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BELLSOUTH
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ENGINEERING AND INSTALLATION STANDARDS CENTRAL OFFICE EQUIPMENT

Technical Reference

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ENGINEERING AND INSTALLATION STANDARDS CENTRAL OFFICE EQUIPMENT

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ENGINEERING AND INSTALLATION STANDARDS CENTRAL OFFICE EQUIPMENT

CONTENTS

GLOSSARY

145C NUMBER PLATE — Cable designations tags

ABAM CABLE — Multiple pair cable with a foil type (non braided) shield

AC — Alternating Current

ADD–DROP MULTIPLEXER (ADM) — Multiplexer capable of interchanging different bit–rates equipped with electrical and/or optical interfaces.

AISLE DISTRIBUTION CABINET — A power distribution cabinet at the end of an (ADC) aisle to fuse a line a line up of frames

ALARM — Electrical signals that actuate an audible, visual, or other indication that there is a problem with telecommunication equipment, facilities, or building environment.

ALARM NETWORKS — All of the equipment and associated distribution cabling needed to interconnect an alarm system capability.

ALARM SYSTEMS — Electronic equipment and software for gathering and distributing signals generated by network elements.

ANALOG — Technology that deals with constantly varying signals

ANCHOR BOLTS — Fasteners that hold central office equipment to the floor

APPLIANCE OUTLETS — Alternating current outlets (usually 117 volts AC, 60 hertz)

ARMORED CABLE — Cable with outer metallic flexible protective casing (ex. BX cable)

ATTENUATION — The reduction of average optical power in an optical waveguide. The main causes are scattering and absorption, as well as optical losses in connectors and splices.

AUXILIARY AC POWER — Typically AC 110V supply of power to equipment area for operation of some equipment such as computer equipment but primarily used for appliance outlets for portable test equipment. Also used to operate aisle lighting.

AUXILIARY FRAMING — Two inch framing channels, in a grid arrangement, consisting of primary and secondary level structures. These structures are used to support cable racks, equipment frames, ladder tracks, ground pipes etc.

AWG	American Wire Gauge, a standard for measuring the size of wire
BACK PLANE	Printed circuit boards in the back of circuit pack shelves where connectors or wiring are terminated
BATTERY DISTRIBUTION FUSE BAY (BDFB)	Secondary distribution point for DC power. Associated fuses are located at this point.
BAY	A unit, also know as a relay rack, into which central office equipment is mounted
BENDING RADIUS	A measure of the turning of a cable. The radius of a circle of which the arc of a bend follows
BER (Bit Error Rate)	In digital applications, the ratio of bits received in error to bits sent. BERs of one errored bit per billion ($1 X 10^9$) sent are typical.
BST	BellSouth Telecommunications, Inc.
BICONIC CONNECTOR	Optical connector with a conical shape for highly repeatable optical connections.
BNC CONNECTOR	Coaxial Connector typically used on equipment backplanes or DSX−3 frames for easily terminating coaxial cables.
BONDED	Mechanical connection of two metallic surfaces, associated with the termination of ground connectors
BRAIDED CABLE	Cable made in the form of a braid that is generally used for grounding
BRIDGING REPEATER	A device that accepts a low−level digital signal as input and retransmits it as output at the full DSX signal level.
BROADBAND INTEGRATED SERVICