIED, IF REQUIRED BECAUSE OF SHARING POWER WITH ANOTHER SYSTEM WHICH REQUIRES A LARGER SIZE WIRE. THE LIMITING CONDITION OF THIS LEAD IS ITS INDUCTANCE (LESS IS BETTER). NOTE: THAT INCREASING THE SIZE OF THE LEAD DOES NOT APPRECIABLY REDUCE INDUCTANCE; THAT IS THE REASON A LARGER SIZE SUCH AS THE 750 MCM USED IN OTHER ESS SWITCH SYSTEMS IS NOT SPECIFIED. A SPECIAL CASE MAY EXIST THAT PLACES LARGE CURRENTS INTO THE GROUND LEAD. (SEE AT&T SPEC 802-001-195 PAR. 8.24 REGARDING E&M TRUNKS). IF THIS EXISTS, PARTICULARLY THROUGH POWER SHARING VIA THE ESS GROUND WINDOW WITH OTHER SYSTEMS, THE SIZE OF THIS LEAD SHOULD BE INCREASED AS REQUIRED TO PROVIDE A MAXIMUM VOLTAGE DROP FOR DC OF .5 VOLT.

89. THE POWER PLANT FRAMEWORK INCLUDING RECTIFIER FRAMEWORK SHOULD BE GROUNDED TO THE CO GROUND BUS. THE PURPOSE OF THIS LEAD IS TO CARRY FAULT CURRENTS (INTERNAL TO THE POWER PLANT) TO GROUND, PER NATIONAL ELECTRICAL CODE. THE MOST DIRECT AND RELIABLE ROUTE THEREFORE, IS TO THE CO GROUND BUS. THE SIZE OF THE GROUND CABLE SHALL BE PER POWER PLANT REQUIREMENTS. NO. 6 AWG IS THE MINIMUM SIZE ALLOWED FOR 5ESS APPLICATION. SIZE THE GROUNDING CONDUCTORS FOR FRAMEWORKS AND RECTIFIERS PER TABLE 250-95 OF THE NATIONAL ELECTRIC CODE; THIS SIZE IS BASED UPON THE RATING OF THE OVER-CURRENT DEVICE FEEDING THE EQUIPMENT.

90. HORIZONTAL GROUND EQUALIZER SPLICE PLATES DO NOT NEED TO BE TAPED, AS HAS BEEN DONE WITH OPEN TYPE GROUND BUS BARS. THE RISK OF HAZARD TO PERSONNEL, OR FROM UNINTENTIONAL GROUNDING TO BUILDING STEEL IS DEEMED SO SMALL AS TO NOT JUSTIFY TAPING. NOT TAPING WILL ALSO FACILITATE VISUAL INSPECTIONS.

91. ANY SINGLE GROUND LEAD (UNPAIRED) THAT CARRIES LIGHTNING CURRENTS SHOULD NOT IN GENERAL BE SURROUNDED BY A COMPLETE METALLIC PATH (SEE FIGURES 27A THRU 27D). FOR 5ESS SWITCHES THIS WOULD APPLY TO THE FOLLOWING LEADS:

- #1/0 CONNECTION BETWEEN THE ESS SINGLE POINT GROUND (GROUND WINDOW) AND THE CENTRAL OFFICE GROUND BAR
- #1/0 CONNECTION BETWEEN THE MAIN DISTRIBUTING FRAME AND THE CENTRAL OFFICE GROUND BAR
- #1/0 CONNECTION BETWEEN THE MAIN DISTRIBUTING FRAME AND THE ESS SINGLE POINT GROUND (GROUND WINDOW), WHEN REQUIRED (SEE NOTE 64).

BUILDING HORIZONTAL AND VERTICAL EQUALIZERS. THESE ARE NOT PART OF THE 5ESS SWITCH, BUT INSTEAD ARE CONTROLLED BY STANDARD AT&T PRACTICES. TYPICALLY THESE ARE 750 MCM CABLE. 750 MCM HORIZONTAL EQUALIZERS BETWEEN SPLICE PLATES OF 5ESS SWITCH PD CABINETS.

THIS CONSTRAINT AGAINST SUCH 'GIRDLING' OF CONDUCTORS WOULD NOT APPLY TO THE FOLLOWING CONDUCTORS IN 5ESS SWITCHES:

- #6 SAFETY BOND WIRE FROM CABINET TO CABINET (NO LIGHTNING)
- #16 GROUND WIRES FROM VARIOUS EQUIPMENT UNITS TO THE GROUND WINDOW (NO LIGHTNING)

-48V POWER FEEDERS (THEY ARE PAIRED)
THE REASON FOR THIS CONSTRAINT IS THAT THE INDUCTANCE OF THESE SINGLE GROUND LEADS IS IMPORTANT IN ENSURING A LOW-IMPEDANCE PATH BACK TO GROUND FOR LIGHTNING CURRENTS; THE LOWER, THE BETTER. FOR MOST APPLICATIONS, THE SAFEST PROCEDURE, IF IN DOUBT, IS TO NOT GIRDLE THE GROUND CONDUCTOR WITH A CLOSED METALLIC PATH. IN SOME CASES, COST SAVINGS MIGHT BE POSSIBLE BY USING A SHORTER ROUTING PATH FOR THE GROUND LEAD, BUT ONE THAT WOULD REQUIRE USE OF SOME FORM OF GIRDLING. FOR THESE APPLICATIONS, THE FOLLOWING

----- CONTINUED TO THE LEFT -----

SEE PROPRIETARY NOTICE ON SHEET ONE

BT13

5ESS SWITCHING EQUIPMENT
GROUNDING METHODS AND
REQUIREMENTS
(6'-0" CABINETS)

DWG SIZE C2 ISSUE 14

ENGINEERING NOTES

***** CONTINUED *****

- PROTECTION AT THE MDF. IF LINE UNITS INCLUDE THE TN1048, WHICH REQUIRES GAS TUBES AT THE MDF, THIS GROUNDING ARRANGEMENT IS NOT ACCEPTABLE. A MAJOR DIFFERENCE WITH THIS FIGURE 32A ARRANGEMENT IS THAT THE RIN LEADS AT THE PCDF SPLICE PLATE DO NOT NEED A HORIZONTAL EQUALIZER LEAD FROM THE NEAREST PCDF TO THE GROUND WINDOW. WITH THE FIGURE 32A ARRANGEMENT, LIGHTNING CURRENTS IN THE RIN MUST GO TO THE POWER PLANT AND THEN TO THE C.O. GROUND BAR. THIS IS ACCEPTABLE BECAUSE TN1058 PACKS CAN FUNCTION WITH THE HIGHER INDUCTANCE THAT COMES WITH A LONGER PATH LENGTH TO GROUND.
166. IN FIG 32A, THIS LEAD SHOULD BE AS SHORT AS POSSIBLE. IN THIS ARRANGEMENT, GIRDLING (WITH AN ENCLOSING METALLIC PATH) IS ACCEPTABLE FOR THE 5ESS SWITCH. THE GAUGE OF THIS WIRE MUST BE AT LEAST NO. 0 FOR 5ESS SWITCH; SIZE TO MEET REQUIREMENTS OF ANY OTHER SYSTEMS SHARING THE POWER PLANT.
167. WHEN ANY DIGITAL CARRIER AND ELECTRONIC PAIR GAIN EQUIPMENT MUST BE LOCATED IN THE ESS ISOLATED GROUND ZONE, IT MUST RECEIVE ITS -48V POWER FROM ITS OWN DEDICATED PCDF POWER DISTRIBUTING FRAME; IT MUST NOT SHARE A PCDF WITH A 5ESS FOR ELECTRICAL NOISE REASONS.
168. THROUGH OUT THIS DRAWING, THE CONNECTION FROM THE ESS GROUND WINDOW TO THE OFFICE PRINCIPAL GROUND POINT (OPGP) IS TYPICALLY SHOWN TO GO VIA A CENTRAL OFFICE GROUND BAR, IF NO SUCH C.O. GROUND BAR EXISTS, OR IF IT IS MORE DIRECT, THE GROUND WINDOW MAY GO DIRECTLY TO THE OPGP.
169. ASCERTAIN THAT THE POWER SERVICE NEUTRAL IS PROPERLY GROUNDED PER THE NATIONAL ELECTRIC CODE. SEE ALSO AT&T PRACTICE 802-001-198.
170. WHEN 60HZ AC POWER IN METALLIC CONDUIT IS DISTRIBUTED IN THE ISOLATED GROUND PLANE SUCH AS A 5ESS SWITCH, THERE CAN BE SOME AMOUNT OF DC IN THIS CONDUIT AND IN THE FRAME GROUND SYSTEM, BECAUSE THIS CONDUIT IS A PATH IN PARALLEL WITH THE -48V DC DISTRIBUTION. THIS AMOUNT OF DC IS ACCEPTABLE.
171. DOLLAR SIGNS (\$) IN FRONT OF AND BEHIND WORDS, SENTENCES, PARAGRAPHS AND/OR CHARACTERS INDICATE HORIZONTALLY LINED OUT INFORMATION.

ENGINEERING NOTES

***** CONTINUED *****

159. THE 845623925 GROUND BAR ASSEMBLY IS PROVIDED WITH CABLE GROUPS 85A AND 86 OF ED5D500-21. THE BAR(S) MUST BE ISOLATED FROM BUILDING GROUND AND CONNECTED TO THE ESS MAIN GROUND BUSBAR (GROUND WINDOW) NOT TO A PCDF SPLICE PLATE. GROUND BAR ASSEMBLIES MAY BE CONNECTED IN SERIES BY OVERLAPPING BARS WITH ONE CONNECTION TO THE GROUND WINDOW. EACH BAR MAY ALSO BE CONNECTED INDIVIDUALLY TO THE GROUND WINDOW. COAX CABLE SHOULD BE SUPPORTED WITHIN TWO FEET OF THE GROUND BAR. NO-OX-ID MUST BE USED BETWEEN THE CABLE CONNECTOR AND THE GROUND BAR AND/OR BETWEEN GROUND BARS WHEN USED AS AN INTERCONNECTION. THE MOUNTING MATERIAL SHOWN IN FIG. L IS NOT PROVIDED WITH ED5D500-21 GROUP 85A OR 86 AND MUST BE ORDERED BY THE LINE ENGINEER AS REQUIRED. THE MATERIAL SHOWN IS TYPICAL AND CAN BE CHANGED TO MEET JOB CONDITIONS.
160. THOUGH NOT GENERALLY RECOMMENDED, THIS SPECIAL FIG 32 ARRANGEMENT CAN BE ACCEPTABLE FOR VERY SMALL OFFICES. IF THE OFFICE IS SMALL, THEN THE LEAD IDENTIFIED BY NOTE 161 WILL BE SHORT, AND THE OFFICE WILL FUNCTION PROPERLY. IF THIS LEAD IS LONG, THEN ITS INDUCTANCE WILL CAUSE EXTREME VOLTAGE EXCURSIONS WHEN LIGHTNING CURRENTS PASS THROUGH IT ON THE WAY TO GROUND. THIS COULD LEAD TO DEGRADED SYSTEM PERFORMANCE AND PERHAPS VOLTAGE BREAKDOWN. THE 5ESS SWITCH, ITS GROUND WINDOW, AND THE POWER PLANT ALL MUST BE LOCATED WITHIN ONE FLOOR OF EACH OTHER (A STANDARD REQUIREMENT). THE 5ESS, LOGIC GROUNDS FOR ALL UNITS EXCEPT LINE UNITS ARE REFERENCED TO FRAME GROUND; THESE GROUNDS MUST BE KEPT ISOLATED FROM -48V RTN. LINE UNIT LOGIC GROUND IS REFERENCED TO -48V RTN. NOTE THAT THIS NEW ARRANGEMENT VIOLATES SEVERAL USUAL GROUNDING CONSTRAINTS:
1. POWER SHARING BETWEEN THE 5ESS SWITCH AND OTHER EQUIPMENT IS NOT DONE VIA THE GROUND WINDOW; POWER FROM THE POWER PLANT GOES DIRECTLY FROM THE POWER PLANT TO THE SHARING EQUIPMENT. IN SOME INSTALLATIONS THIS MIGHT CAUSE NOISE PROBLEMS, IN WHICH CASE THE SYSTEM WILL NEED TO BE RE-CONFIGURED.
 2. LIGHTING CURRENTS IN THE 5ESS SWITCH ARE PLACED IN THE -48V RIN LEAD BY DESIGN. THEY ARE SPECIFICALLY NOT PLACED IN THE CABINET STEEL, AS THEY ARE IN SOME OTHER COMPETING DIGITAL SWITCH DESIGNS, LEADING TO GROUNDING ARRANGEMENTS PROPOSED BY OTHERS. THIS NEW ALLOWABLE 5ESS SWITCH GROUNDING ARRANGEMENT IS AN ATTEMPT TO ALLOW GROUNDING SIMILAR TO THIS PLAN, GIVEN THAT BASIC DIFFERENCE. WE BELIEVE THAT LIGHTNING CURRENTS SHOULD NOT BE PLACED IN THE CABINET STEEL, FOR PERSONNEL SAFETY REASONS. IN SOME COUNTRIES, THIS IS NOT PERMITTED. NOTE THAT FOR THIS NEW ALLOWABLE 5ESS GROUNDING ARRANGEMENT, THE LIGHTNING CURRENTS IN THE RTN MUST NOW GO ALL THE WAY TO THE POWER PLANT AND ALL THE WAY BACK TO THE CENTRAL OFFICE GROUND BAR AND THEN TO THE OFFICE PRINCIPAL GROUND POINT. THIS LONG ROUTING IS UNACCEPTABLE IN LARGE OFFICES, BUT CAN BE ACCEPTABLE IF DISTANCES ARE KEPT SMALL. THE DISTANCES FROM THE PCDF POWER DISTRIBUTING FRAME TO THE POWER PLANT ARE NOT QUITE AS CRITICAL, SINCE THERE ARE MANY -48V RTNS IN PARALLEL, GIVING AN EFFECTIVELY LOWER INDUCTANCE AND THEREFORE LESS VOLTAGE EXCURSION UNDER LIGHTNING CONDITIONS.
161. IN FIG 32, THIS LEAD SHOULD BE AS SHORT AS POSSIBLE, WITH A DESIRED LENGTH NO GREATER THAN 10 FEET, AND A MAXIMUM LENGTH OF 25 FT. IF THIS CANNOT BE DONE, THEN THIS ARRANGEMENT SHOULD NOT BE USED. SEE NOTE 160. THE GAUGE OF THIS LEAD MUST BE AT LEAST NO. 0 FOR THE 5ESS SWITCH, AND MUST BE AS LARGE AS REQUIRED FOR THE OTHER SHARING EQUIPMENT. SINCE IT CARRIES LIGHTNING CURRENTS, THIS LEAD MUST NOT BE GIRDLED.
162. MAXIMUM DESIRABLE LEAD LENGTH IS 25 FEET.
163. DOLLAR SIGNS (\$) IN FRONT OF AND BEHIND WORDS, SENTENCES, PARAGRAPHS AND/OR CHARACTERS INDICATE HORIZONTALLY LINED OUT INFORMATION.
164. THE ADHESIVE LABEL SHOWN IN FIG. M, CAN BE PROVIDED FOR ATTACHMENT TO ANY CONVENIENT SURFACE NEAR THE GROUND WINDOW, SUCH AS THE OUTSIDE SURFACE OF A LADDER RACK STRINGER. THE LABEL SHOULD BE READILY SEEN FROM THE EQUIPMENT FLOOR. QUANTITY TO BE ONE OR TWO PER GROUND WINDOW, DEPENDANT ON JOB CONDITION. LABELS MAY BE OBTAINED AS COMCODE 845624329 FROM 'NAMEPLATE AND PANEL TECHNOLOGY, DIVISION OF PHOTO TECHNIQUES CORP,' 387 GUNDERSEN DR., CAROL STREAM, IL 60188 OR APPROVED EQUIVALENT.
165. FIGURE 32A REPRESENTS A METHOD WHEREBY A 5ESS MAY BE GROUNDED TO MEET THE INTENT OF BELLCORE TR-EOP-000295. THIS ARRANGEMENT IS ACCEPTABLE ONLY IF THE 5ESS LINE UNITS ARE EQUIPPED EXCLUSIVELY WITH TN1058 CIRCUIT PACKS, WHICH DO NOT REQUIRE GAS TUBE
- CONTINUED TO THE LEFT -----

ENGINEERING NOTES

***** CONTINUED *****

97. ONCE A LOCATION FOR THESE HAS BEEN CHOSEN ALL SIMILAR LEADS IN GROWTH SITUATIONS MUST BE TERMINATED IN THAT SAME PLACE.
98. MINIMUM SIZE DC GROUND BOND TO BE NO. 6 AWG FOR STANDARDIZATION PURPOSES. (SEE NOTE 99 FOR AC APPLICATIONS). THE POWER PLANT FRAMEWORK BOND SHALL BE SIZED PER POWER PLANT REQUIREMENTS.
99. SEE NATIONAL ELECTRICAL CODE, PAR 250-95 WHICH STATES THAT EACH AC GROUNDING CONDUCTOR SHALL BE SIZED ON THE BASIS OF THE AMPERE RATING OF THE HIGHEST OVERCURRENT DEVICE PROTECTING A CIRCUIT CONDUCTOR IN THE RACEWAY AS FOLLOWS. DO NOT SUM UP THE INDIVIDUAL OVERCURRENT DEVICE RATINGS IN DETERMINING THE WIRE GAUGE.

CKT BKR OR FUSE AMPERE RATING	COPPER GROUND WIRE GAUGE	USE
15 AMPERE	14 AWG	
20 AMPERE	12 AWG	
30 AMPERE	10 AWG	6 AWG MIN
40 AMPERE	10 AWG	
60 AMPERE	10 AWG	
100 AMPERE	8 AWG	
200 AMPERE	6 AWG	
300 AMPERE	4 AWG	4 AWG

100. IN NEW BUILDINGS THE GROUND ELECTRODE SYSTEM SHOULD BE PROVIDED PER LATEST EDITION OF THE NATIONAL ELECTRICAL CODE. IN EXISTING BUILDINGS USE EXISTING GROUND SYSTEM. REF AT&T SPEC 802-001-180 AND ASSOCIATED APPLICABLE PRACTICES.
151. FOR OSPS EQUIPMENT ARRANGEMENTS SEE APPLICATION SCHEMATIC SD-5D135-01.
152. IN OSPS ALL -48 VOLT RETURN FEEDERS ARE TO BE ISOLATED FROM THE OSPS EQUIPMENT CABINETS. ALL 'O' BUS RETURNS IN AN EQUIPMENT CABINET LINE-UP ARE MADE COMMON AND ALL '1' BUS RETURNS IN THE SAME EQUIPMENT CABINET LINE-UP ARE MADE COMMON.
153. FOR OSPS APPLICATIONS, TOLL AND TRANSMISSION EQUIPMENT IS PART OF THE INTEGRATED (BUILDING) GROUND PLANE.
154. OSPS POWER DISTRIBUTION CABINETS ON ISOLATED (ESS GROUND) GROUND PLANE MUST HAVE FRAMEWORK GROUNDED WITH A KS-5482-01 1/0 WIRE, DIRECTLY TO THE GROUND WINDOW BUS BAR. OSPS POWER DISTRIBUTION CABINETS ON INTEGRATED (BUILDING GROUND) GROUND PLANE SHALL HAVE FRAMEWORK GROUNDED WITH A KS-5482-01 1/0 WIRE TO THE CO GROUND SYSTEM ON THE FLOOR THE PD IS LOCATED ON.
155. THE SIZE OF THE OSPS EQUIPMENT GROUND CONDUCTOR FROM THE CO GROUND TO THE BST OR VDT POWER CORD MUST BE THE SAME SIZE AS THE CALCULATED POWER FEEDER FROM THE PD FUSE PANEL.
156. POWER FEEDERS AND RETURNS MUST BE PAIRED AND RUN IN THE SAME RACK.
157. MULTIPLE BST'S OR VDT'S CAN BE FUSED FROM A SINGLE FUSE (SEE SD-5D135-01). THE EQUIPMENT GROUNDS MAY BE MULTIED TOGETHER FOR GROUPS OF BST'S OR VDT'S THAT SHARE A COMMON SUPPLY FUSE. THE MATERIAL REQUIRED TO MAKE THE SPLICES TO THE BST'S OR VDT'S POWER CABLE IS A JOB ENGINEERED CONDITION BASED ON THE CABLE SIZE, NUMBER AND TYPE OF CONNECTIONS REQUIRED.
158. TERMINATE CABINET GROUND CABLE TO EQUIPMENT MOUNTING HOLES ON EITHER REAR UPRIGHT. THIS TERMINATION SHALL BE MADE WITHIN THE TOP FIVE MOUNTING POSITIONS. THE PRIME POSITION BEING THE THIRD AND FOURTH MOUNTINGS DOWN. ROUTE CABLE ASSEMBLY ALONG THE UPRIGHT TO THE CABLE RACK. ED-5D507-17 G24A PROVIDES THE #6 BARE WIRE, A CONNECTOR WITH REQUIRED MOUNTING HARDWARE AND A 'C' TAP FOR CONNECTION TO OVERHEAD GROUND CONDUCTOR; HOWEVER IN THE EVENT OF A BREAK IN THE FRAME LINEUP ETC, THE LINE ENGINEER MAY BE REQUIRED TO ORDER ADDITIONAL 'C' TAPS ON A JOB BASIS. (SEE FIG. 11 & J). IN A WORKING OFFICE THIS BARE NO. 6 SAFETY BOND WIRE MUST NOT BE REMOVED, OR A SYSTEM MALFUNCTION MY OCCUR.
- CONTINUED TO THE LEFT -----

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BT13

5ESS SWITCHING EQUIPMENT
GROUNDING METHODS AND
REQUIREMENTS
(6'-0" CABINETS)

DWG SIZE C2 ISSUE 14

LUCENT TECHNOLOGIES INC ED5D022-11

SHEET A4 OF 44

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MANUFACTURING NOTES

1. ALL ESS EQUIPMENT CABINETS SHALL BE FASTENED TO THE FLOOR AS SHOWN ON ED-5D511-11. CARE MUST BE EXERCISED TO ENSURE THAT THE CABINETS DO NOT INADVERTANTLY TOUCH THE INTEGRATED GROUND PLANE AT ANY POINT. THIS ALSO APPLIES TO END GUARDS AND STANCIONS. THE EFFECTIVENESS OF EACH INSULATED BOLT CONNECTION SHALL BE VERIFIED BY TEST (FIG. 12).
2. THE CO GROUND MUST BE CONNECTED TO THE OFFICE PRINCIPAL GROUND POINT BEFORE ANY AC OR DC POWER FRAMES ARE ENERGIZED.
3. WHENEVER ESS INSULATED BATTERY AND GROUND CONDUCTORS OR METAL RACEWAYS ON THE ISOLATED GROUND PLANE PENETRATES A FLOOR OR WALL, NON-METALLIC SLEEVES OR INSULATED CABLE PORT MUST BE USED.
4. THE ENTIRE SPLICE PLATE AND ASSOCIATED LUGS FOR THE H-512-137 (A&M ONLY) -48 VOLT BUS BAR ASSEMBLIES (ABOVE PD CABINETS) SHALL BE TAPED FOR PROTECTION. THE GROUND BUS BAR NEED NOT BE TAPED.
5. TERMINATE CABINET GROUND CABLE TO EQUIPMENT MOUNTING HOLES ON EITHER REAR UPRIGHT. THE INSTALLER SHALL SELECT UNUSED MOUNTING HOLES AS NEAR THE TOP OF THE UPRIGHT AS POSSIBLE THAT WILL ALLOW DRESSING THE GROUND CABLE WITHOUT ANY SHARP BENDS. THIS TERMINATION SHALL BE MADE WITHIN THE TOP FIVE MOUNTING POSITIONS. THE PRIME POSITION BEING THE SECOND & THIRD MOUNTING POSITION DOWN. (SEE FIG. 11, J & K FOR MATERIALS AND METHOD OF ASSEMBLY).
6. THE ED-4C471-30 JUNCTION BUS BAR ASSEMBLIES (BATTERY & GROUND), ABOVE THE P.D. CABINETS, DO NOT REQUIRE TAPING.
7. IN A WORKING OFFICE THE BARE NO. 6 SAFETY BOND WIRE ON EACH CABINET MUST NOT BE REMOVED, OR A SYSTEM MALFUNCTION MAY OCCUR.
8. SEE ENGINEERING NOTE 164.

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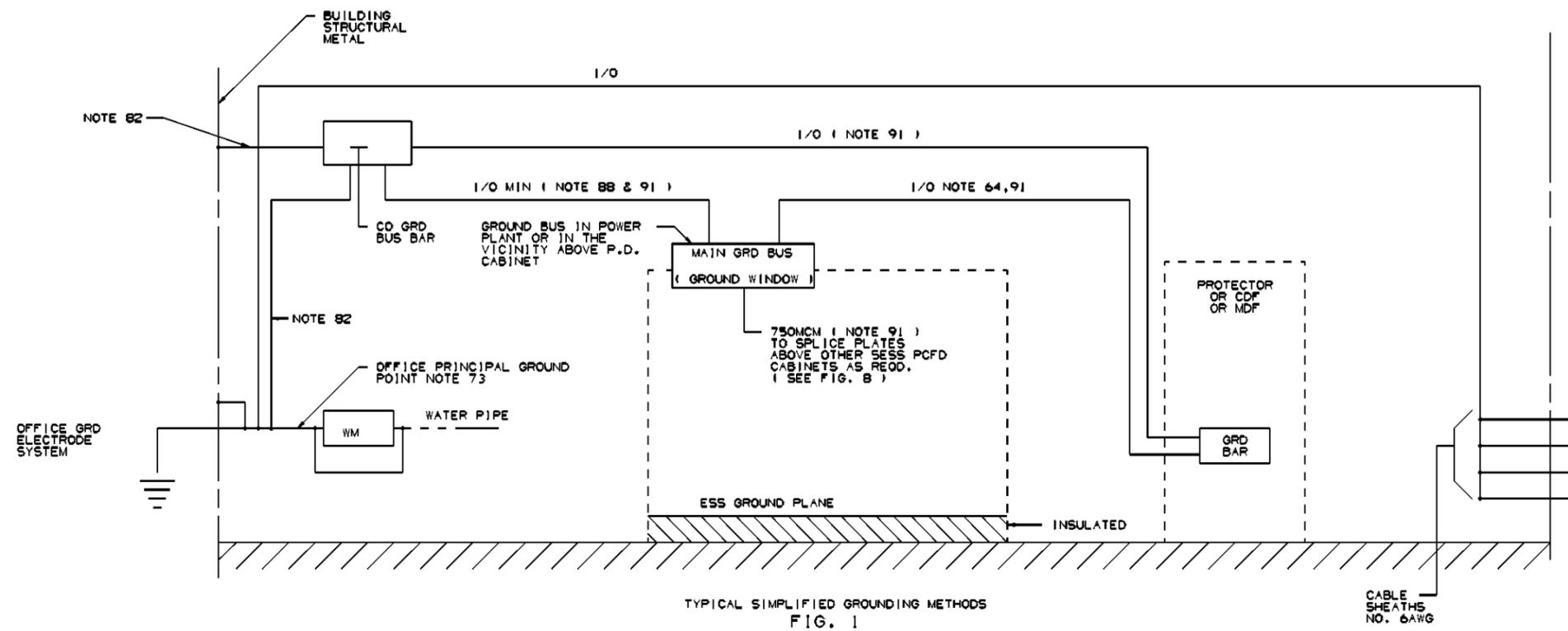
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ESS SWITCHING EQUIPMENT
GROUNDING METHODS AND
REQUIREMENTS
(6'-0" CABINETS)

DWG SIZE C2	ISSUE 14
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ED5D022-11

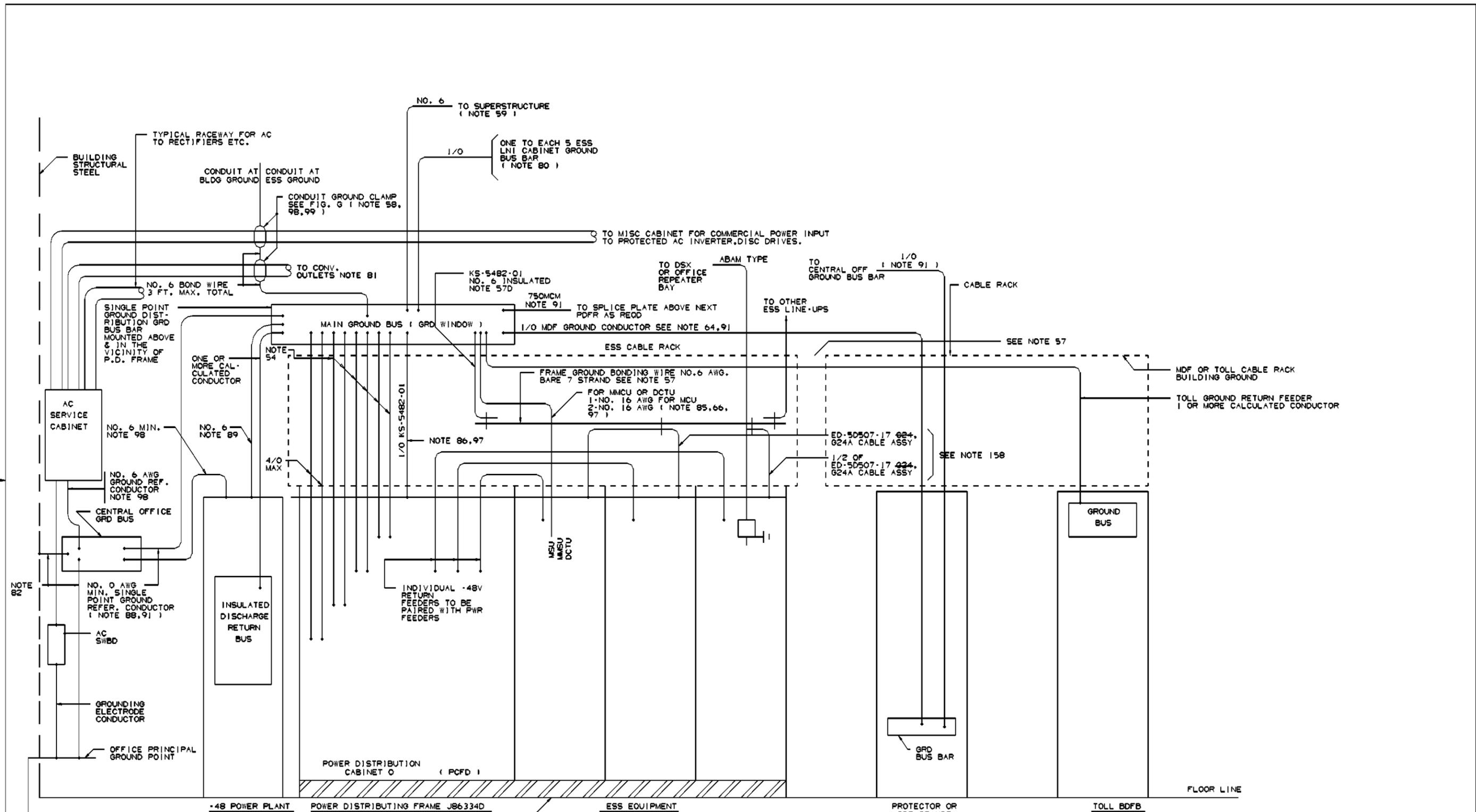
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TYPICAL SIMPLIFIED GROUNDING METHODS
FIG. 1

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GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
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TYPICAL GROUNDING ARRANGEMENT WITH P.D. CABINET AND SEPARATE POWER PLANT (NOTE 91)

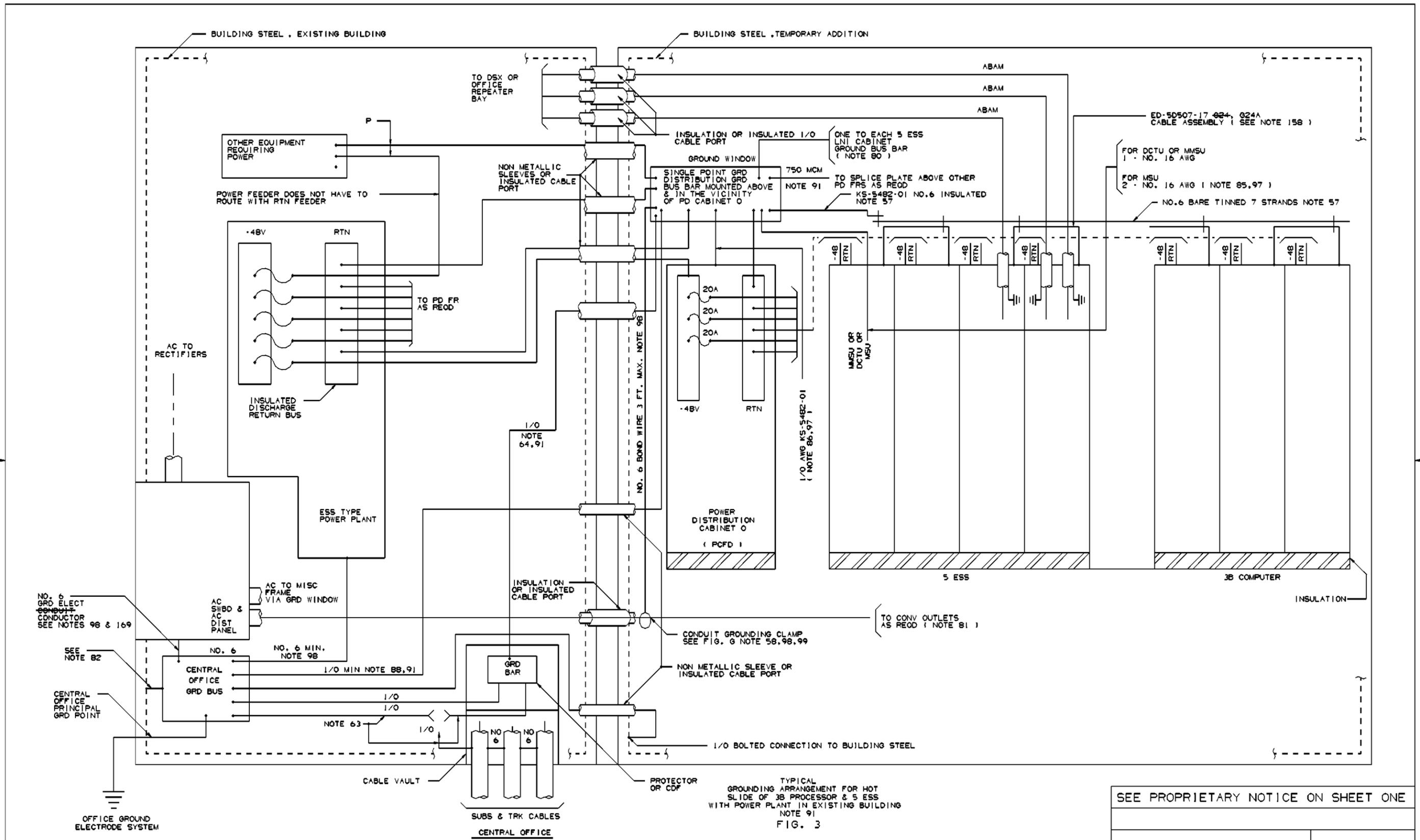
FIG. 2

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GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
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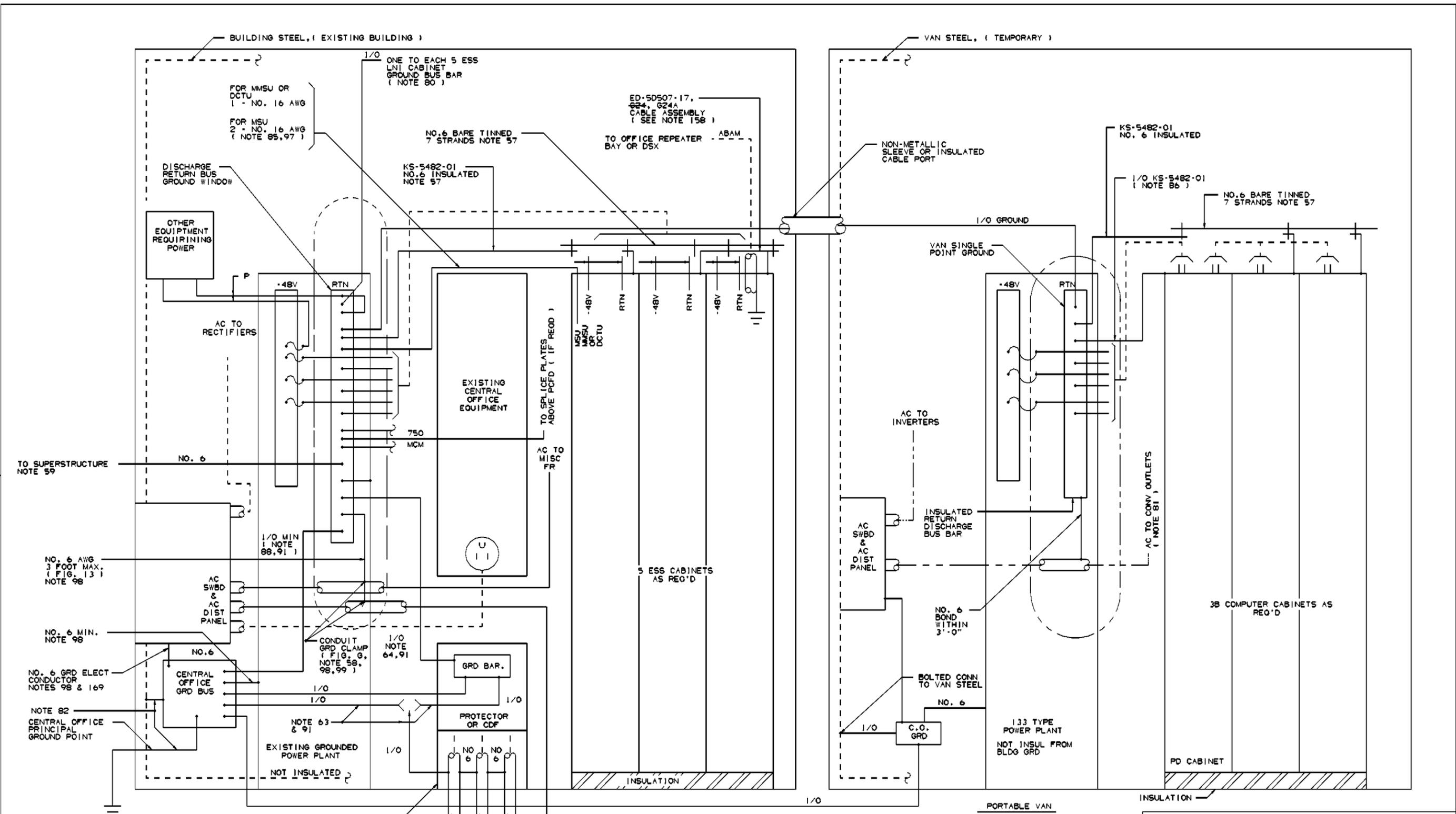
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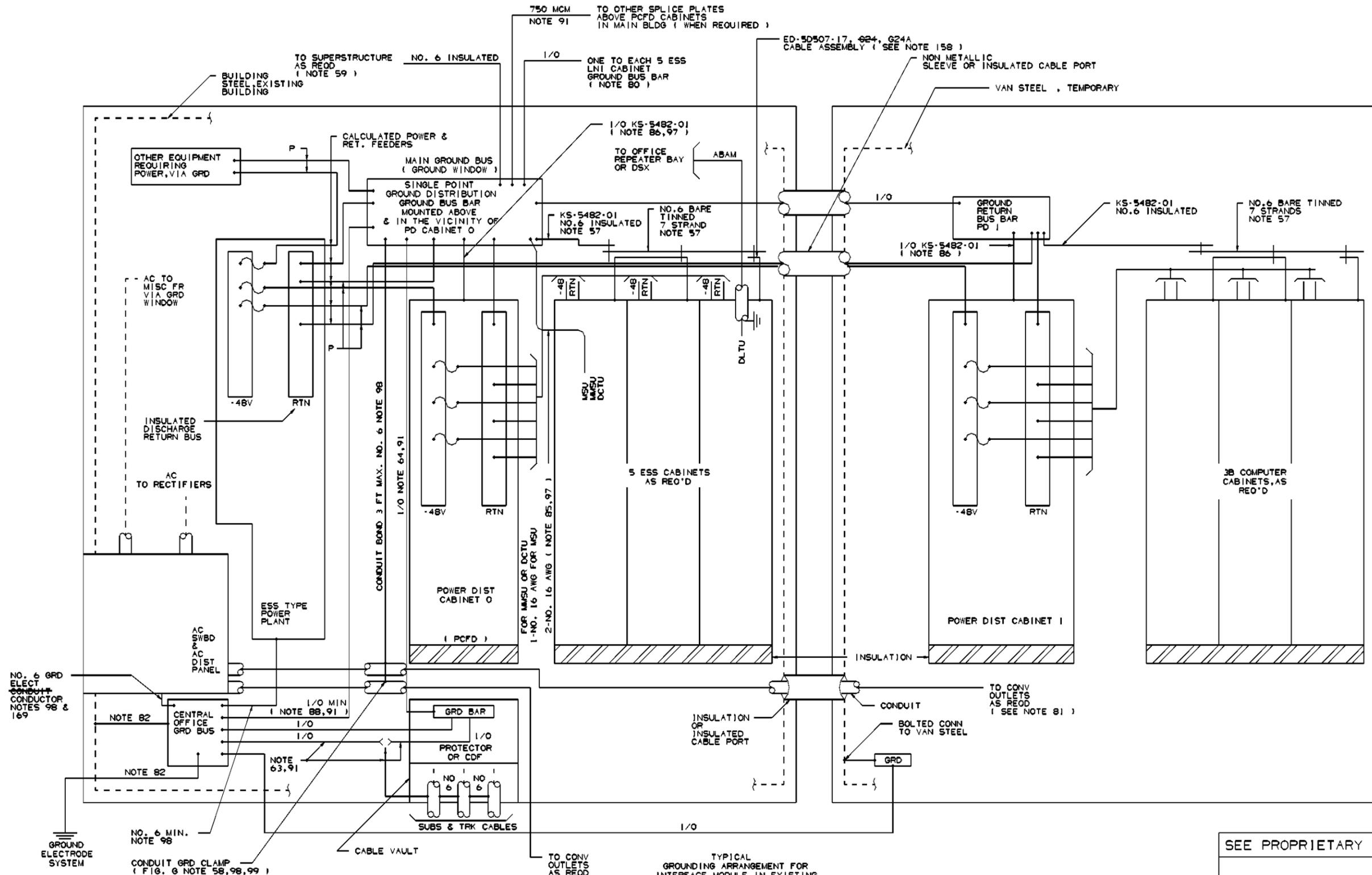
GROUNDING METHODS AND REQUIREMENTS		DWG SIZE c2	ISSUE 14
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TYPICAL
GROUNDING ARRANGEMENT FOR INTERFACE MODULE
IN EXISTING BUILDING AND 3B COMPUTER WITH
POWER PLANT IN VAN
NOTE 91
FIG. 4

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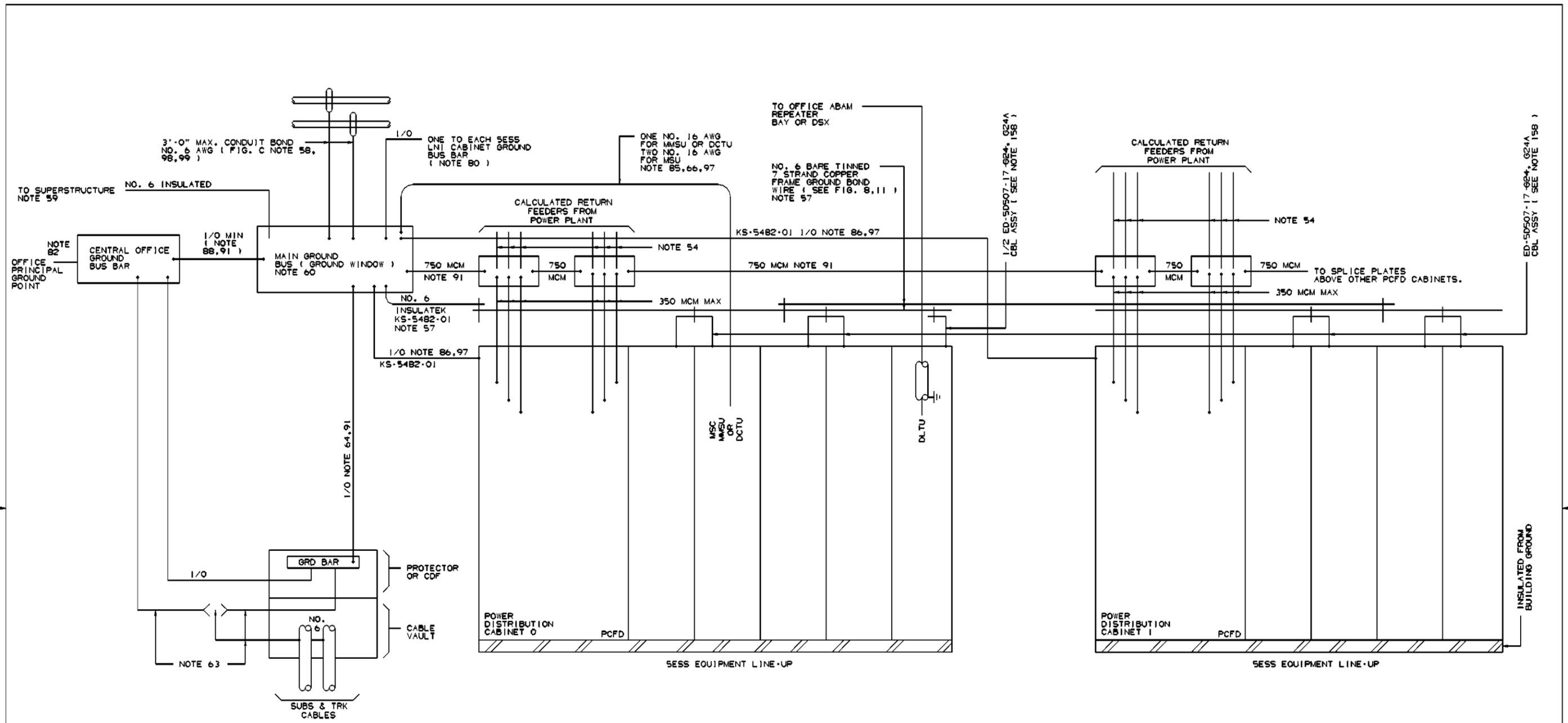
GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E4



TYPICAL
GROUNDING ARRANGEMENT FOR
INTERFACE MODULE IN EXISTING
BUILDING AND 3B COMPUTER
WITHOUT POWER PLANT IN VAN
NOTE 91
FIG. 5

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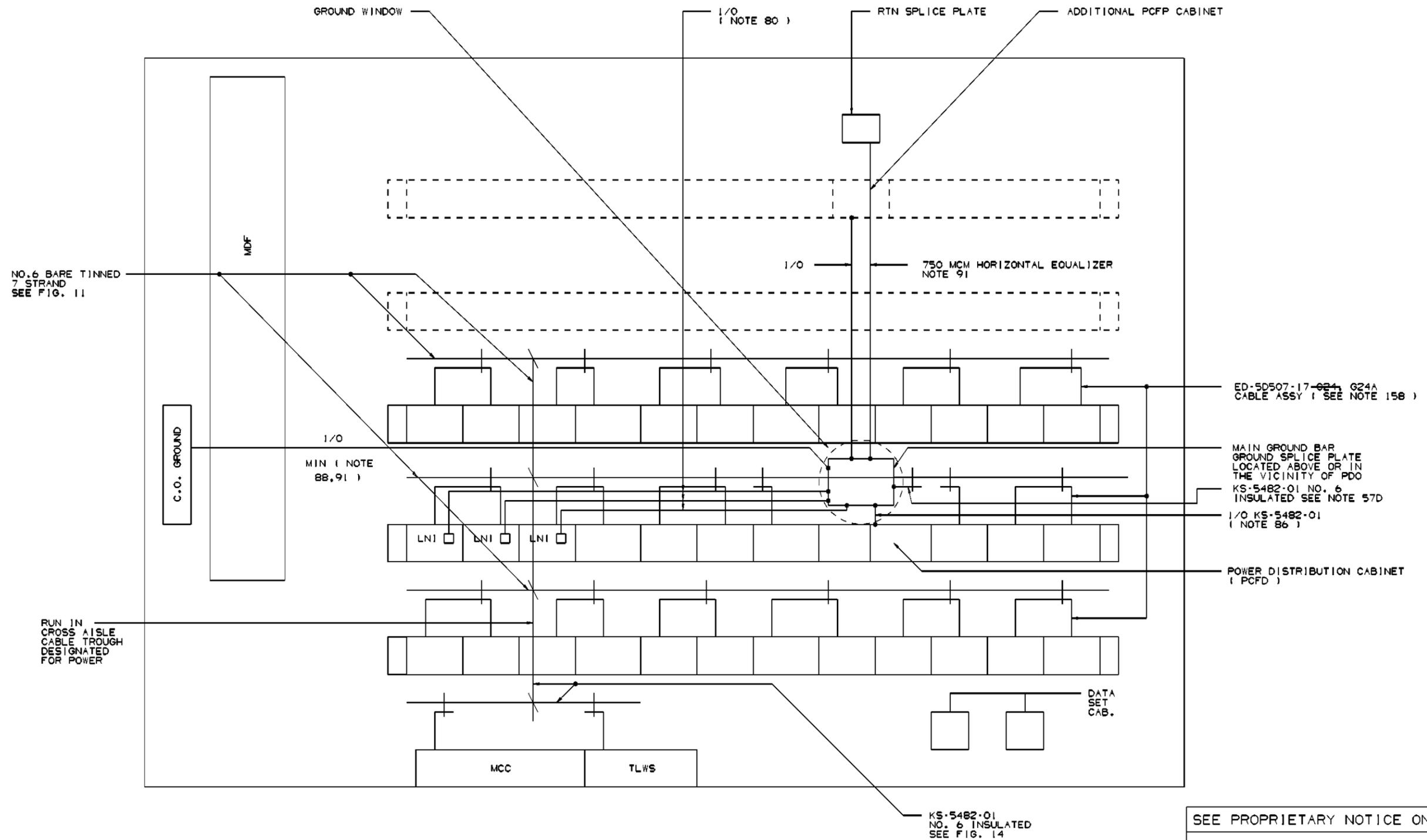
GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
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TYPICAL GROUNDING ARRANGEMENT
 USING ED-4C471-30 JUNCTION BUS BARS
 WITH GROUND WINDOW NOT IN POWER PLANT
 NOTE 91
 FIG. 6

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GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
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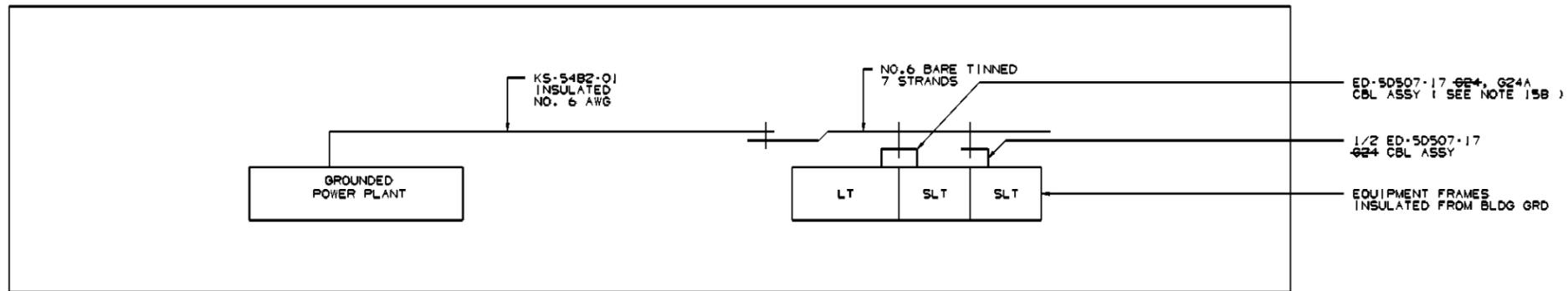


TYPICAL ESS CABINET GROUND DISTRIBUTION WITHOUT POWER PLANT IN LINE-UP
NOTE 91

FIG. 8

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
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TYPICAL ESS FRAME GROUND DISTRIBUTION
WITH GROUNDED POWER PLANT AND NO P.D. CABINET

FIG. 10

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS

DWG SIZE	ISSUE
c2	14

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E8

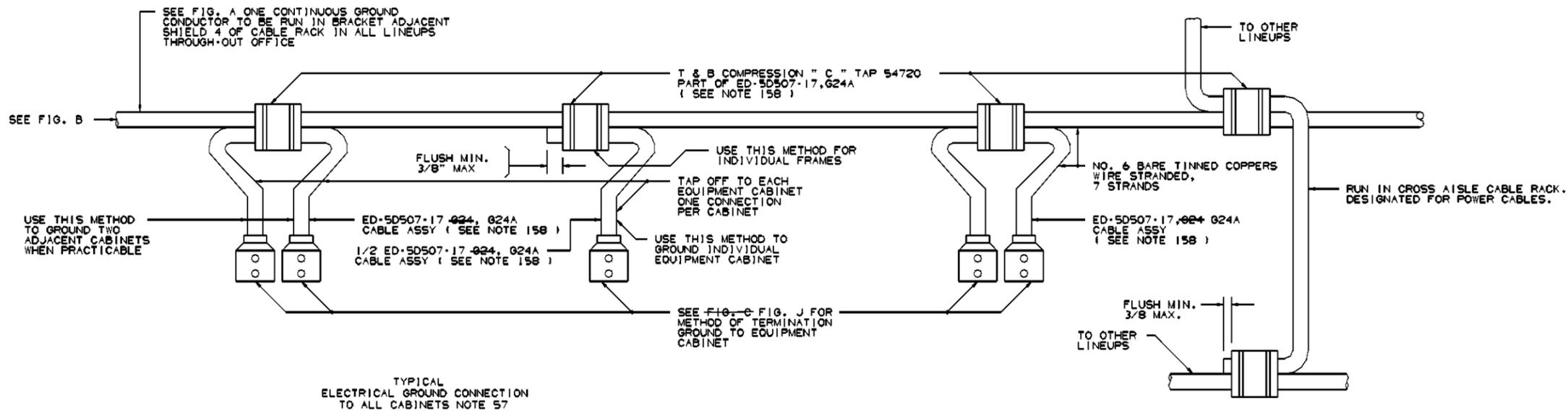
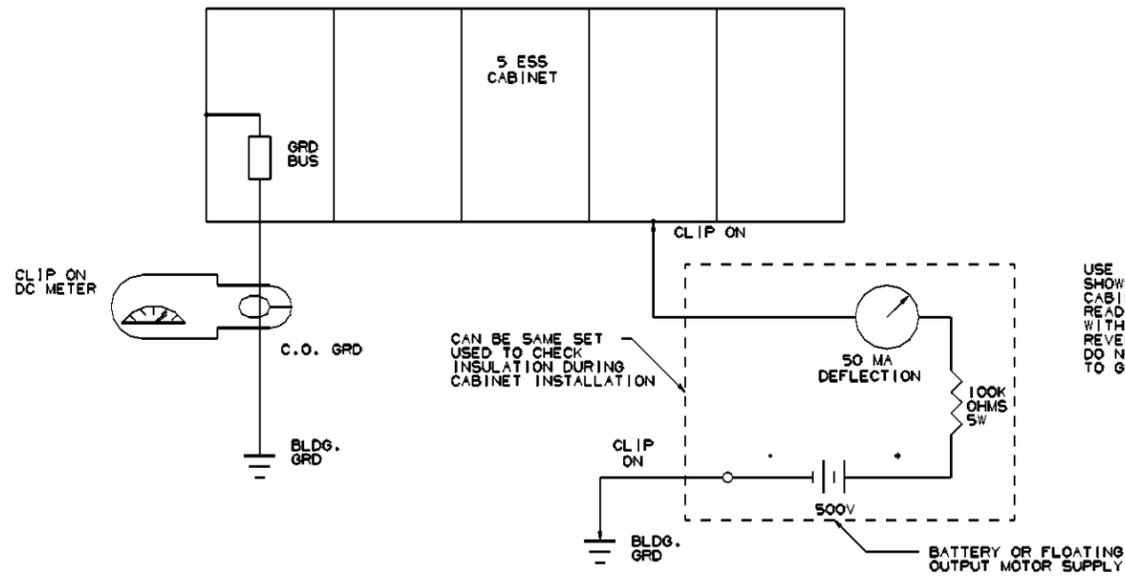


FIG. 11



TESTING OF EQUIPMENT CABINET FOR SATISFACTORY GROUND INSULATION (NOTE 57)

FIG. 12

TESTING OF EQUIPMENT CABINETS FOR SATISFACTORY GROUND

THE EFFECTIVENESS OF THE EQUIPMENT CABINETS INSULATION FROM BUILDING GROUND SHOULD BE CHECKED FOR EACH CABINET AS IT IS INSTALLED. THIS MAY BE DONE BY THE FOLLOWING METHOD.

TEST DC CURRENT WHICH WILL FLOW FOR BOTH PLUS AND MINUS 500 VOLT DIFFERENCES BETWEEN THE EQUIPMENT CABINET AND THE MAIN BUILDING GROUND. THE CURRENT SHOULD NOT EXCEED 5 MA. (A LIMITING RESISTOR SHOULD BE USED IN CASE THERE IS A SHORT).

AFTER CENTRAL OFFICE HAS BEEN PUT IN OPERATION, PERIODIC TESTING OF THE GROUNDING MAY BE PERFORMED AS SHOWN IN FIG. 15

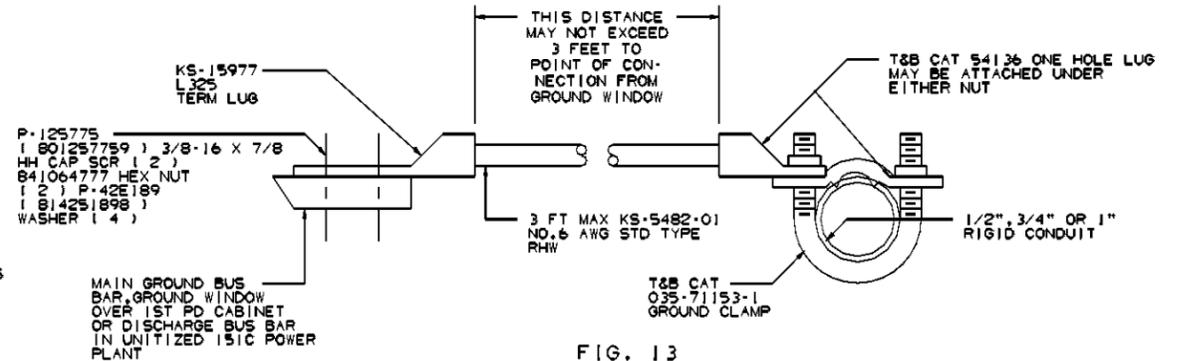


FIG. 13
A TYPICAL METHOD OF GROUNDING AC CONDUIT TO GROUND WINDOW

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	C2	14
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E9

SHEET NOTE:

1. THIS TERMINATION CAN ALSO BE MADE TO ANY POINT OF THE 5 ESS BARE TINNED NO. 6 AWG GROUND SYSTEM AND IS NOT A REQUIREMENT THAT IT MUST TERMINATE ON THE GROUND WINDOW BUS BAR.
2. WHEN A DATA SET CABINET, THE STLWS OR REMOTED TERMINAL AND PRINTER, IS LOCATED ON BUILDING GROUND AND ITS AC IS SUPPLIED FROM A PDSC ON BLDG GROUND THE AC RACEWAY DOES NOT NEED TO BE ROUTED THRU AND BONDED TO THE GROUND WINDOW.

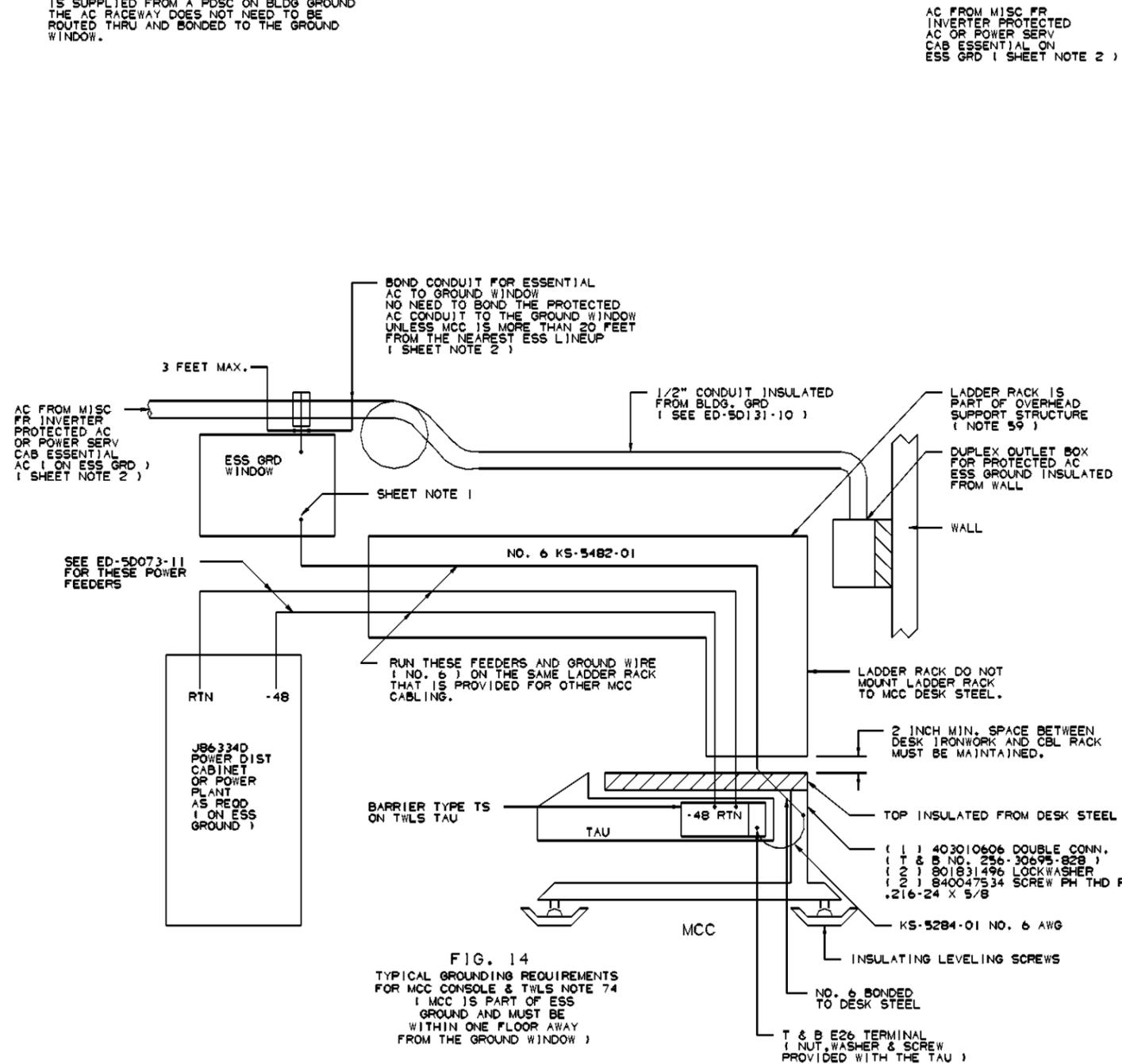


FIG. 14
TYPICAL GROUNDING REQUIREMENTS FOR MCC CONSOLE & TWS NOTE 74 (MCC IS PART OF ESS GROUND AND MUST BE WITHIN ONE FLOOR AWAY FROM THE GROUND WINDOW)

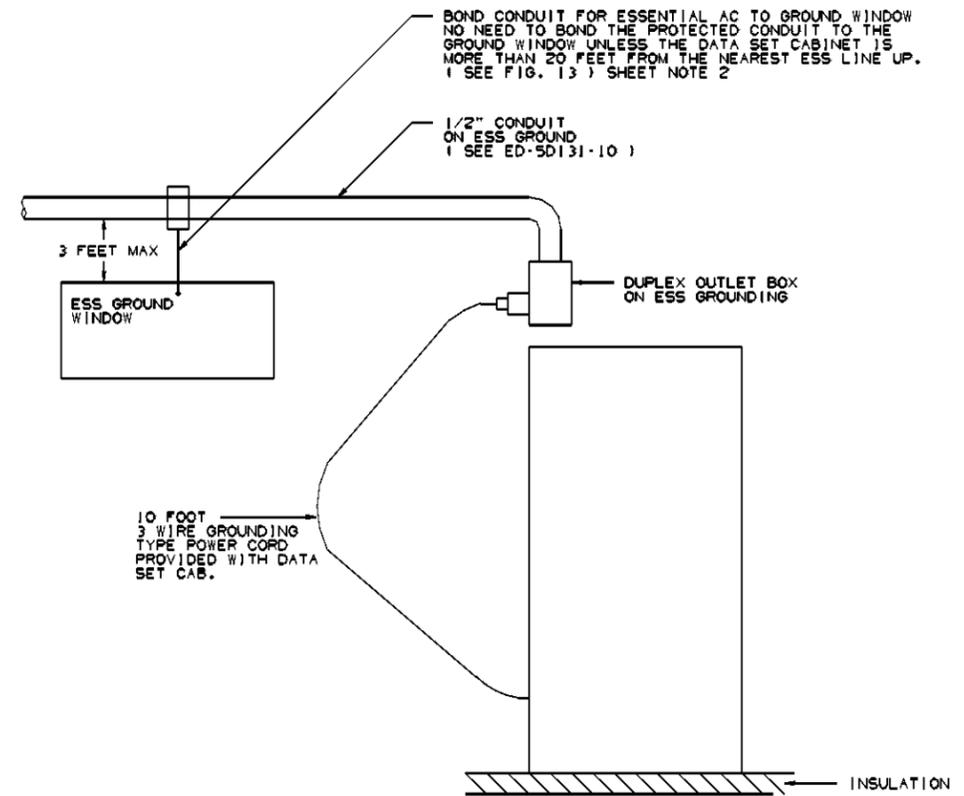
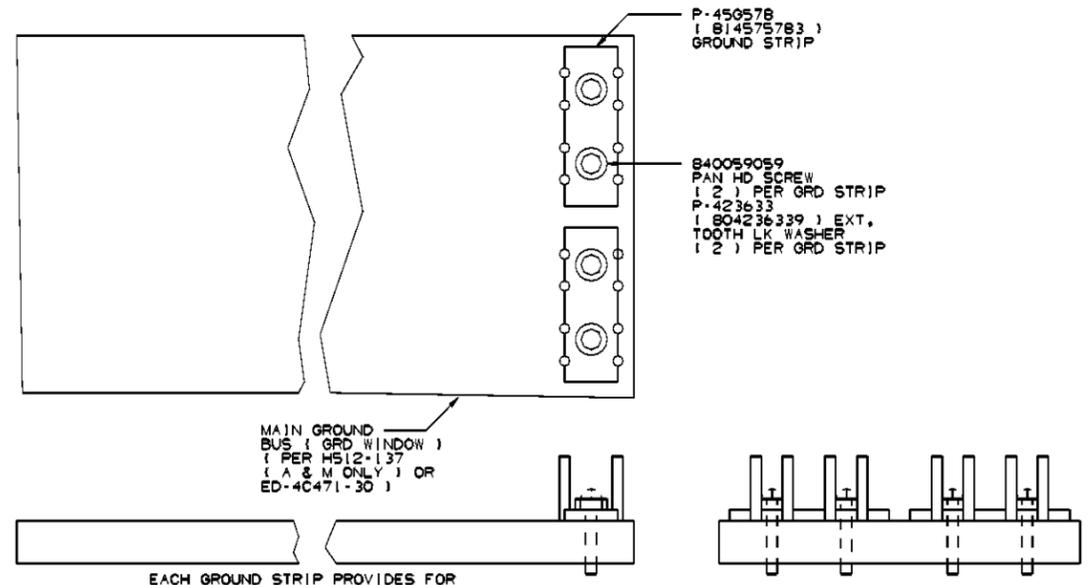


FIG. 15
TYPICAL GROUNDING FOR DATA SET CABINET KS-2001B NOTE 74, 75 & 83



- EACH GROUND STRIP PROVIDES FOR
- (A) MAXIMUM WIRE WRAP CONDUCTOR SIZE, 20 AWG
 - (B) MAXIMUM NUMBER OF WIRE WRAPS PER TERMINAL, 2
 - (C) MAXIMUM ONE BUTT CONNECTOR PER TERMINAL (16 AWG)
 - (D) ALL CONNECTIONS MUST BE SOLDERED, WHETHER DIRECT OR USING BUTT CONNECTOR, (NOTE 69).

FIG. 16
TYPICAL METHOD FOR BONDING SMALL GROUND CONDUCTORS TO THE GROUND BUS BAR IN THE GROUND WINDOW

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		DWG SIZE c2	ISSUE 14
LUCENT TECHNOLOGIES INC		ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E10

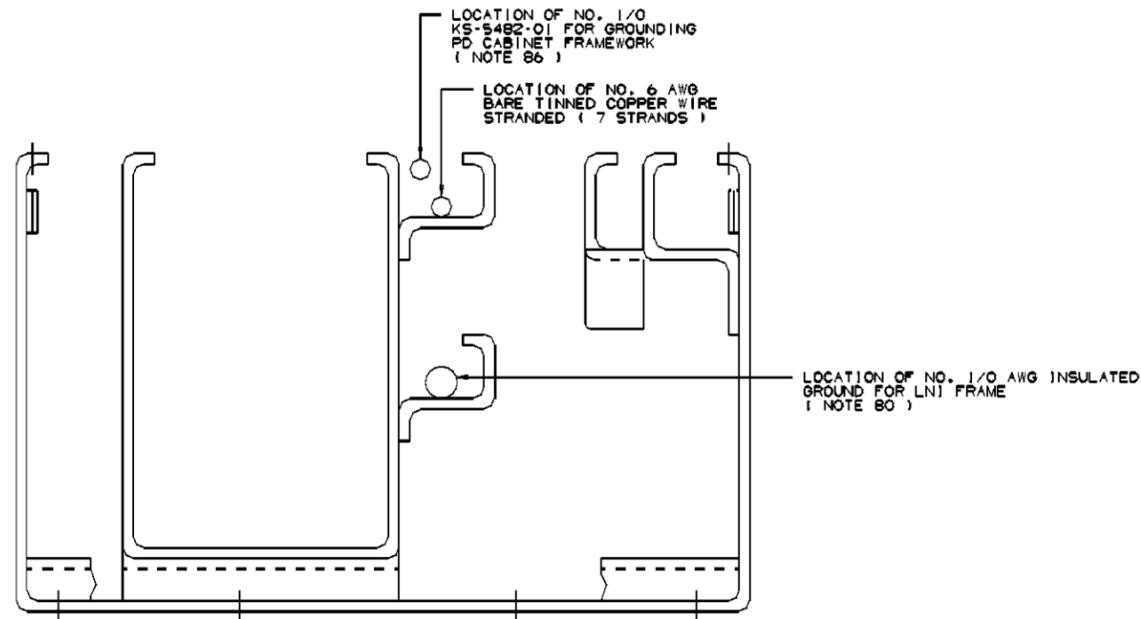


FIG. A
END VIEW OF LINE-UP CABLE RACK
SHOWING LOCATION OF GROUND WIRES
(NOTES 80 & 86)

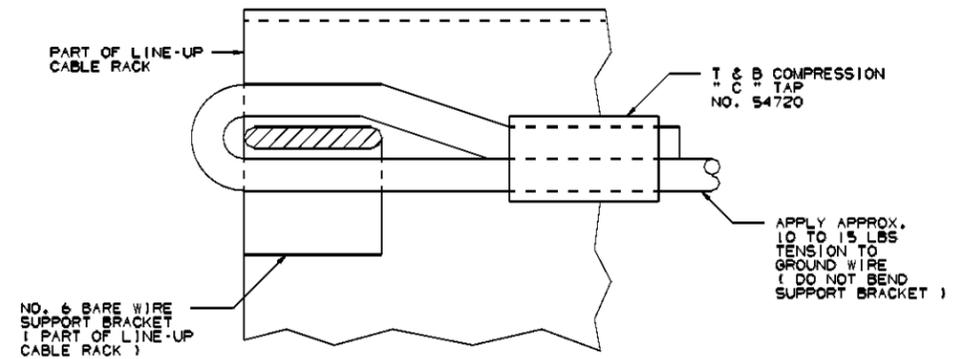


FIG. B
TYPICAL METHOD OF SECURING GROUND
CABLE TO CABLE RACK, SAME FOR EITHER
END OF LINE-UP. (LEFT REAR CONNECTION SHOWN)

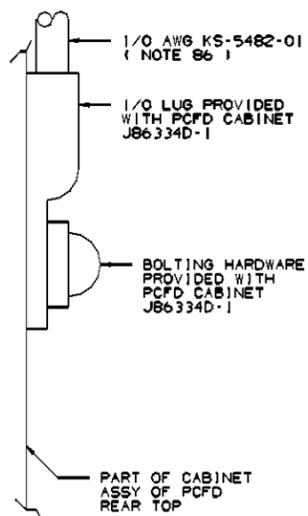


FIG. E
METHOD OF ATTACHING
PCFD 1/0 CABINET GROUND
TO JB6334D-1 PCFD CABINET
(NOTE 86)

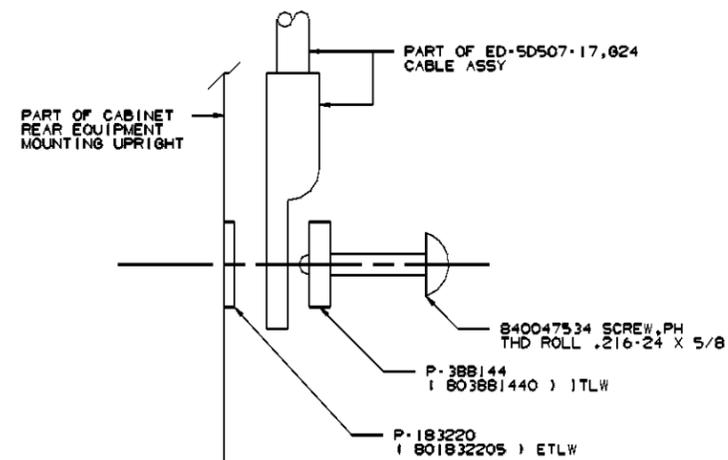


FIG. C (DA) SEE FIG. J
METHOD OF ATTACHING CABINET
GROUND CONDUCTOR TO CABINET
UPRIGHT OTHER THAN PCFD CABINET
(SEE NOTE 84 & FIG. D)

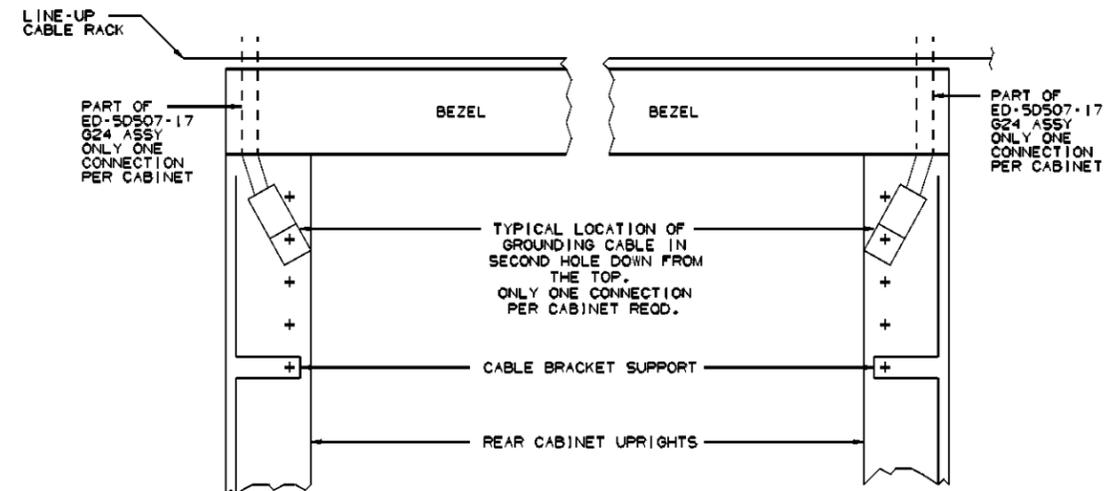
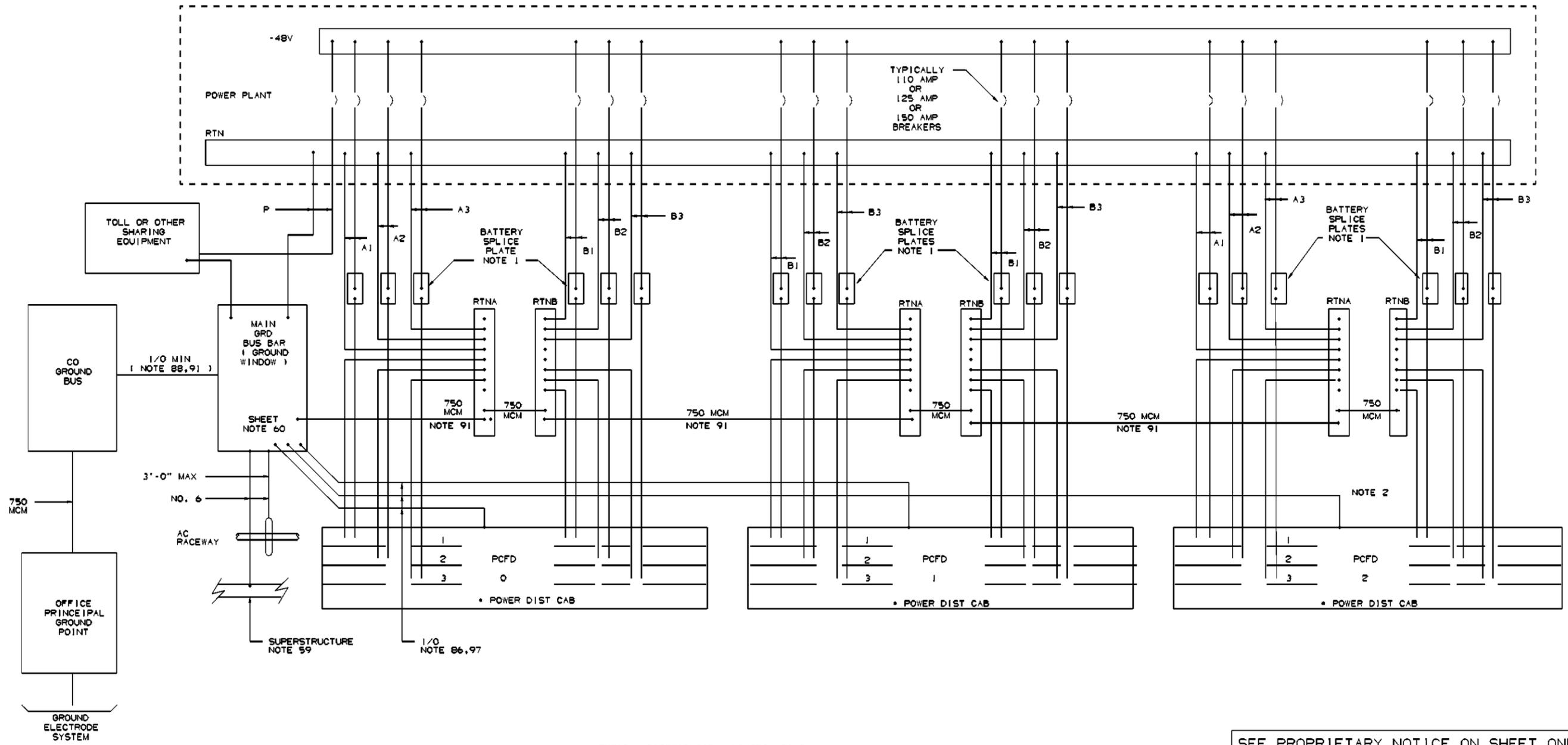


FIG. D (DA) SEE FIG. K
TYPICAL LOCATION OF CABINET
GROUND BONDS
(SEE FIG. 11, A & B)
(NOTE 84 & 86)

SEE PROPRIETARY NOTICE ON SHEET ONE		
GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E11

SHEET NOTE

- 48V SPLICE PLATES FOR DISTRIBUTION MAY NOT BE REQUIRED IF FEEDERS ARE SIZED TO TERMINATE DIRECTLY TO THE BATTERY BUS BAR WITHIN THE PCFD CABINET. (DISTRIBUTION FEEDERS ARE CALCULATED PER INFORMATION FOUND IN ED-50073-11. (NOTE 62))



TYPICAL DISTRIBUTION AND GROUNDING
USING ED-40471-30 SPLICE PLATES
NOTE 91
FIG. 17

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		DWG SIZE c2	ISSUE 14
LUCENT TECHNOLOGIES INC		ED50022-11 <small>PRINTED IN U.S.A.</small>	SHEET E12

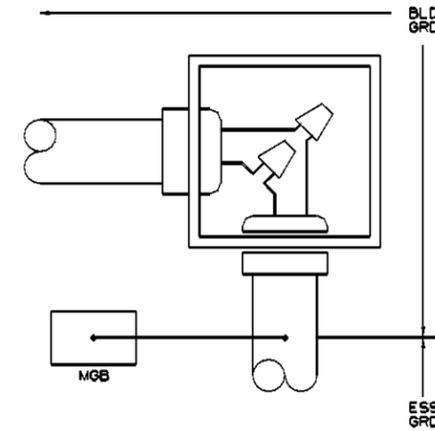
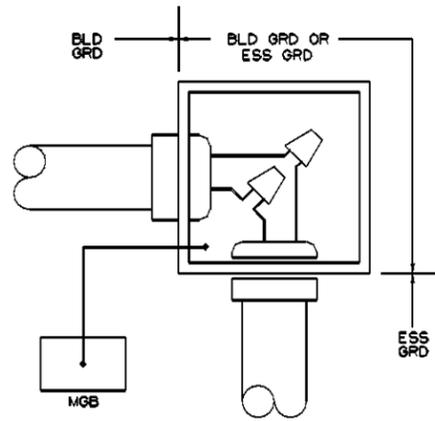
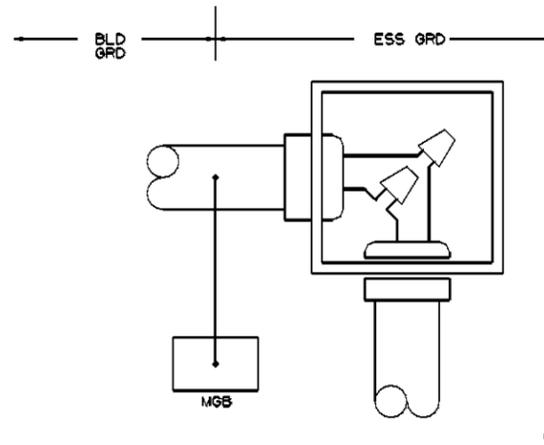
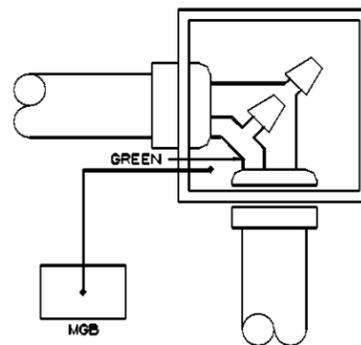
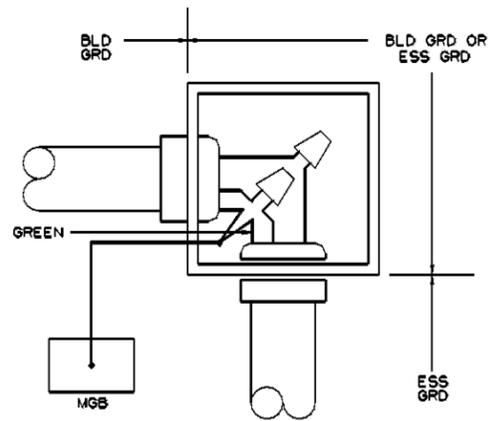
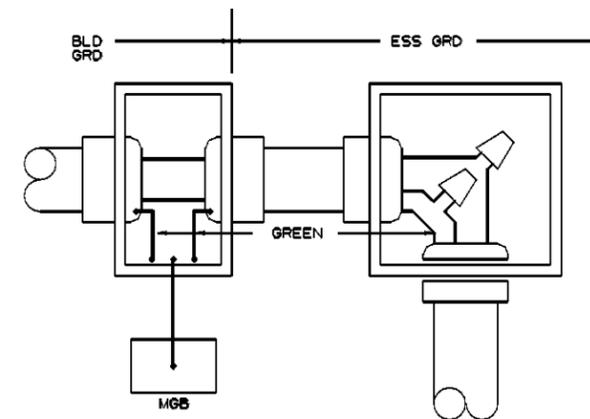


FIG. 18A (D.A.)
(SEE NOTE 94)



VIOLATION
NOT BONDING
GREEN WIRE

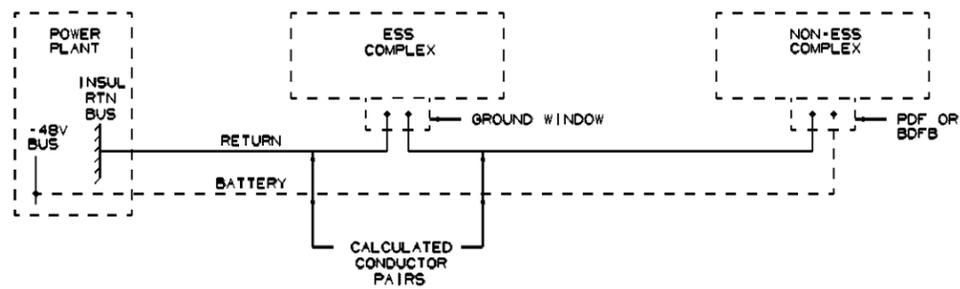


TYPICAL SPLICE BOX WIRING CONFIGURATIONS (NOTE 94)

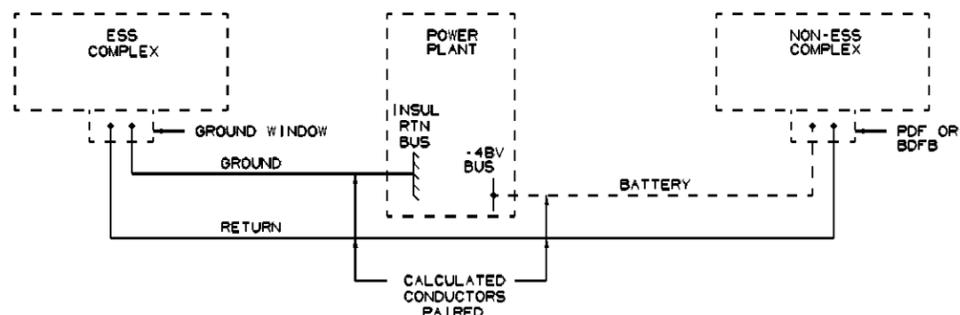
FIG. 18

SEE PROPRIETARY NOTICE ON SHEET ONE

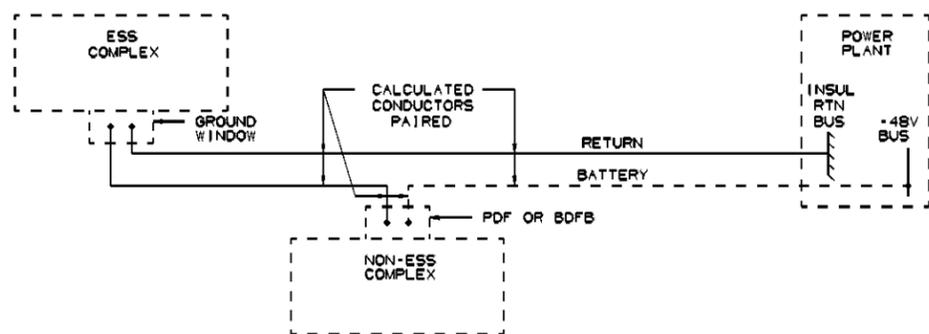
GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E13



DET. A

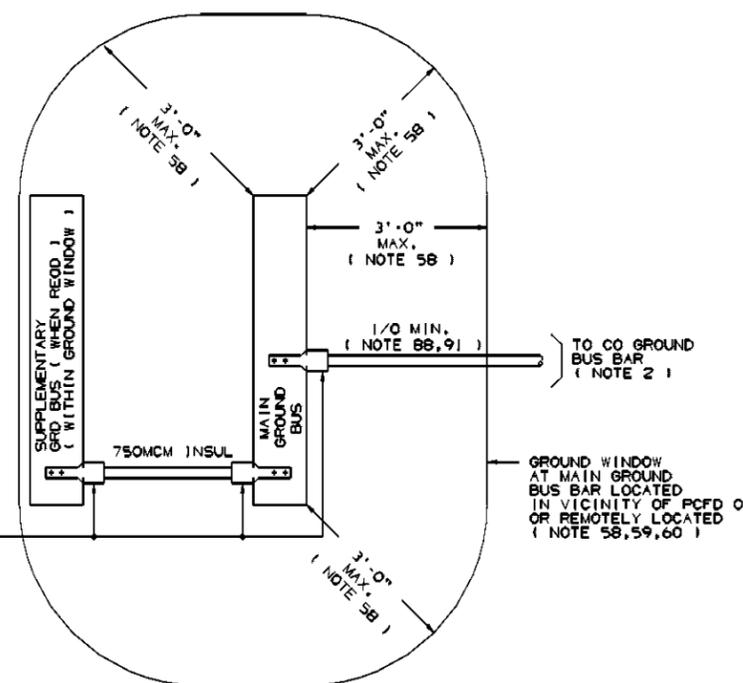


DET. B



DET. C

TYPICAL METHODS OF RUNNING
CONDUCTORS TO A NON-ESS COMPLEX
FROM A POWER PLANT SHARED WITH
AN ESS COMPLEX
FIG. 19



2 HOLE CRIMP
TYPE TERMINALS
AND BOLTING MATERIALS
PER HS12-137 (A & M)
TABLES A & B OR
ED-4C471-30
TABLE AA & AB

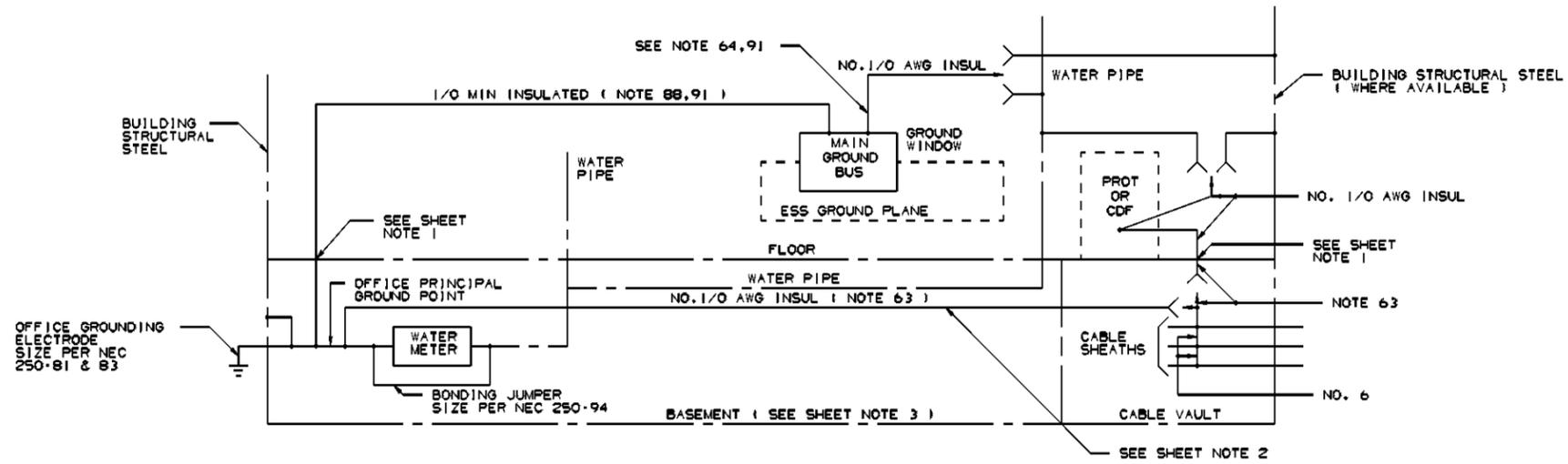
TYPICAL METHOD OF ADDING
SUPPLEMENTARY GROUND BUS
(NOTE 58,59)
(FIG. 20 IS NOT DRAWN TO SCALE)
FIG. 20

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E14

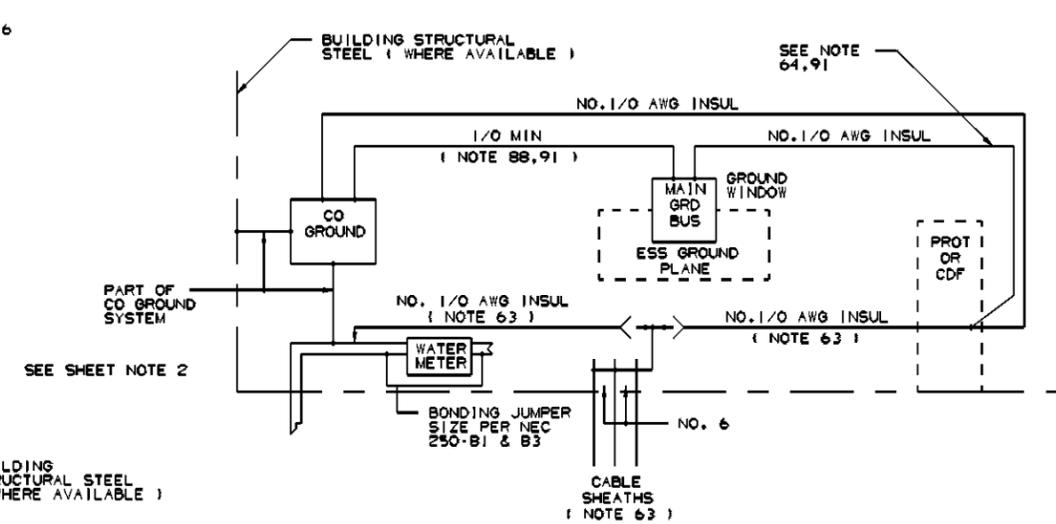
NOTES:

1. USE NON-METALLIC SLEEVES FOR GROUNDING CONDUCTORS GOING THROUGH FLOORS OR WALLS OF THE BUILDING.
2. THIS GROUNDING CONDUCTOR IS NOT REQUIRED IF THE GROUNDING PATH VIA THE BUILDING STRUCTURAL STEEL FRAMEWORK (NOT CONCRETE STRUCTURE REINFORCING RODS) IS A CONTINUOUS AND RELIABLE PATH. (NOTE 63)
3. SOME BUILDINGS MAY NOT HAVE A BASEMENT. IN THIS CASE THE ESS, CDF, CABLE ENTRANCE AND OFFICE PRINCIPAL GROUND POINT MAY ALL BE ON THE SAME FLOOR.



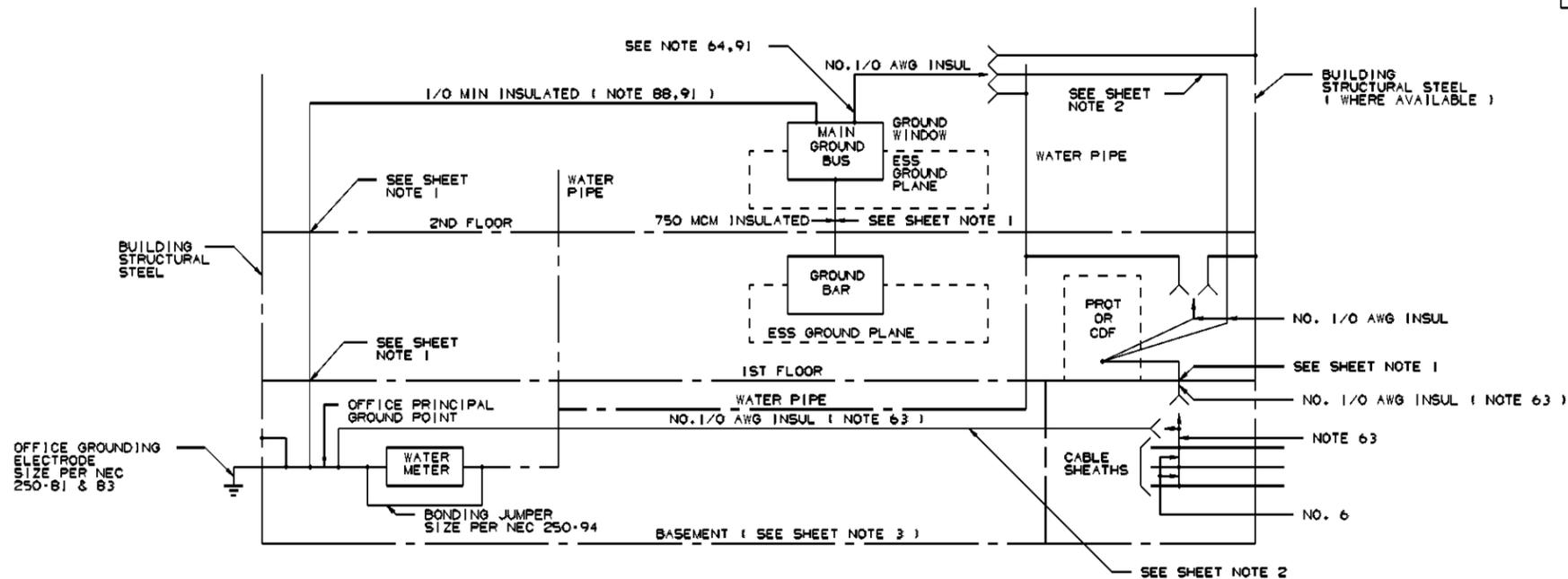
PROTECTOR FRAME AND GROUND WINDOW ON SAME FLOOR
NO. C.O. GROUND (ONE ESS COMPLEX)
TYPICAL ARRANGEMENT
NOTE 63,64,91

FIG. 21



PROTECTOR FRAME AND GROUND WINDOW ON SAME FLOOR CO GROUND SYSTEM EXISTS
NO BASEMENT
NOTE 63,64,91

FIG. 23



PROTECTOR FRAME AND GROUND WINDOW ON SEPARATE FLOORS
NO. C.O. GROUND (ONE OR MORE ESS COMPLEXES)
NOTE 63,64,91

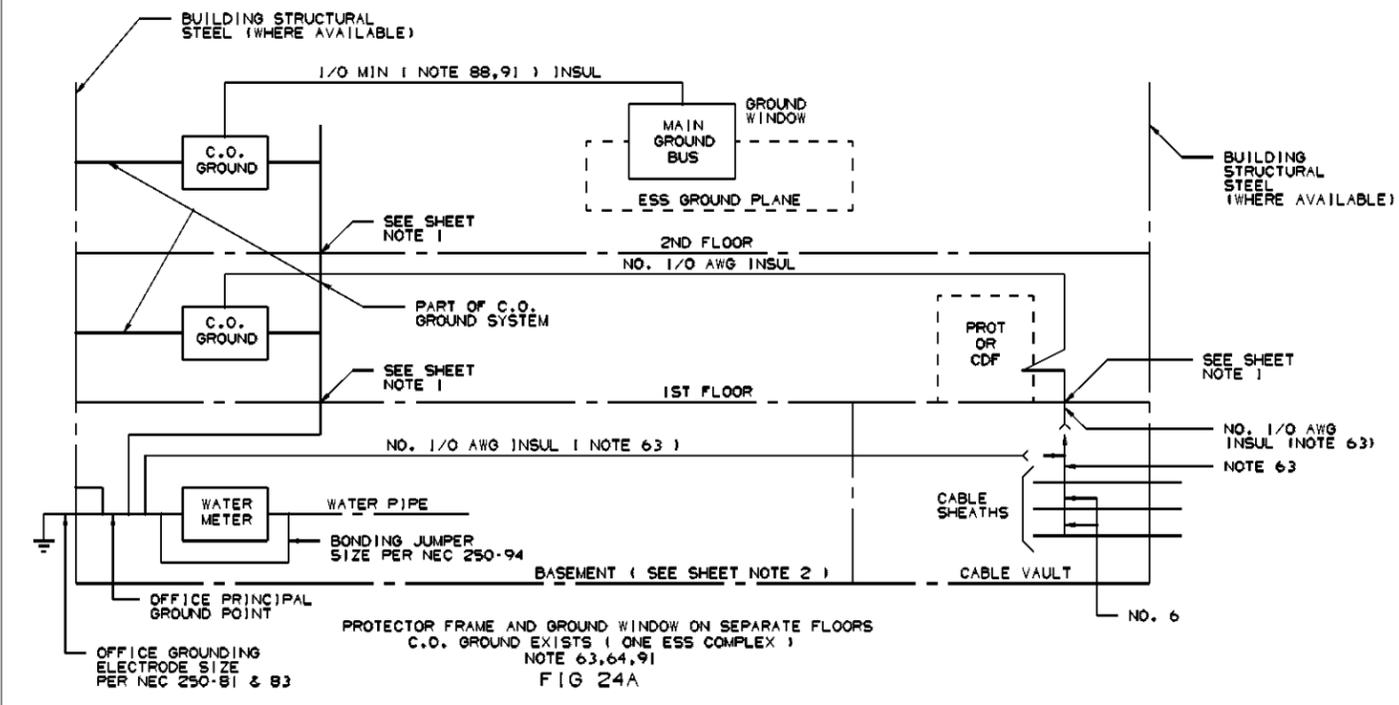
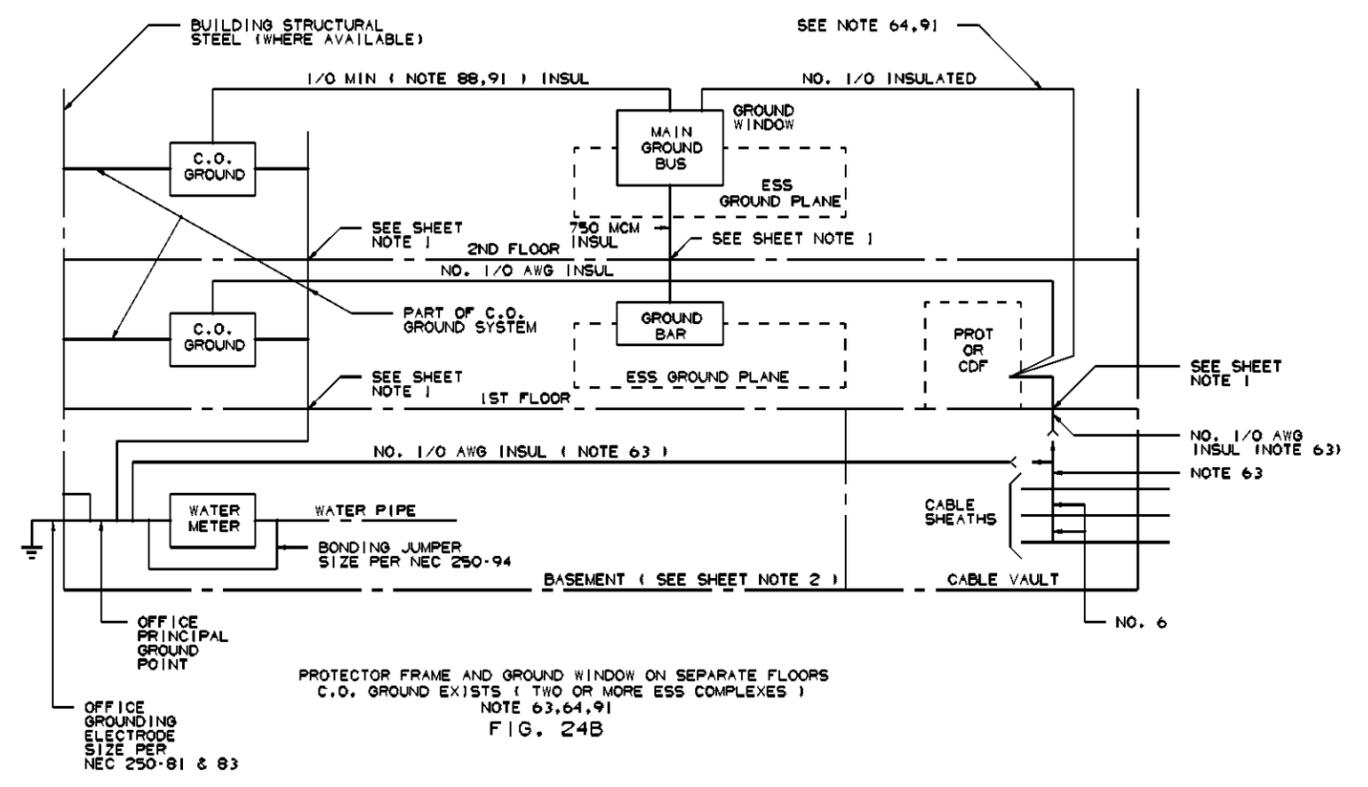
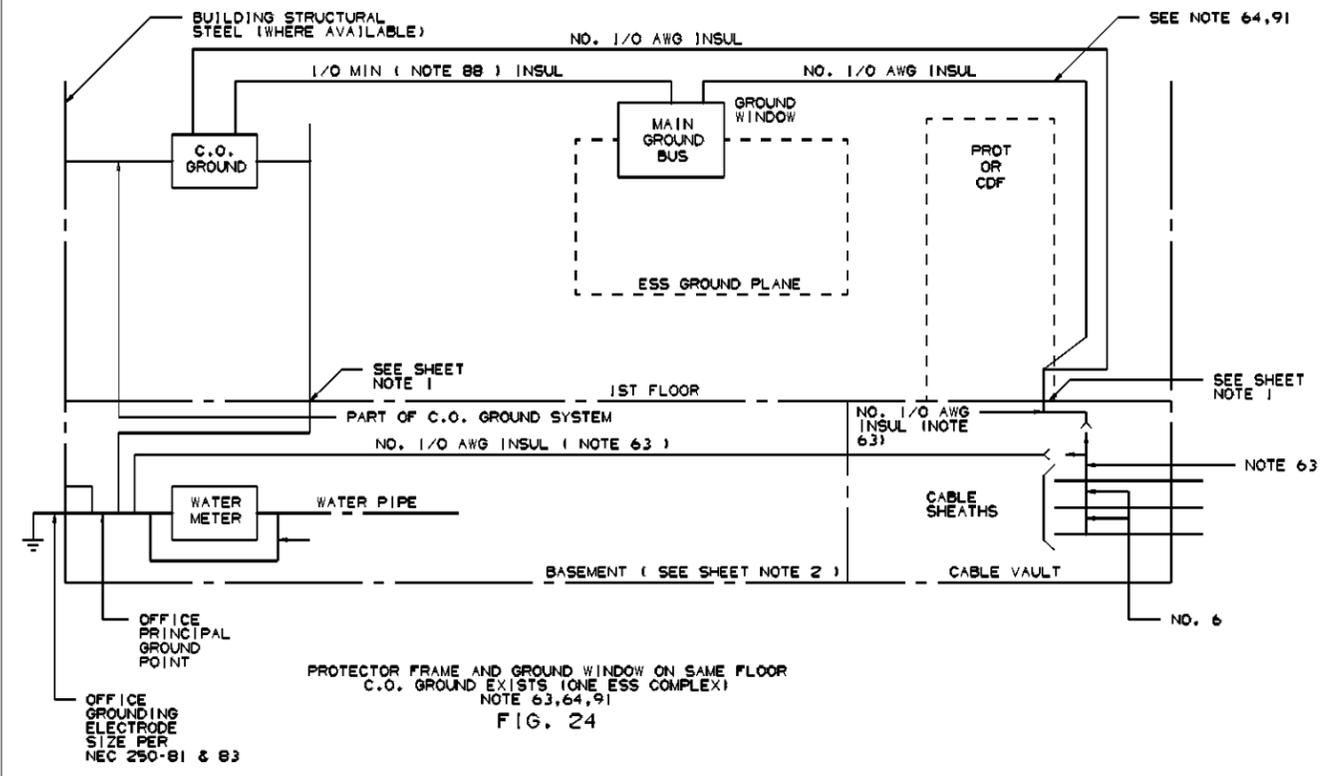
FIG. 22

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E15

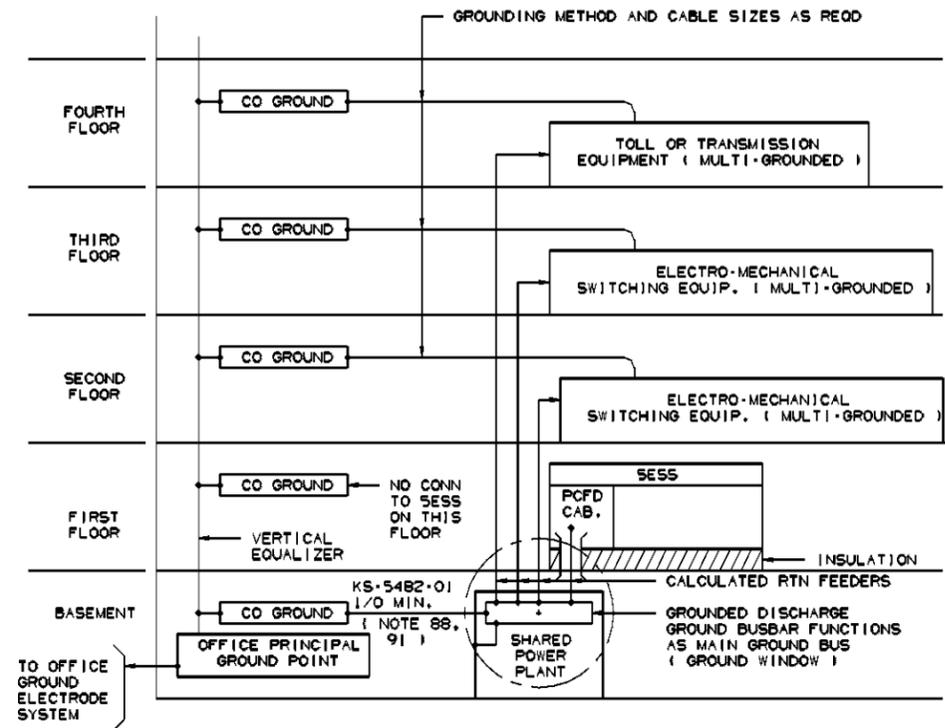
NOTES:

1. USE NON-METALLIC SLEEVES FOR GROUNDING CONDUCTORS GOING THROUGH FLOORS OR WALLS OF THE BUILDING.
2. SOME BUILDINGS MAY NOT HAVE A BASEMENT. IN THIS CASE THE ESS, CDF, CABLE ENTRANCE AND OFFICE PRINCIPAL GROUND POINT MAY ALL BE ON THE SAME FLOOR.



SEE PROPRIETARY NOTICE ON SHEET ONE

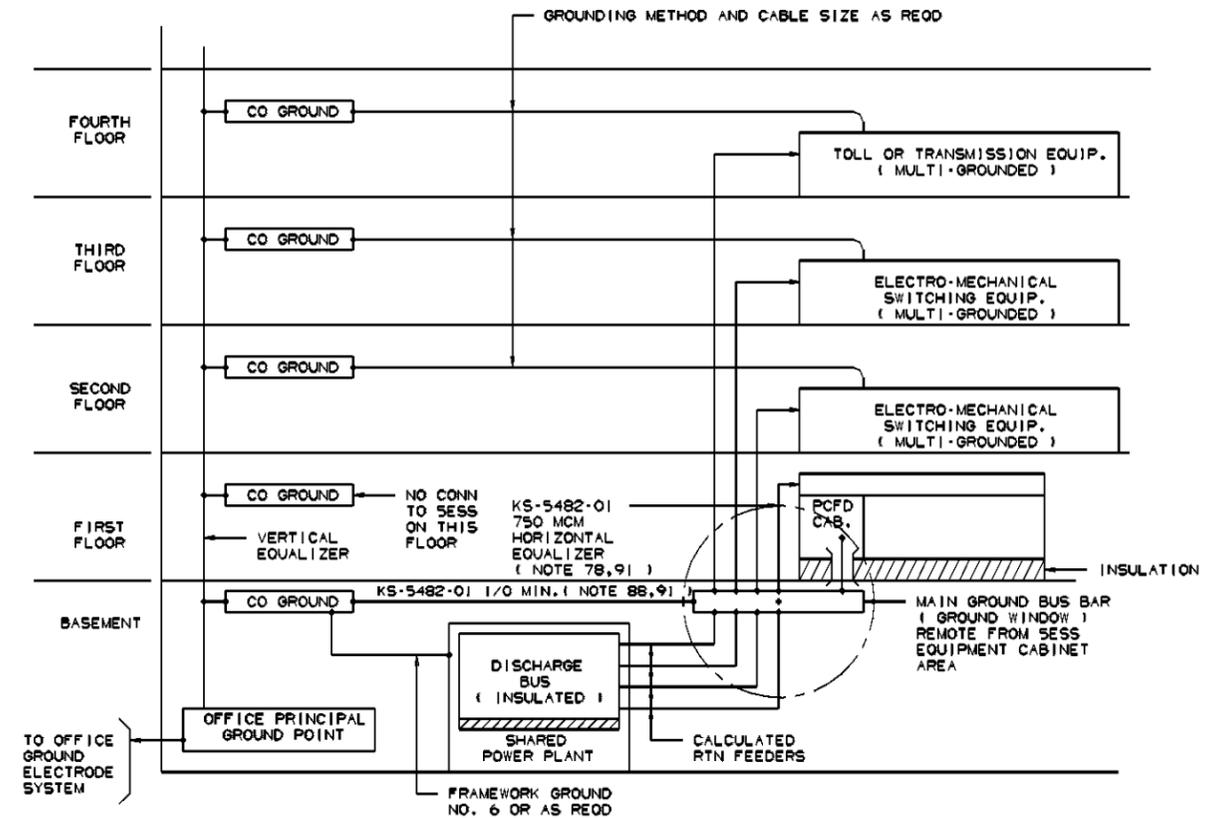
GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E16



THIS ARRANGEMENT IS ACCEPTABLE SINCE SESS IS WITHIN ONE FLOOR OF THE GROUND WINDOW AND ALL NON-ESS SHARED FEEDER RETURNS ARE VIA THE GROUND WINDOW.

TYPICAL ACCEPTABLE SHARED POWER GROUNDING ARRANGEMENT WITH A GROUNDED DISCHARGE BUS BAR OF THE POWER PLANT AS THE MAIN GROUND BUS BAR (GROUND WINDOW)

FIG. 25A



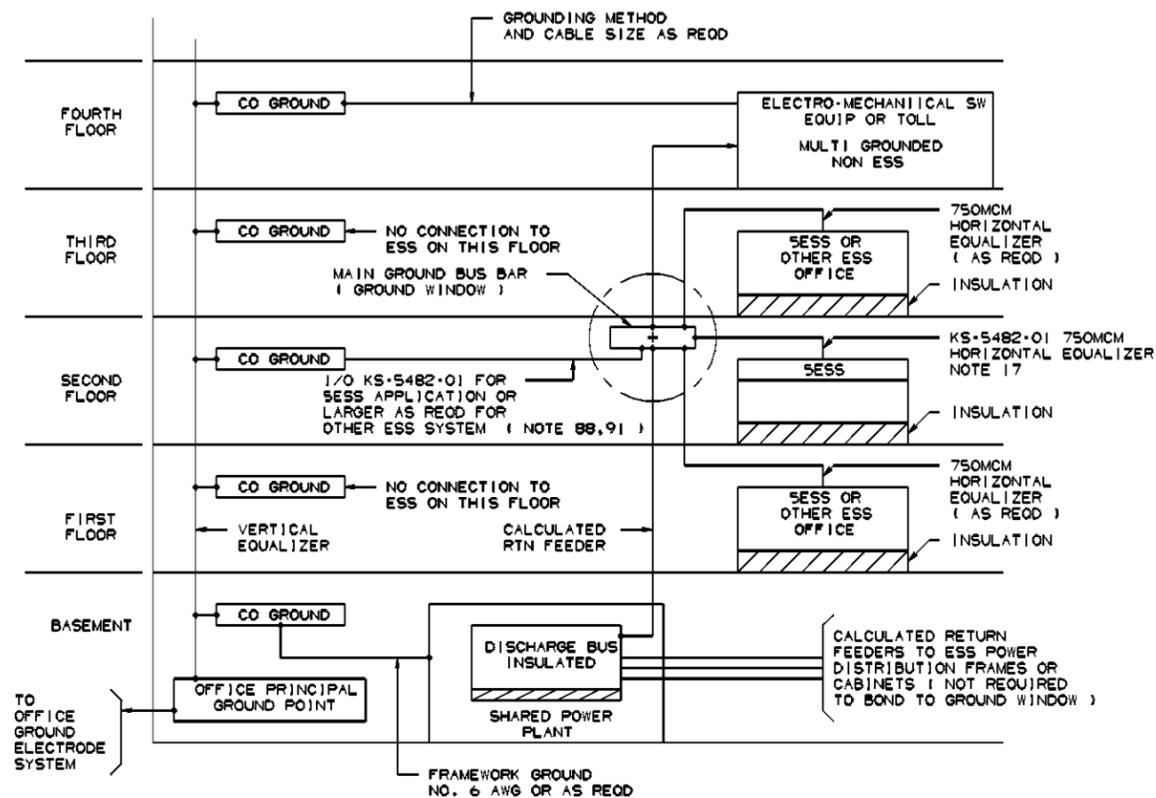
THIS ARRANGEMENT IS ACCEPTABLE SINCE SESS IS WITHIN ONE FLOOR OF THE GROUND WINDOW AND ALL NON-ESS SHARED FEEDER RETURNS ARE VIA THE GROUND WINDOW.

TYPICAL ACCEPTABLE SHARED POWER GROUNDING ARRANGEMENT WITH A POWER PLANT HAVING AN INSULATED DISCHARGE BUS BAR (ESS TYPE) AND A MAIN GROUND BUS BAR (GROUND WINDOW) LOCATED REMOTELY FROM THE SESS EQUIPMENT AREA NO MORE THAN ONE FLOOR FROM THE SESS.

FIG. 25B

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E17

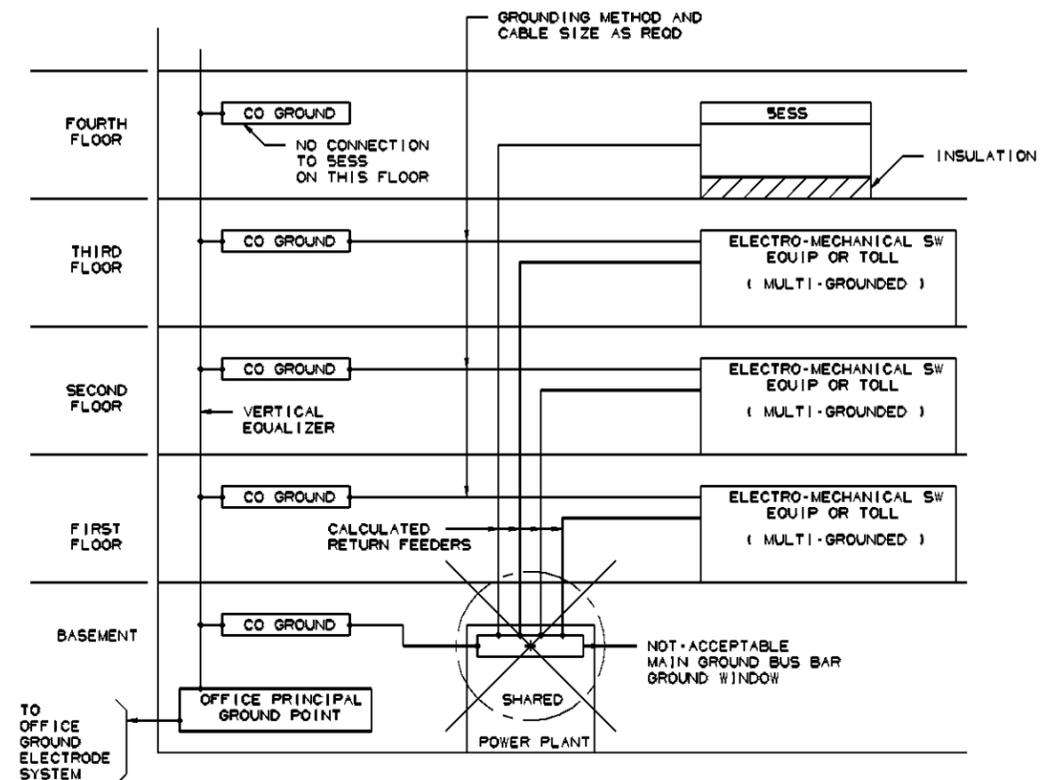


THIS ARRANGEMENT IS ACCEPTABLE SINCE THE SINGLE ENTITY SESS OR MULTIPLE ESS OFFICE IS WITHIN ONE FLOOR OF THE GROUND WINDOW AND ALL NON-ESS SHARED FEEDER RETURNS ARE VIA THE GROUND WINDOW.

TYPICAL ACCEPTABLE SHARED POWER GROUNDING ARRANGEMENT WITH A POWER PLANT HAVING AN INSULATED DISCHARGE GROUND BUS BAR (ESS TYPE) AND MULTI-FLOOR ESS OFFICES SHARING A COMMON (GROUND WINDOW).

FIG. 25C

SINGLE ENTITY SESS OR MULTIPLE ESS OFFICES
MAXIMUM MULTIFLOOR ESS GROUND PLANE SPREAD
IS 3 FLOORS, ONE FLOOR ABOVE AND ONE FLOOR
BELOW THE GROUND WINDOW.



THIS ARRANGEMENT IS NOT-ACCEPTABLE BECAUSE THE SESS IS MORE THAN ONE FLOOR AWAY FROM THE GROUND WINDOW.

TO MAKE THIS OFFICE ARRANGEMENT ACCEPTABLE THE FOLLOWING MUST BE DONE.

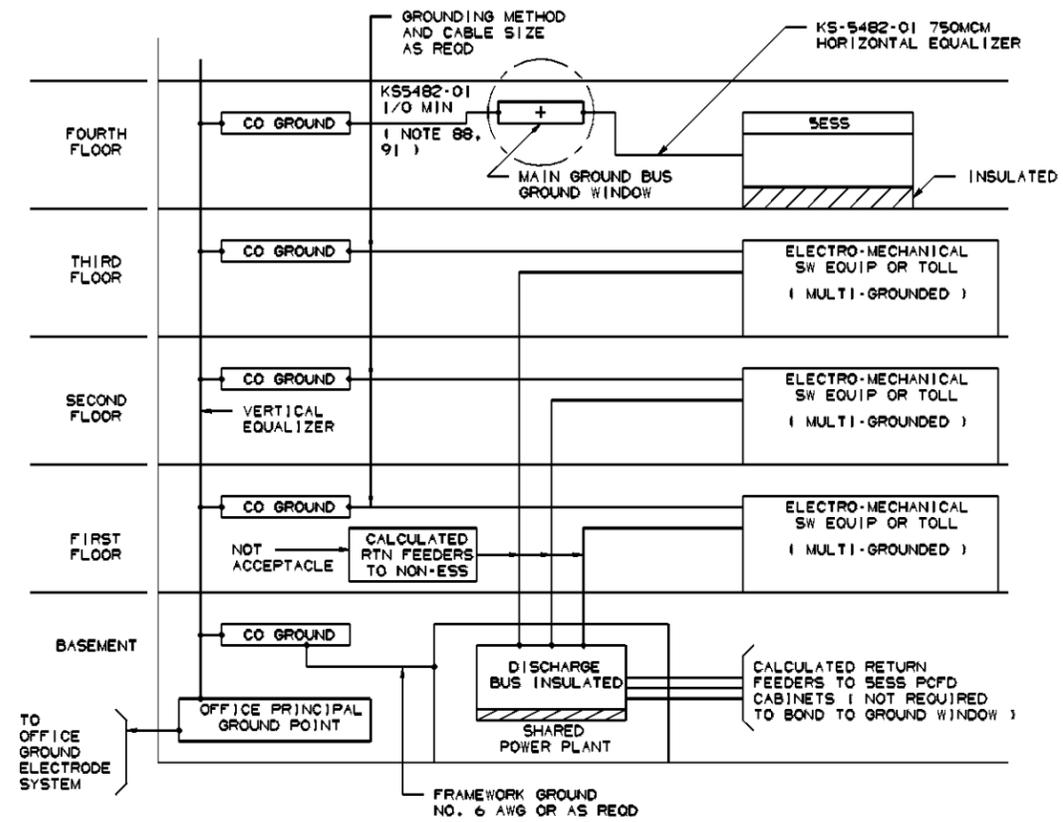
1. THE POWER PLANT DISCHARGE BUS BAR MUST BE ISOLATED FROM THE FRAMEWORK AND THE TERMINATION TO THE CO GROUND BUS BAR MUST BE REMOVED. THE FRAMEWORK OF THE POWER PLANT MUST BE GROUNDED TO THE CO GROUND NETWORK.
2. A MAIN GROUND BUS BAR MUST BE LOCATED WITHIN ONE FLOOR OF THE SESS AND MUST BE BONDED TO THE CO GROUND BUS BAR ON THE SAME FLOOR THE GROUND WINDOW IS LOCATED ON WITH 1/0 CABLE. (NOTE 88,91).
3. ALL RETURN FEEDERS TO NON-ESS EQUIPMENT MUST BE REROUTED THRU THE GROUND WINDOW.

A TYPICAL NOT-ACCEPTABLE SESS GROUNDING ARRANGEMENT. GROUND WINDOW CAN NOT BE MORE THAN ONE FLOOR FROM THE SESS EQUIPMENT FLOOR.

FIG. 25D
(NOT-ACCEPTABLE)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E18



THIS ARRANGEMENT IS NOT ACCEPTABLE BECAUSE THE RETURN FEEDERS OF THE NON-ESS EQUIPMENT ARE NOT ROUTED THRU AND BONDED TO THE GROUND WINDOW.

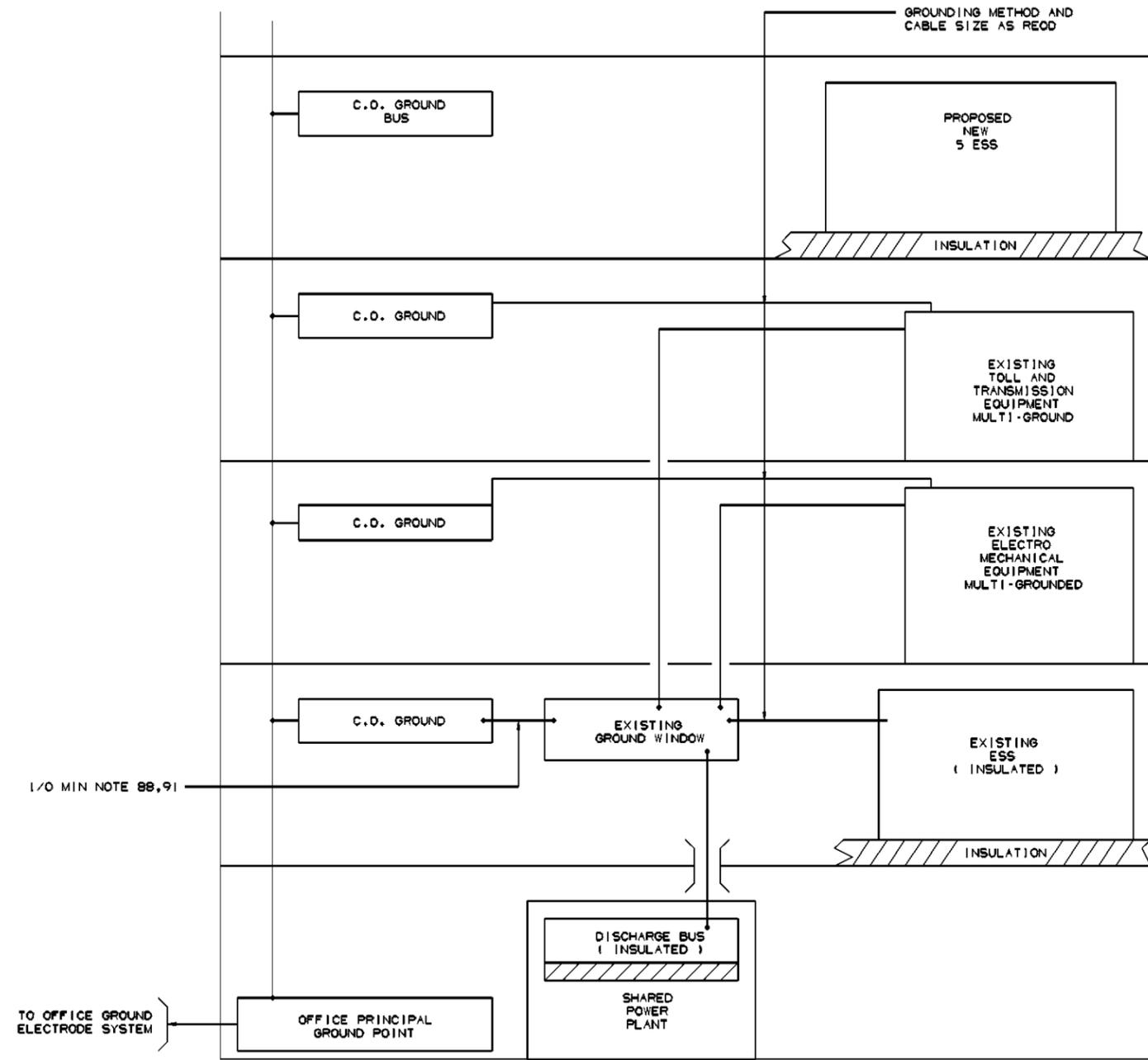
TO MAKE THIS ARRANGEMENT ACCEPTABLE THE NON-ESS RETURN FEEDERS MUST BE RE-ROUTED THRU THE GROUND WINDOW (SEE FIG. 19 FOR TYPICAL).

A TYPICAL NOT ACCEPTABLE SESS GROUNDING ARRANGEMENT (NON-ESS EQUIPMENT SHARING POWER PLANT RETURN FEEDERS ARE NOT ROUTED VIA THE GROUND WINDOW).

FIG. 25E
(NOT-ACCEPTABLE)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E19

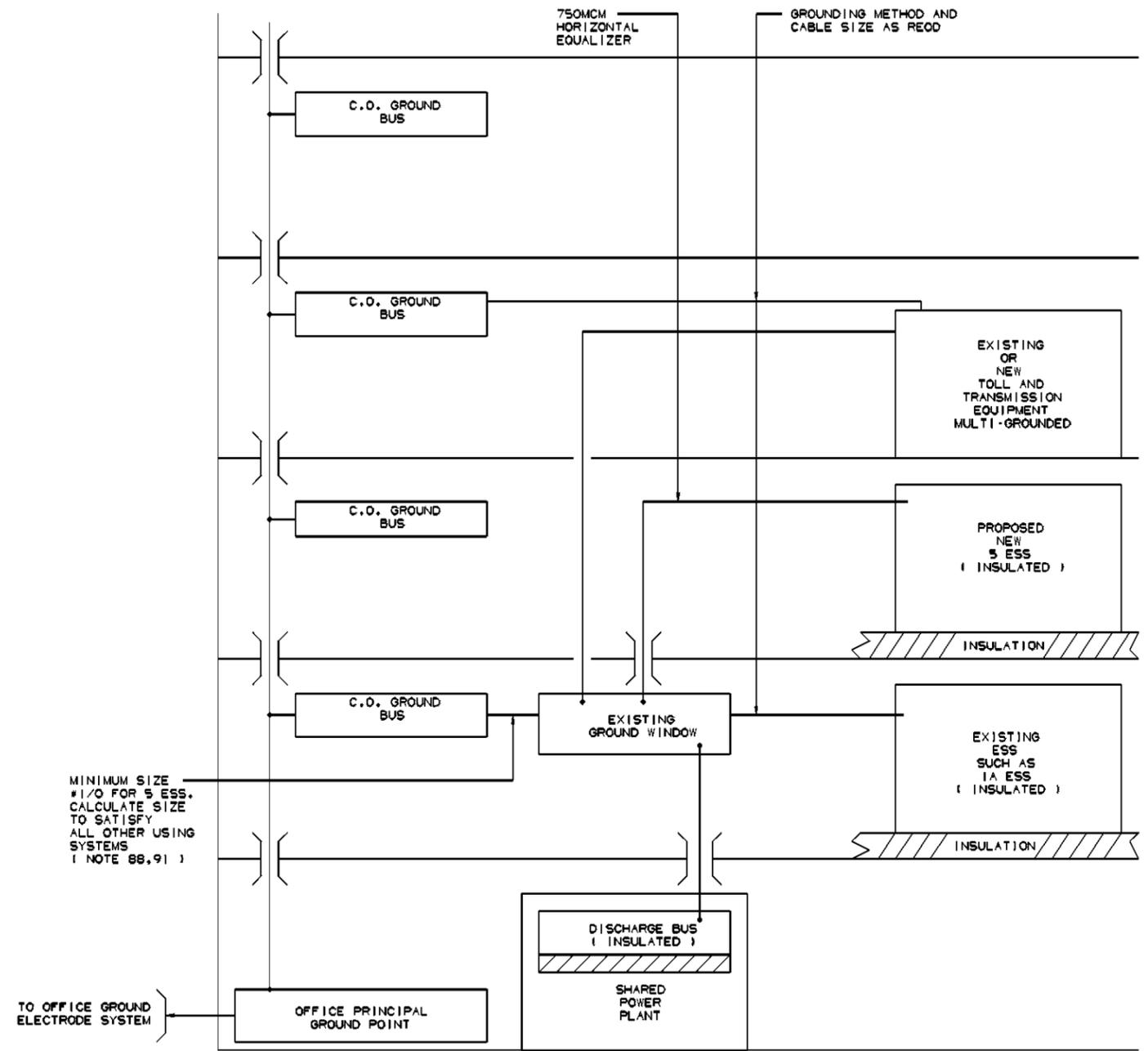


NOT ACCEPTABLE
 5 ESS IS MORE THAN ONE FLOOR AWAY FROM THE EXISTING GROUND WINDOW RUNNING HEAVY LEADS SUCH AS BUS DUCT FROM EXISTING GROUND WINDOW UP TO PROPOSED 5 ESS LOCATION DOES NOT GET AROUND THE 1 FLOOR LIMITATION

FIGURE 25F
 GROUNDING ARRANGEMENT
 (NOT ACCEPTABLE)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE	ISSUE	
c2	14	
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E20



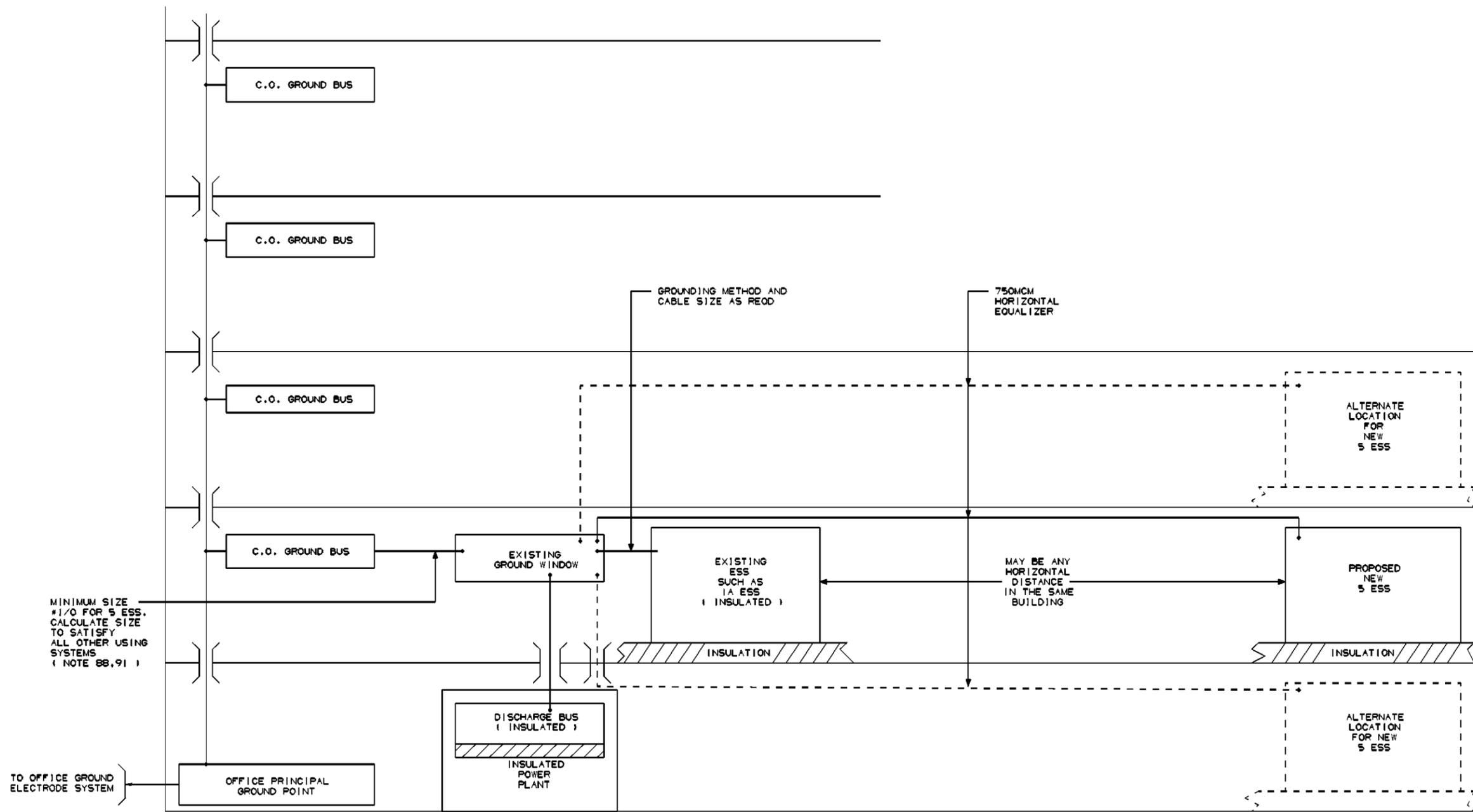
MINIMUM SIZE #1/0 FOR S ESS. CALCULATE SIZE TO SATISFY ALL OTHER USING SYSTEMS (NOTE 88.91)

USE NON METALLIC SLEEVES ON HORIZONTAL AND VERTICAL EQUALIZERS AND ESS GROUND LEADS

THIS ARRANGEMENT IS ACCEPTABLE SINCE THE S ESS IS ONLY ONE FLOOR FROM THE EXISTING GROUND WINDOW FOR THE OTHER ESS. NOTE THAT ONLY ONE GROUND WINDOW PER POWER PLANT IS PERMITTED; ANY NUMBER OF ESS'S MAY SHARE THIS GROUND WINDOW AS LONG AS EACH IS ON THE SAME FLOOR OR WITHIN ONE FLOOR
 FIGURE 25G
 GROUNDING ARRANGEMENT
 (ACCEPTABLE)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E21



THIS ARRANGEMENT IS ACCEPTABLE
 FIGURE 25H
 GROUNDING ARRANGEMENT (ACCEPTABLE)

USE NON METALLIC SLEEVES ON HORIZONTAL AND VERTICAL EQUALIZERS AND ESS GROUND LEADS

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E22

SHEET NOTES:

OLDER LARGE POWER PLANTS SUCH AS 302A TYPES MAY HAVE VERY LONG DISTRIBUTION GROUND (ED) BUS BARS (TOPS AND/OR BOTTOMS). THESE MAY BE USED AS THE GROUND WINDOW FOR S ESS. AS LONG AS THE FOLLOWING CONDITIONS ARE MEET.

1. S ESS IS WITHIN ONE FLOOR OF THE POWER PLANT.
2. ALL CONDUITS ENTERING THE ESS AREA MUST BE RUN WITHIN 3 FEET OF THE GROUND WINDOW AND BONDED THERE WITH A #6 WIRE.
3. THE BUS BAR HAS AT LEAST A #1/0 CONNECTION TO THE C.O. GROUND BUS OR OFFICE PRINCIPAL GROUND POINT. FOR S ESS (NOTE 88,91). THE LONG LENGTH OF THE DISTRIBUTION GROUND BUS BAR WILL NOT AFFECT THE S ESS. THE FACT THAT PORTIONS OF THE BUS BAR EXCEED THE USUAL 3 FOOT RADIUS FOR GROUND WINDOWS WILL NOT MATTER IN THIS INSTANCE. PREFERABLY, THE CONDUIT BOND SHOULD BE WITHIN 3 FEET OF THE LOCATION ON THE BUS BAR WHERE THE S ESS IS TERMINATED, BUT THIS IS NOT A REQUIREMENT. OLDER LARGE POWER PLANT SUCH AS 302A TYPE (GROUNDED) NO EXISTING GROUND CONNECTIONS IN THE POWER PLANT OR OTHER SHARING EQUIPMENT NEED TO BE LIFTED.
4. ALL ESS CONNECTIONS ARE MADE WITH TWO HOLE CRIMP TYPE CONNECTIONS.

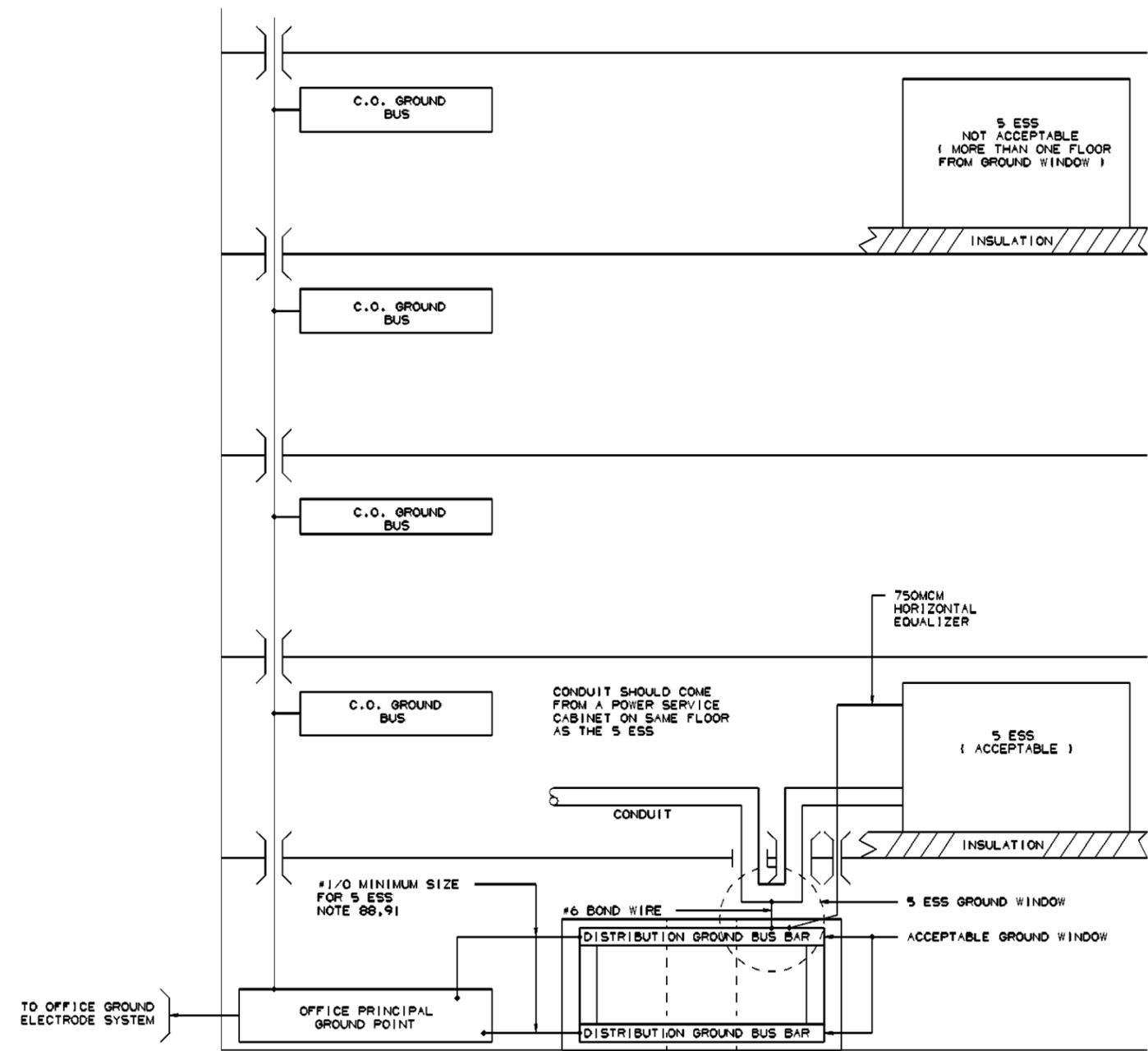
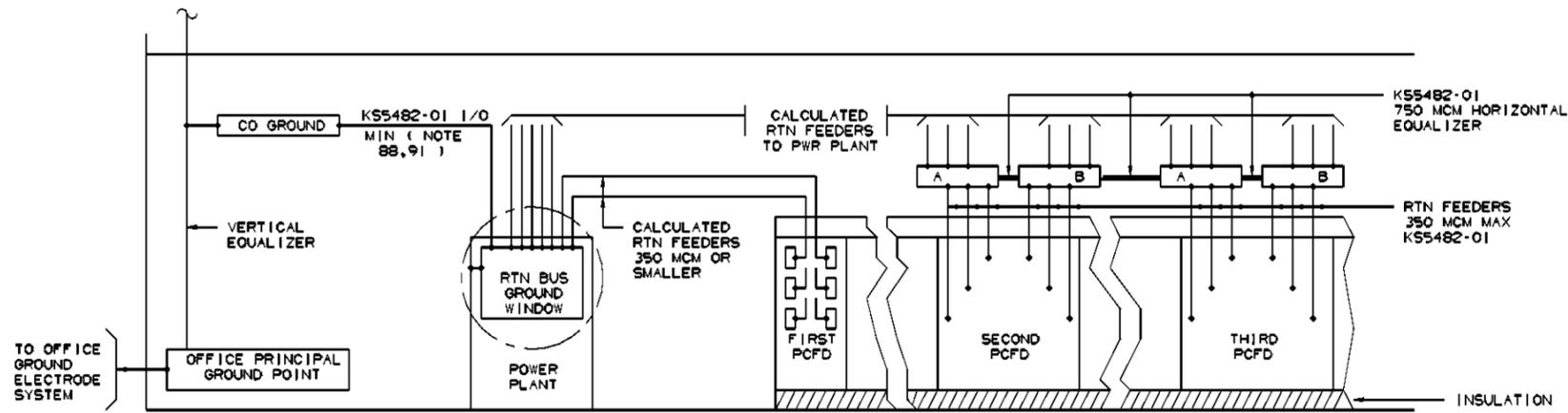


FIGURE 25J
 RE-USE OF OLDER LARGE POWER PLANTS
 WITH LONG DISCHARGE BUS BARS
 (SEE SHEET NOTES)

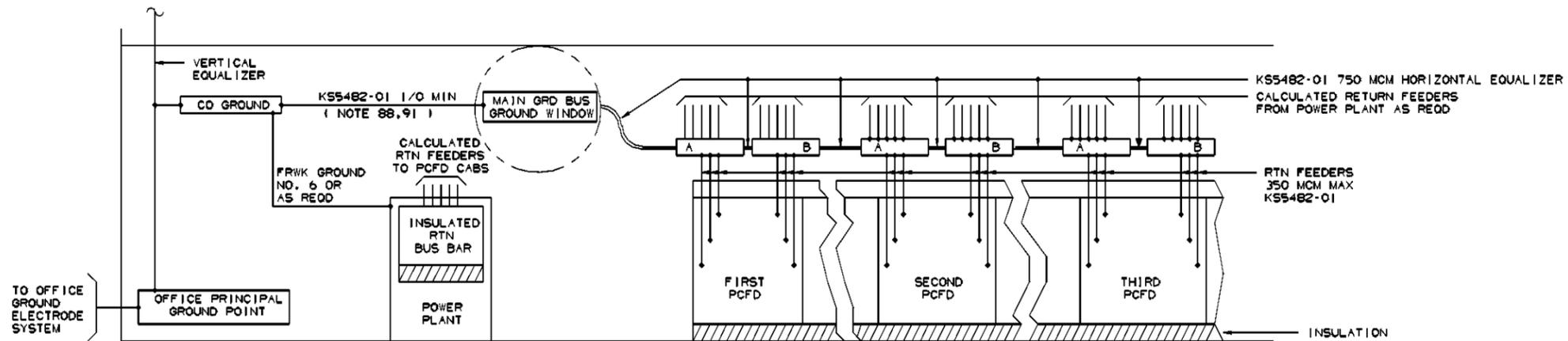
SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
	DWG SIZE c2	ISSUE 14
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E23



TYPICAL HORIZONTAL EQUALIZER WHEN POWER PLANT GROUND DISCHARGE BUS BAR IS THE GROUND WINDOW AND THE DISTANCE BETWEEN THE POWER PLANT AND A PCFD ALLOWS THE RETURN FEEDERS TO TERMINATE DIRECTLY TO THE PCFD RETURN BUS BARS. (SEE NOTE 62)

FIG. 26A

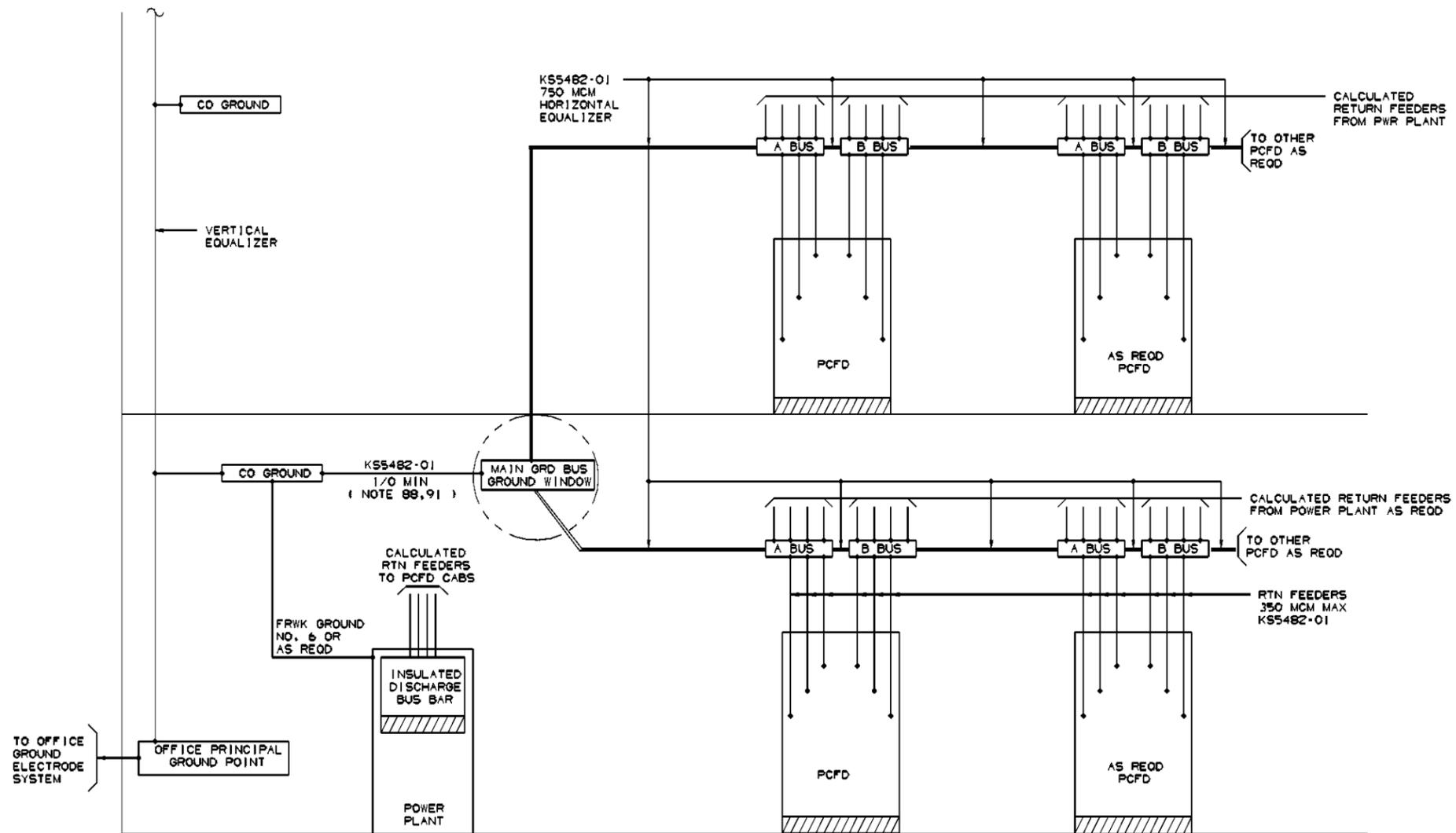


TYPICAL HORIZONTAL EQUALIZER WITH ESS TYPE INSULATED GROUND DISCHARGE BUS BAR ON THIS POWER PLANT AND GROUND SPLICE PLATES ABOVE ALL PCFD CABINETS. (NOTE 78)

FIG. 26B

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE c2	ISSUE 14	
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E24



TYPICAL MULTI-FLOOR 5ESS HORIZONTAL EQUALIZER
 WITH 5ESS TYPE INSULATED GROUND DISCHARGE BUS BAR
 ON THE POWER PLANT (NOTE 78)
 FIG. 26C

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE	ISSUE	
c2	14	
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E25

SHEET NOTE:

1. TO MAKE FIG. 27C AND 27D ALWAYS ACCEPTABLE WRAP AT LEAST TWO LAYERS OF INSULATION PAPER AROUND ONE LADDERACK STRINGER TO BREAK THE METALLIC PATH.
2. TO MAKE FIG. 27D ALWAYS ACCEPTABLE USE ONE INSULATING STANDOFF INSULATOR.

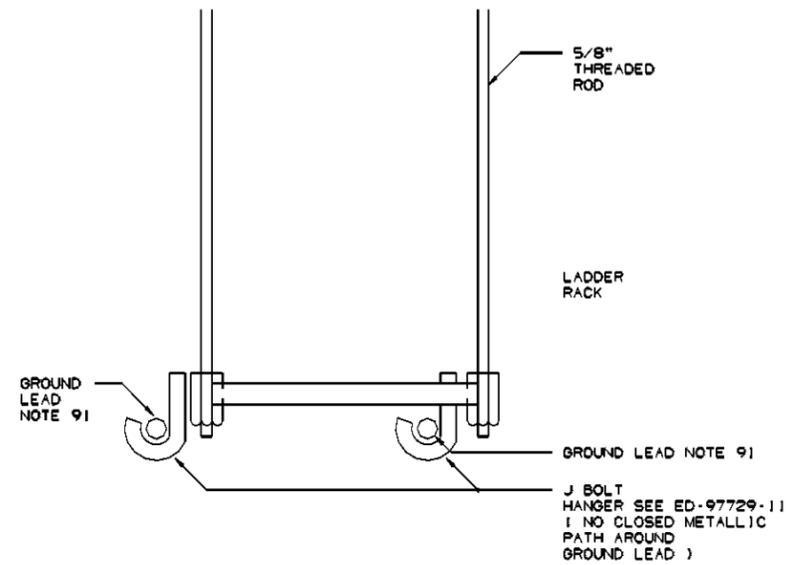


FIGURE 27A
GROUND LEAD
NOT GIRDLED
(ALWAYS ACCEPTABLE)
(NOTE 91)

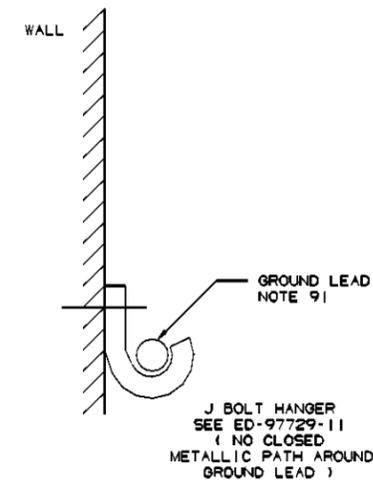


FIGURE 27B
GROUND LEAD
NOT GIRDLED
(ALWAYS ACCEPTABLE)
(NOTE 91)

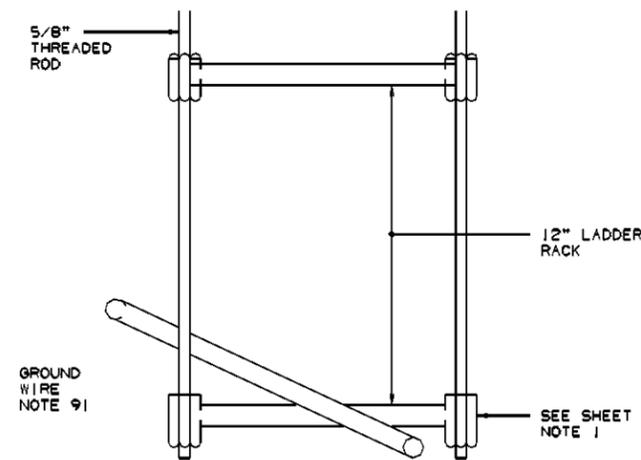


FIGURE 27C
GIRDLING OF
GROUND LEAD
WITH LADDER RACKS
(GENERALLY NOT ACCEPTABLE)
(NOTE 91)

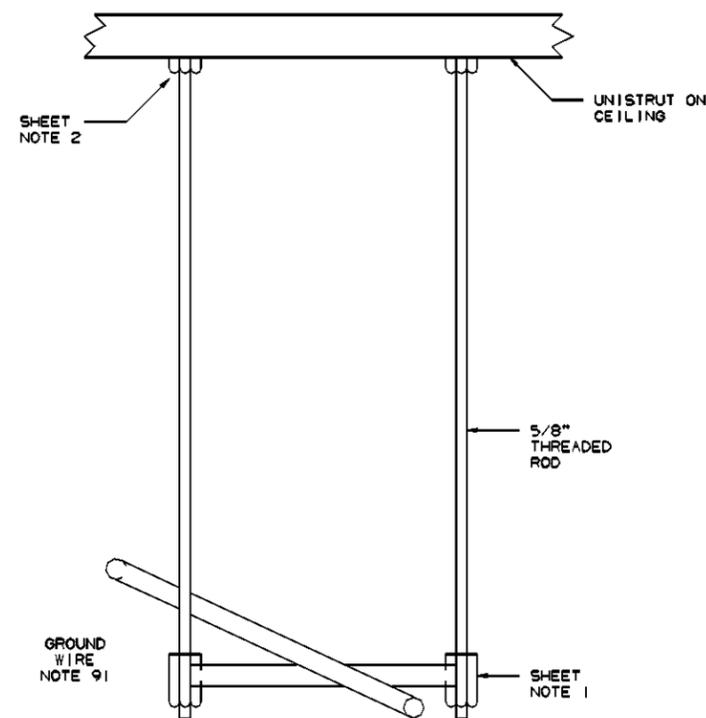


FIGURE 27D
GIRDLING OF
GROUND LEAD
WITH LADDER RACK
AND UNISTRUT
(MAY BE ACCEPTABLE, DEPENDING
ON LENGTH OF HANGER ROD)
(NOTE 91)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E26

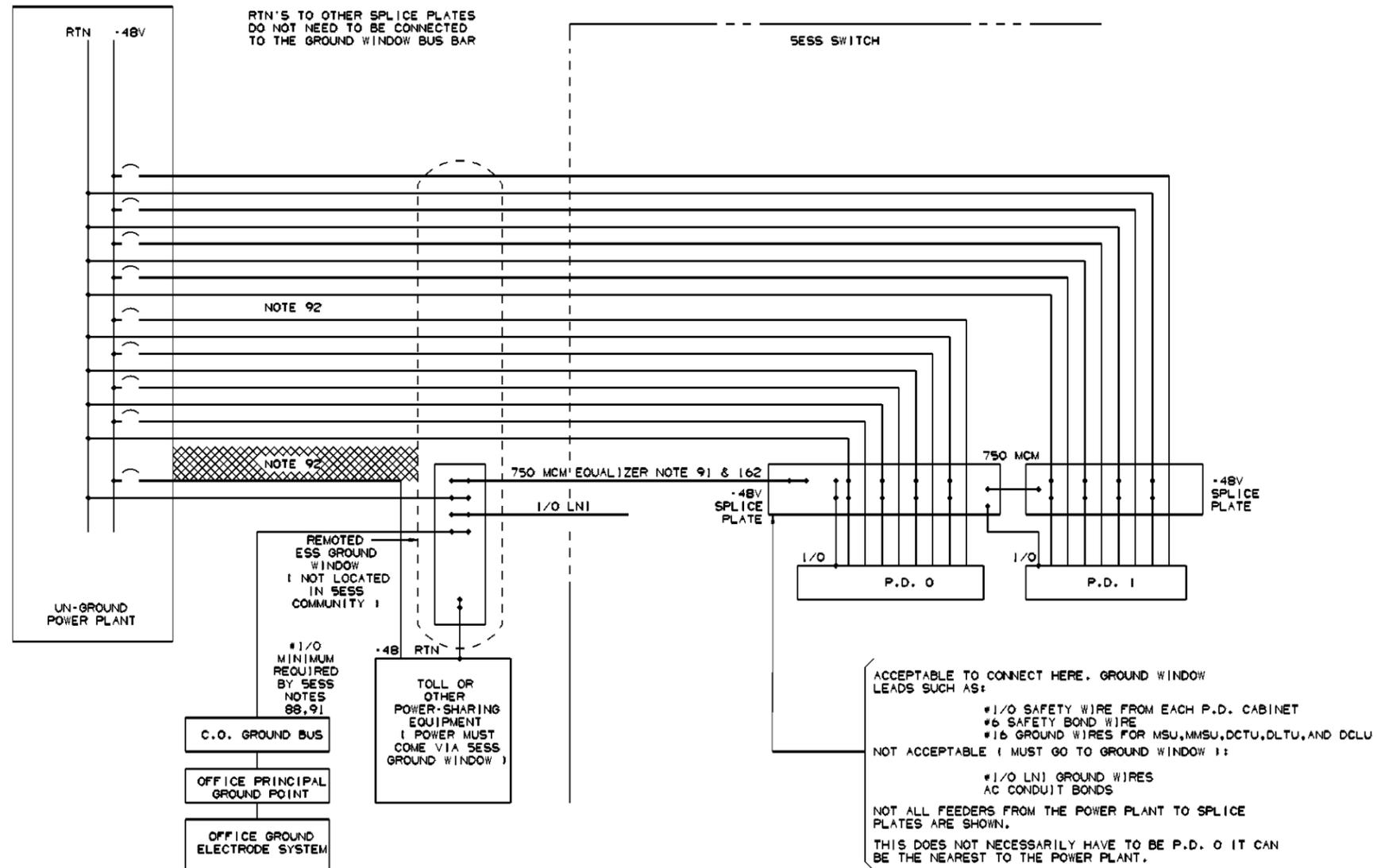


FIGURE 28A (PREFERRED)
ACCEPTABLE GROUNDING ARRANGEMENT
FOR REMOTED ESS GROUND WINDOW
(NOT IN SESS OR IN POWER PLANT)
(NOTE 92)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
	DWG SIZE c2	ISSUE 14
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E27

INFORMATION NOTES (CONT) :
332.

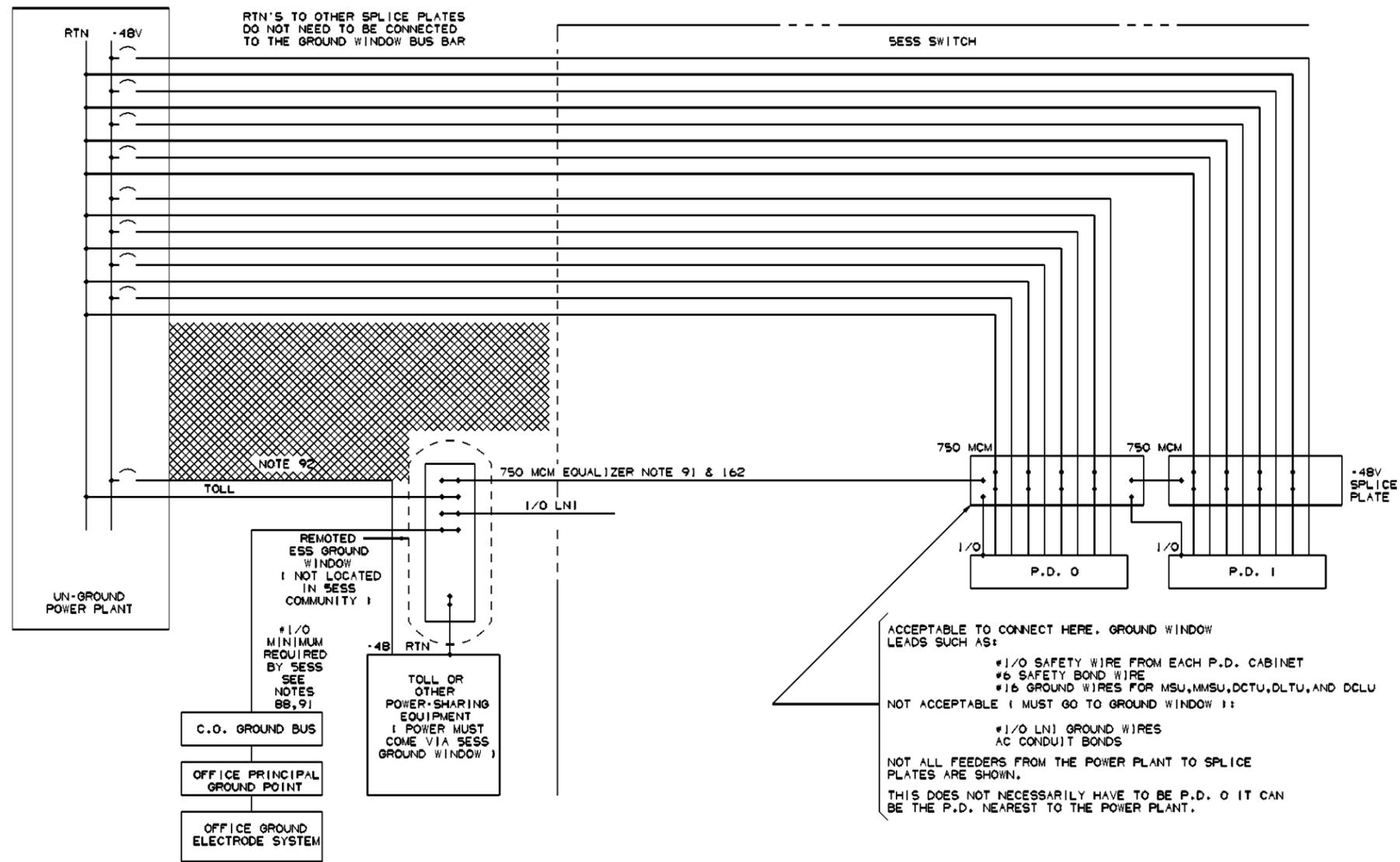
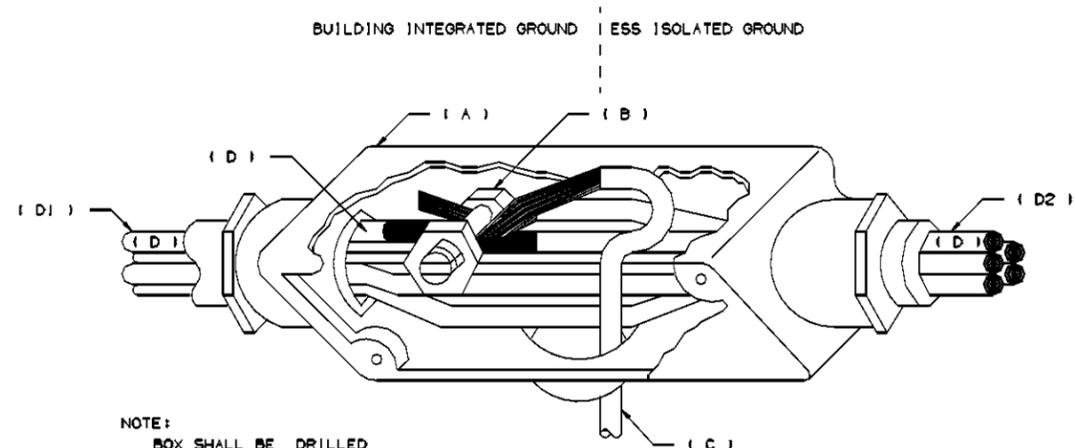


FIGURE 28B (LESS DESIRABLE)
ACCEPTABLE GROUNDING ARRANGEMENT
FOR REMOVED ESS GROUND WINDOW
(NOT IN SESS OR IN POWER PLANT)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
	DWG SIZE c2	ISSUE 14
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E28



NOTE:

BOX SHALL BE DRILLED AS REQUIRED TO MOUNT GROUND CONNECTOR STUD.

(A) SPLICE BOX - KONDU T3 FITTING OR SIMILAR

(B) GROUND CONNECTOR - BURNDY CAT. K2C23 OR SIMILAR

(C) NO. 6 AWG MINIMUM GROUND BOND TO MAIN GROUND BUS (SEE NOTE 98,99)

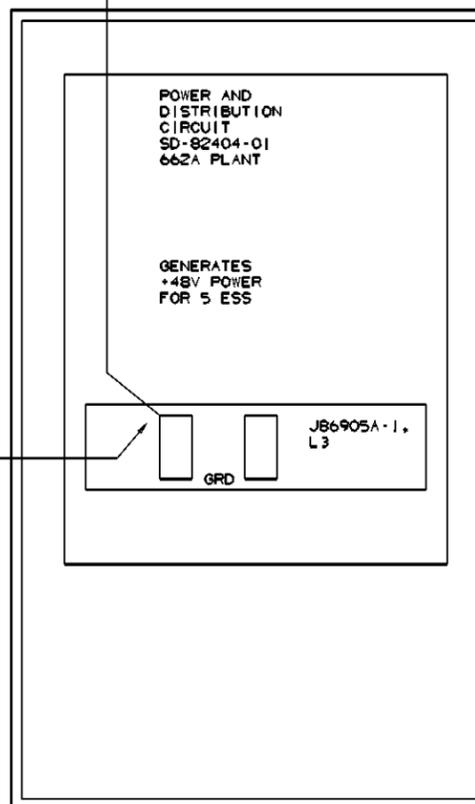
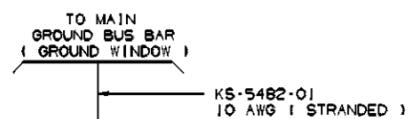
(D) AC EOPT GRD CONDUCTOR (GREEN WIRE)

(D1) FROM AC SUPPLY (PSC)

(D2) TO AC DIST PNL OR AC LOADS IN SESS SWITCH AREA

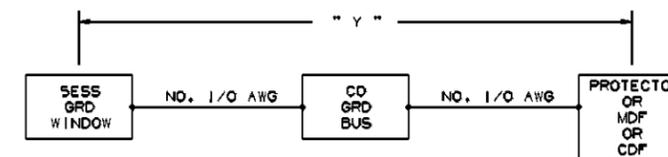
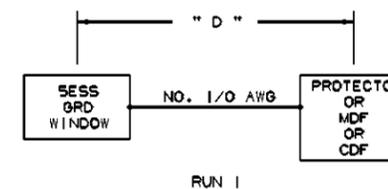
FIG. G

TYPICAL METHOD OF CONNECTING AC CIRCUITS EQUIPMENT GROUND CONDUCTOR (ACEG) AND CONDUIT TO MAIN GROUND BUS BAR (GROUND WINDOW).



SOLDER 10 AWG KS5482-01 TO UPPER LEFT PIN ON LEFT HAND GROUND STRIP (AS SEEN FROM THE REAR). BOTH STRIPS ARE IDENTIFIED ONLY AS " GRD "

FIGURE 29
METHOD OF GROUNDING 662A PLANT
SD-92404-01 LOCATED IN J5D005C
MISCELLANEOUS CABINET



RUN 1 IS REQUIRED TO BE ADDED WHEN THE CONDUCTOR LENGTH OF " D " (RUN 1) IS LESS THAN ONE HALF THE TOTAL CONDUCTOR LENGTH OF " Y " (RUN 2). SEE NOTE 64 AND AT&T SPEC 802-001-195

BONDING LEAD BETWEEN GROUND WINDOW AND THE PROTECTOR, MDF OR CDF. (SEE NOTES 64,91)

FIG. H

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS

DWG SIZE
C2

ISSUE
14

LUCENT TECHNOLOGIES INC

ED5D022-11

SHEET
E29

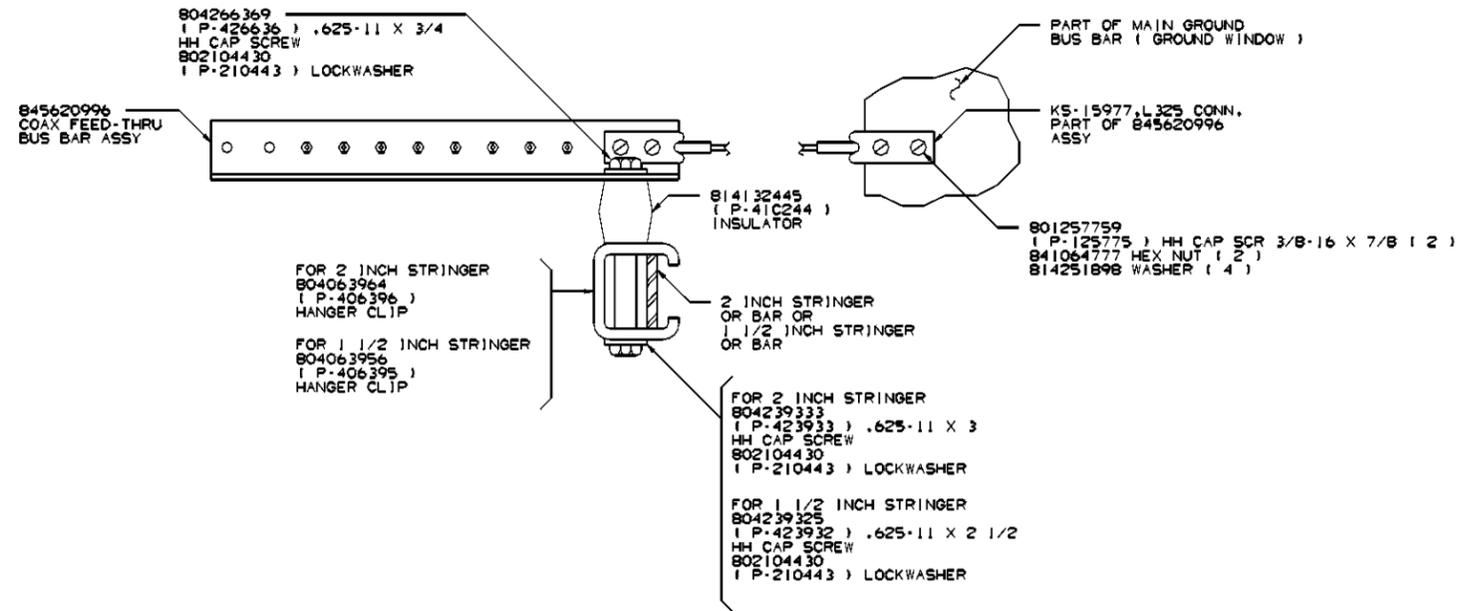


FIG. F
TYPICAL METHOD OF MOUNTING
TRCU COAX FEED-THRU BUS BAR
ASSEMBLY (845620996)
(SEE NOTE 96)

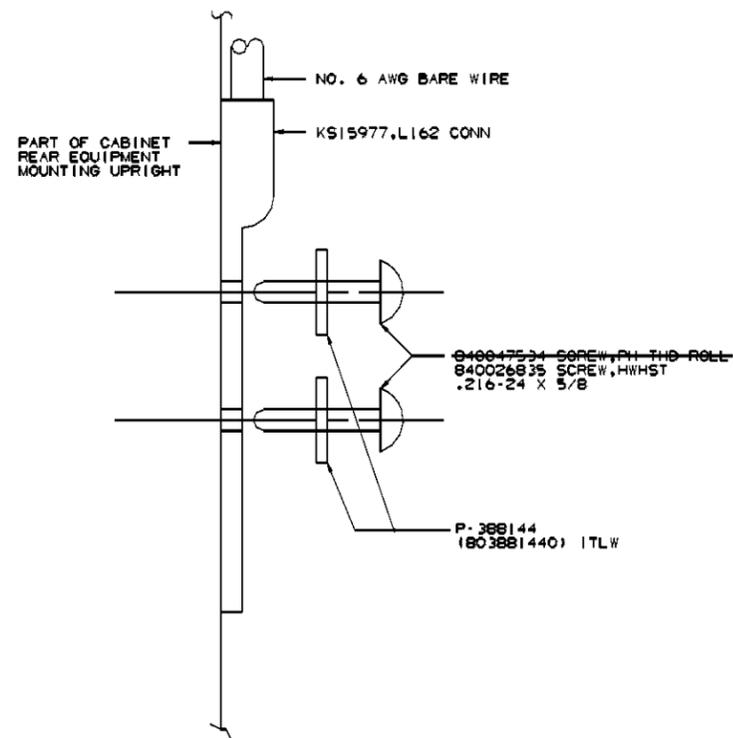


FIG. J
ED-50507-17, G24A
METHOD OF ATTACHING CABINET
GROUND CONDUCTOR TO CABINET
UPRIGHT OTHER THAN PCFD CABINET
(SEE NOTE 158 & FIG. K)



FIG. M
GROUND WINDOW LABEL
(SEE NOTE 164)

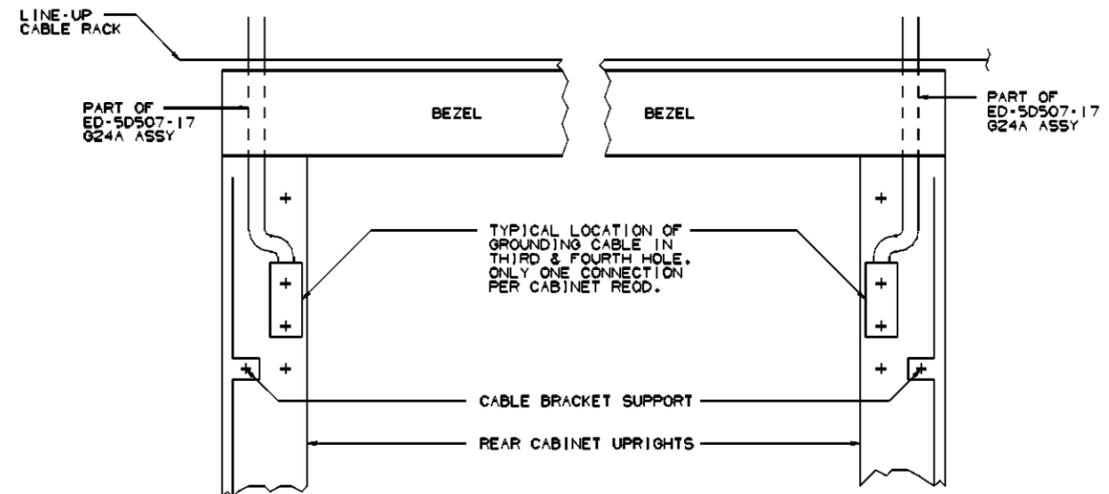
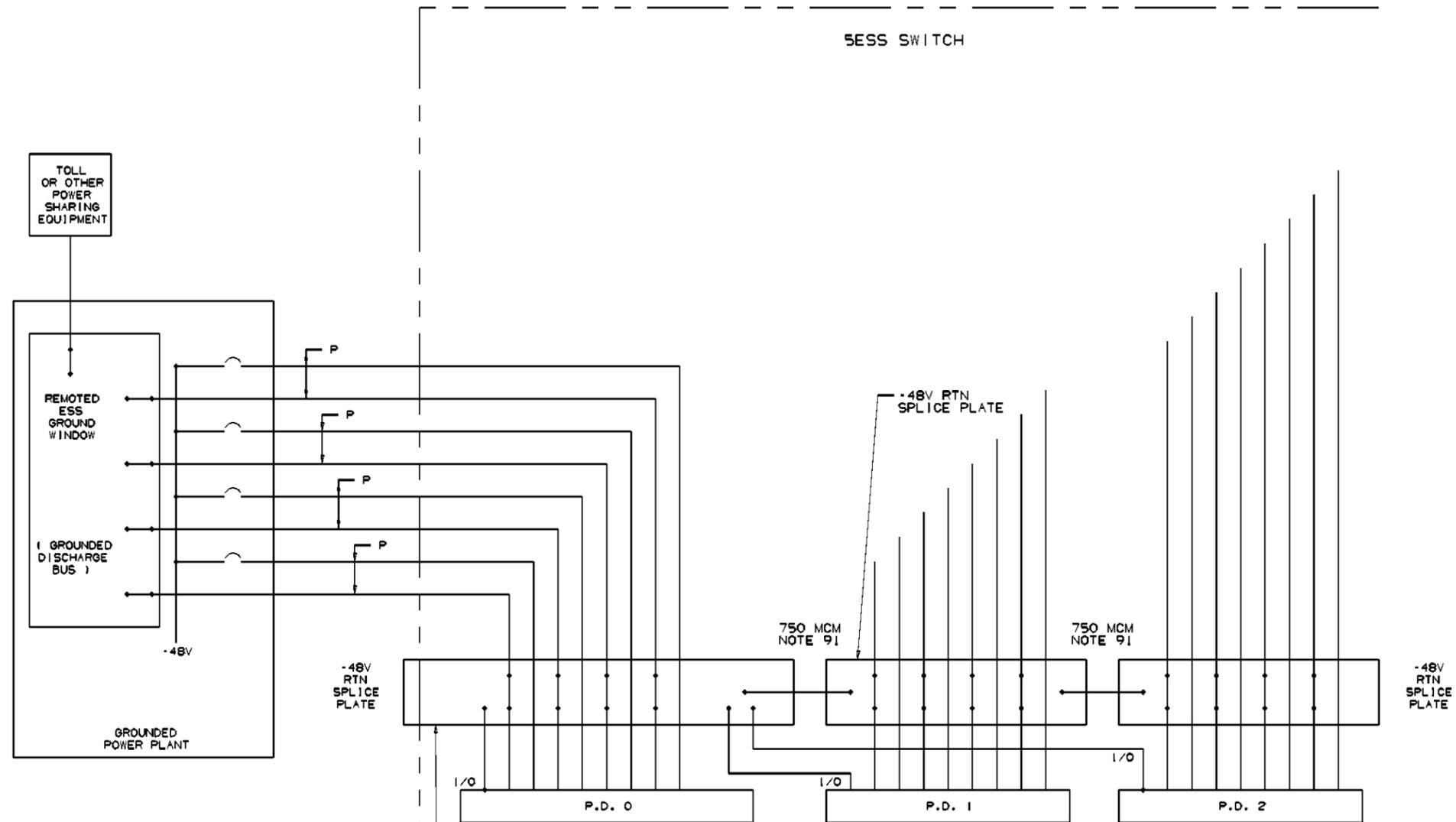


FIG. K
TYPICAL LOCATION OF CABINET
GROUND BONDS
(SEE FIG. 11, A & B)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE C2	ISSUE 14	
LUCENT TECHNOLOGIES INC	ED5D022-11 PRINTED IN U.S.A.	SHEET E 30

FOR SOME UNUSUAL INSTALLATIONS, TYPICALLY WHERE THE ESS GROUND WINDOW IS REMOTELY LOCATED FROM THE SESS SWITCH (SUCH AS BEING THE DISCHARGE BUS OF THE POWER PLANT) MANY LONG CABLE AND WIRE RUNS TO THE GROUND WINDOW MAY RESULT. AN ACCEPTABLE ALTERNATIVE ARRANGEMENT IS TO RUN THESE LEADS TO THE -48V RTN SPLICE PLATE OF THE FIRST (NEAREST) POWER DISTRIBUTION CABINET.



ACCEPTABLE TO CONNECT HERE. GROUND WINDOW LEADS SUCH AS:
 #1/0 SAFETY WIRE FROM EACH P.D. CABINET (NOTE 86)
 #6 SAFETY BOND WIRE (NOTE 57 D5)
 #16 GROUND WIRES FOR MSU, MMSU AND DCTU, DLTU AND DCLU (NOTE 85)

NOT ACCEPTABLE (MUST GO TO GROUND WINDOW):
 #1/0 AWG LNI GROUND WIRE'S, AC CONDUIT BONDS

NOT ALL FEEDERS FROM THE POWER PLANT TO SPLICE PLATES AS SHOWN
 SEE NOTE 97

FIG. 30
 ACCEPTABLE GROUNDING ARRANGEMENT
 FOR REMOTED ESS GROUND WINDOW
 IN POWER PLANT, WITH
 SPLICE PLATES AT EVERY PD CABINET

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
	DWG SIZE c2	ISSUE 14
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E 31

1. THIS ARRANGEMENT WILL PROBABLY BE POSSIBLE ONLY WHEN THE POWER PLANT IS VERY CLOSE TO THE 5 ESS SWITCH, AND THEREFORE MIGHT NOT NEED SPLICE PLATES AT THE FIRST (OR OTHER) P.D. (S), BECAUSE VOLTAGE DROP CONSTRAINTS DO NOT REQUIRE THEM.
2. CONNECT TO GROUND WINDOW
 - 1/0 SAFETY WIRE FROM EACH P.D. CABINET
 - #6 SAFETY BOND WIRE
 - #16 GROUND WIRES FOR MSU, MMSU AND DCTU (SEE NOTE 85)
 - #1/0 LNI GROUND WIRES
 - AC CONDUIT BONDS
 - NOT ALL FEEDERS FROM THE POWER PLANT TO SPLICE PLATES ARE SHOWN.

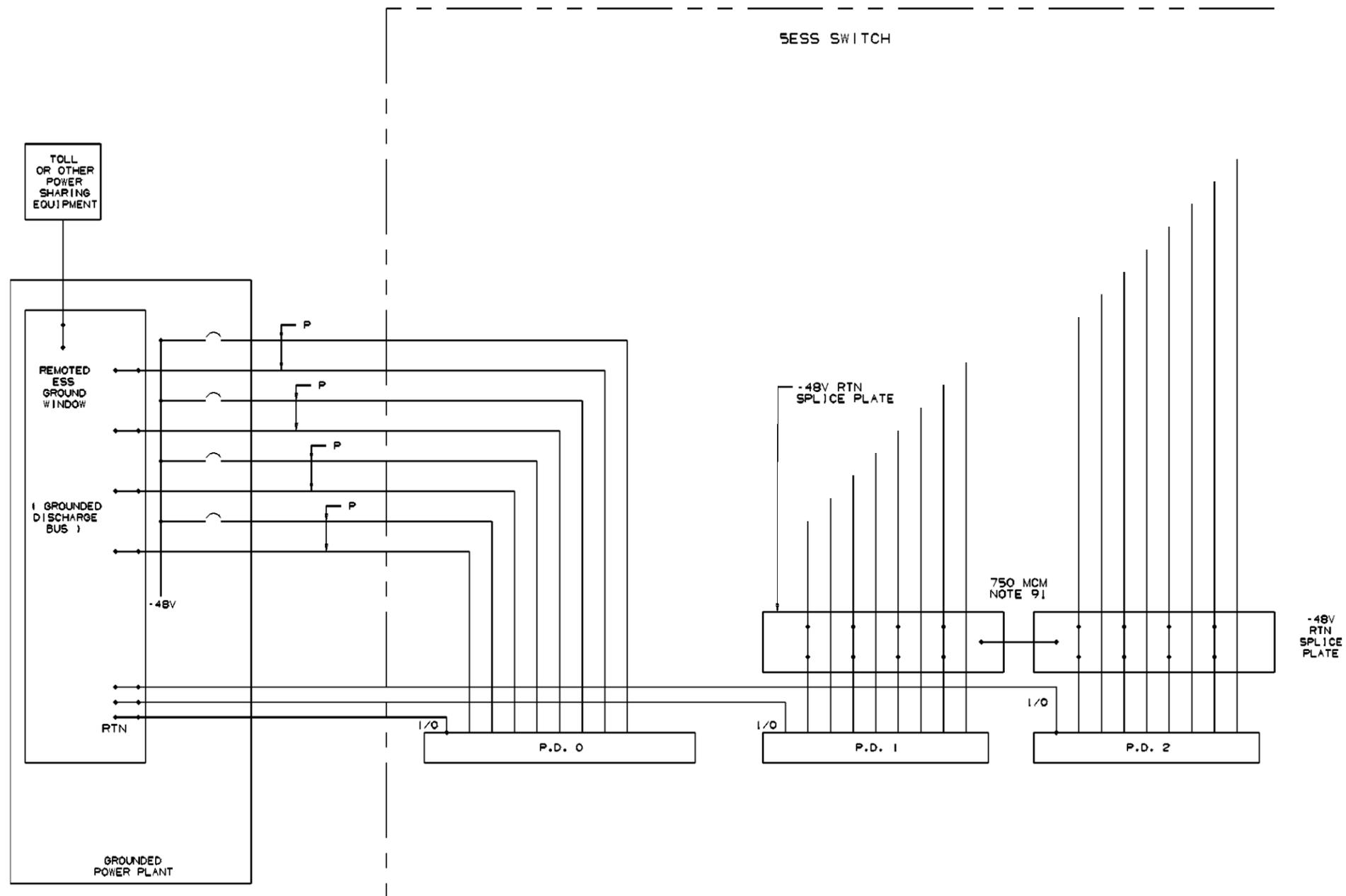


FIG. 31
ACCEPTABLE ARRANGEMENT FOR
5 ESS WITH ONE OR MORE P. D.
CABINETS WITH NO SPLICE PLATES
AT ONE OR MORE P. D. CABINETS.

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
	DWG SIZE c2	ISSUE 14
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E 32

1. C.O. GROUND BAR (MASTER GROUND BAR) MAY BE COMBINED WITH OFFICE PRINCIPAL GROUND POINT (SEE NOTE 168).

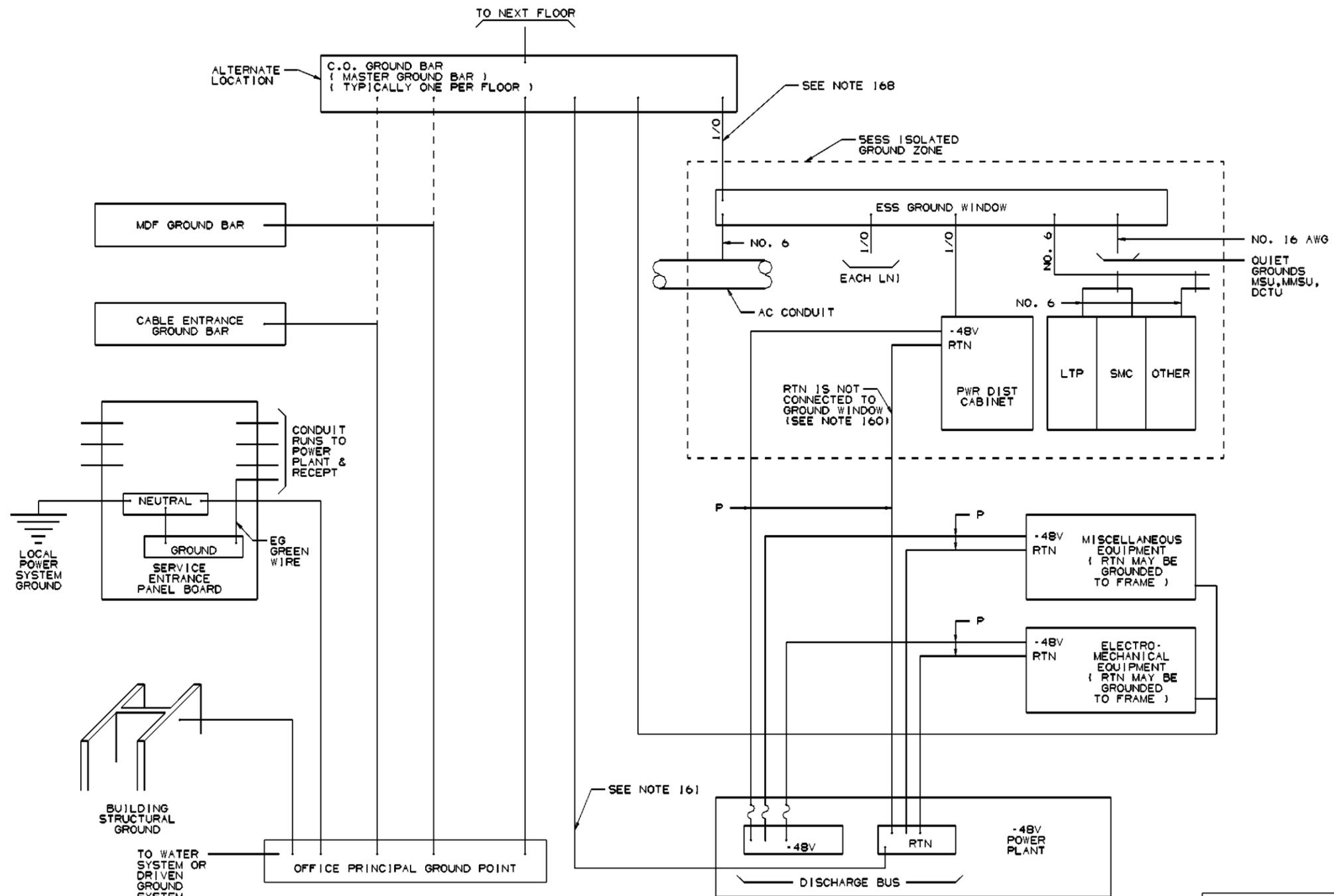


FIG. 32
ACCEPTABLE GROUNDING ARRANGEMENT
FOR VERY SMALL SESS OFFICES (SEE NOTE 160)
SEE FIG. 32A FOR BELLCORE REQUIREMENTS
USING TN1058 CIRCUIT PACKS

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
	DWG SIZE c2	ISSUE 14
LUCENT TECHNOLOGIES INC	ED5D022-11 <small>PRINTED IN U.S.A.</small>	SHEET E33

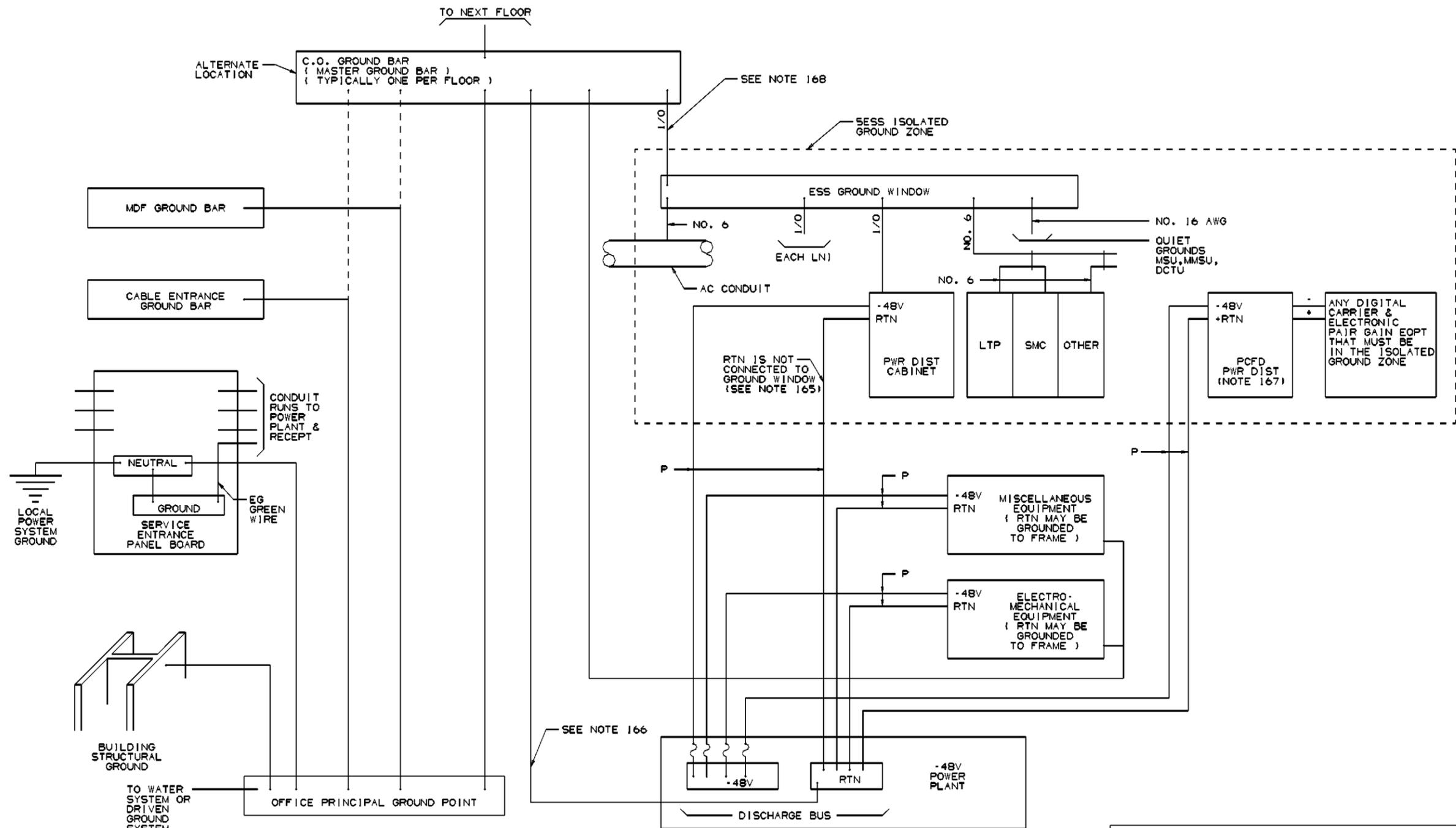


FIG. 32A
 ACCEPTABLE BELLCORE GROUNDING ARRANGEMENT
 FOR SESS OFFICES USING TN1058 CKT PACKS OR
 HAVING NO LU1, LU2 OR LU3 LINE UNITS.
 (SEE NOTE 165)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
	DWG SIZE c2	ISSUE 14
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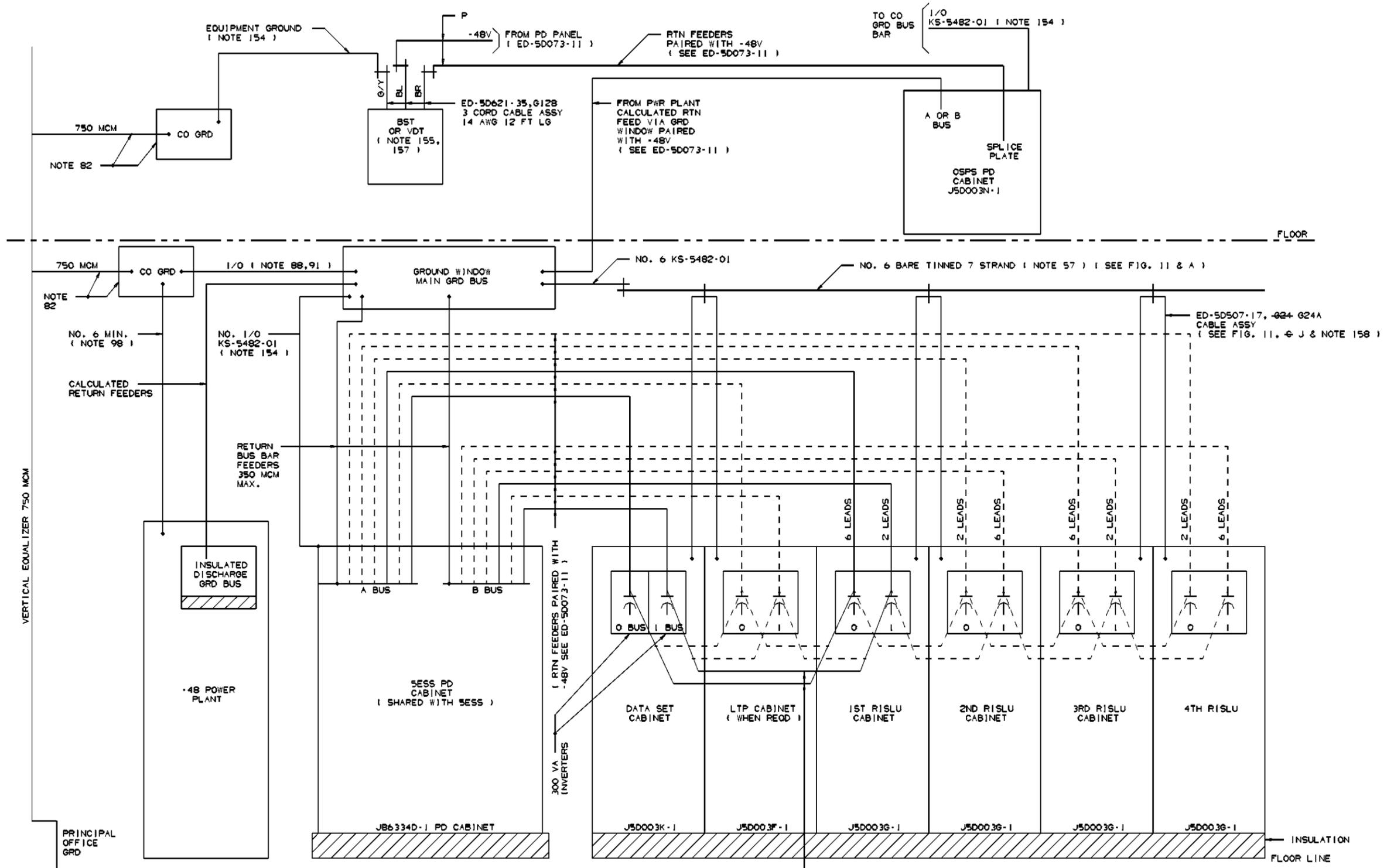


FIG. 71
 TYPICAL OSC SITE WITH SHARED ESS POWER PLANT WITH OPC PD REMOTED WITH BST'S OR VDT'S. OPC DATASET CABINET AND RISLU CABINETS LOCATED WITH SESS SWITCH EQUIPMENT AND POWERED FROM JB6334D-1 PD CABINET (NOTE 58,59).

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
DWG SIZE	ISSUE	
c2	14	
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E 35

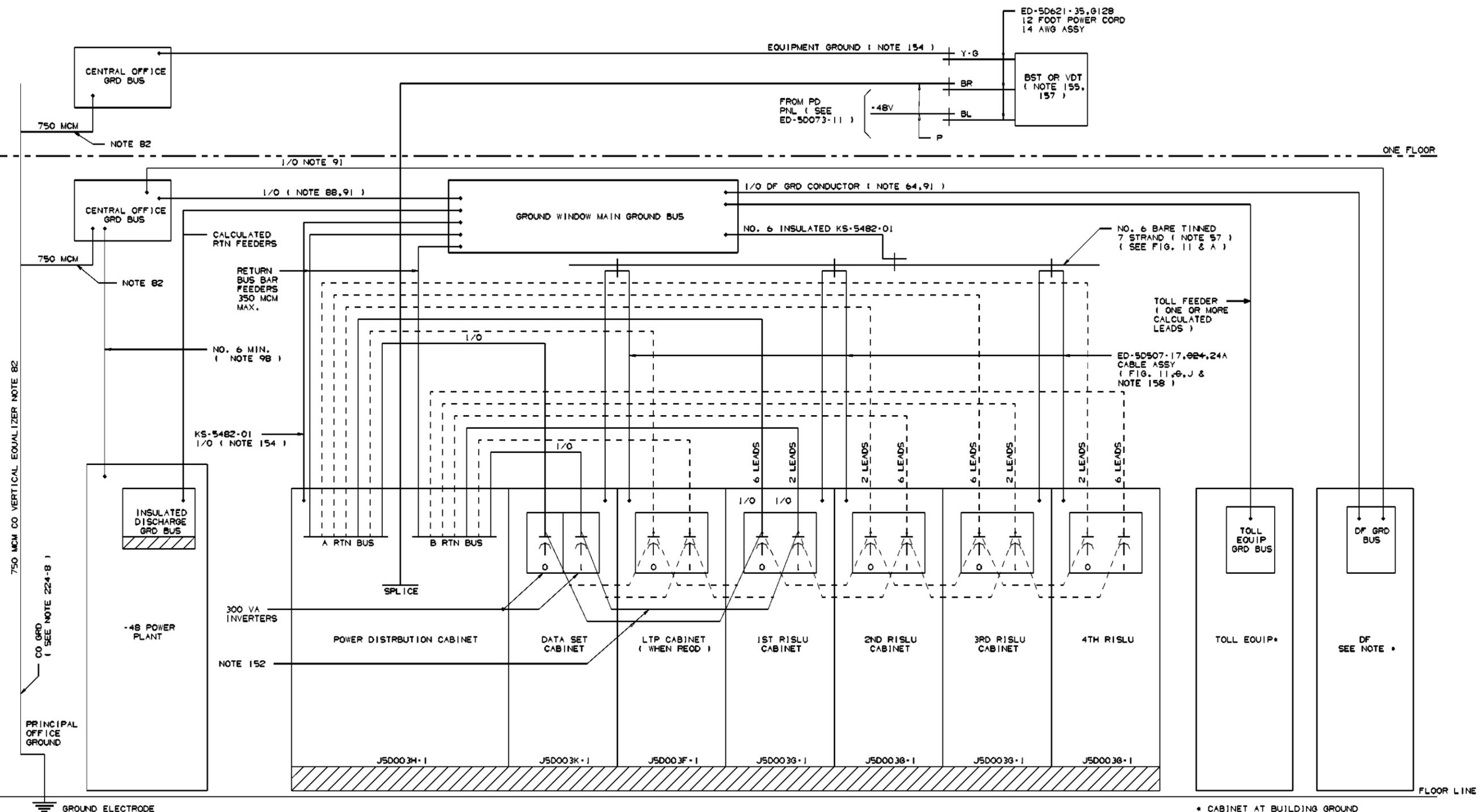


FIG. 72
 TYPICAL GSPS APPLICATION FOR REMOTE OSC SITE
 WITH DEDICATED POWER PLANT AND LOCAL OPC PD.
 (BST'S OR VDT'S OVER 800 CABLE LOOP FEET FROM OPC PD)
 (NOTE 58,59)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
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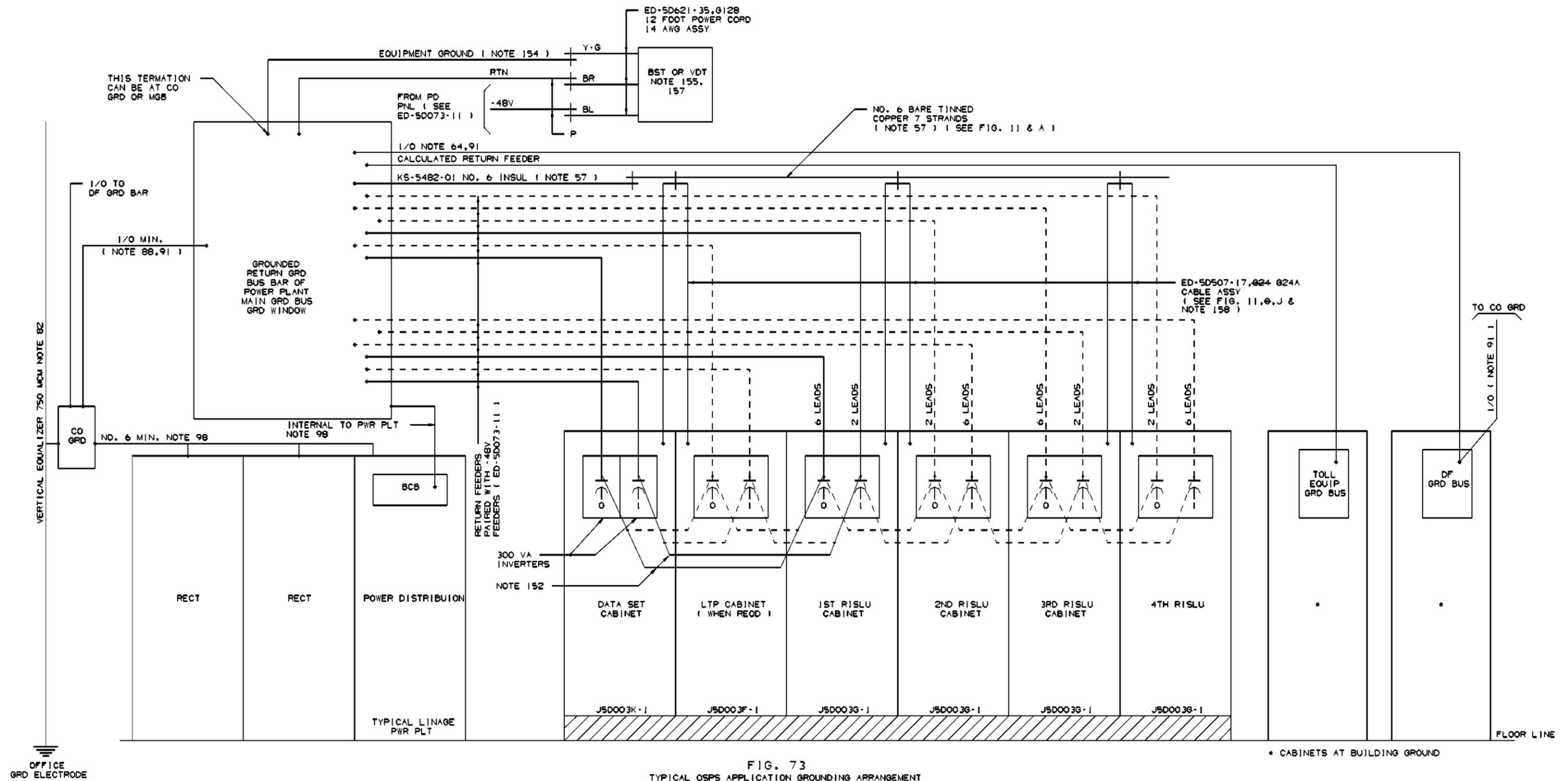


FIG. 73
 TYPICAL OSPS APPLICATION GROUNDING ARRANGEMENT
 FOR REMOTE OSC SITE WITH DEDICATED POWER PLANT
 WITHOUT OPERATOR POSITION CONTROL (OPC) PD.
 THIS ARRANGEMENT TO BE USED FOR NEW INSTALLATIONS
 WHERE THE BST'S OR VDT'S ARE EQUAL TO OR LESS THAN
 800 CABLE LOOP FEET FROM THE POWER PLANT.
 (NOTE 58,59)

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		DWG SIZE C2	ISSUE 14
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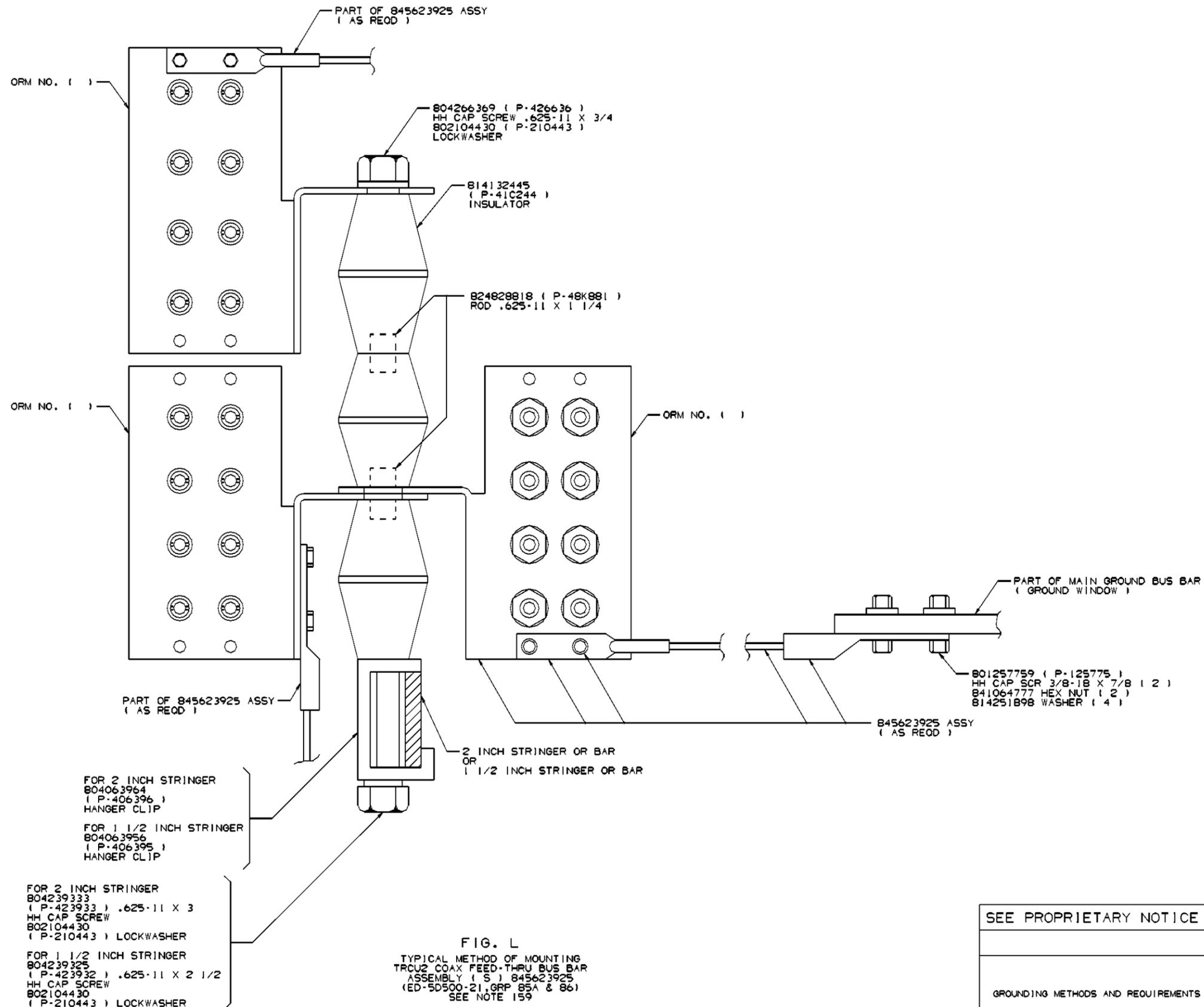


FIG. L
 TYPICAL METHOD OF MOUNTING
 TRCU2 COAX FEED-THRU BUS BAR
 ASSEMBLY (S) 845623925
 (ED-5D500-21, GRP 85A & 86)
 SEE NOTE 159

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS		
	DWG SIZE c2	ISSUE 14
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PARTIAL REAR VIEW OF CABINET
FRAME TOP ASSEMBLY

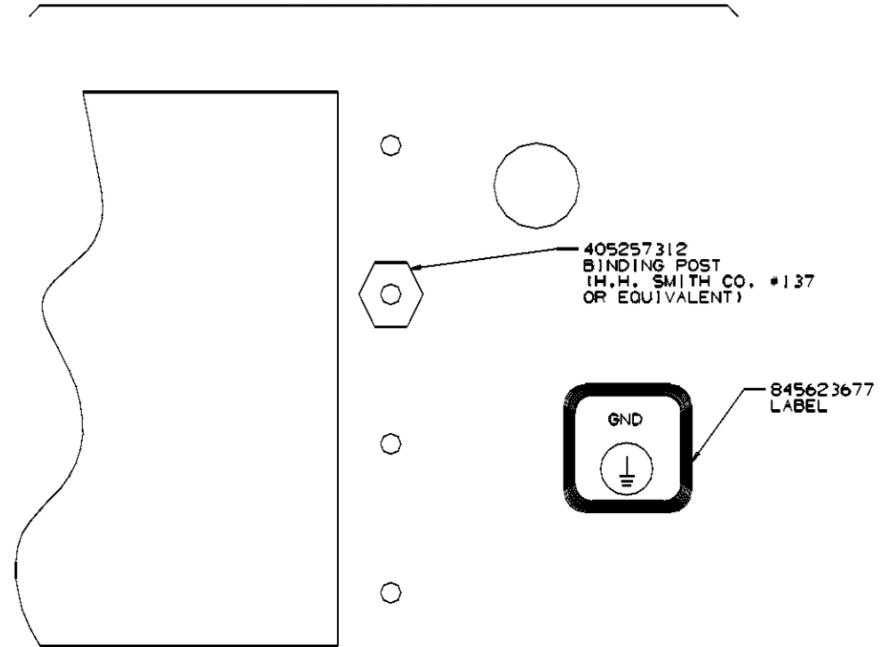


FIG. N

TYPICAL METHOD OF PROVIDING UNDERWRITERS
LABORATORY GROUND CONNECTION. (ALL CABINETS EXCEPT PCFD
REQUIRED ONLY FOR SESS INSTALLATIONS NEEDING
U.L. APPROVAL).

SEE PROPRIETARY NOTICE ON SHEET ONE

GROUNDING METHODS AND REQUIREMENTS	DWG SIZE	ISSUE
	c2	14
LUCENT TECHNOLOGIES INC	ED5D022-11	SHEET E 39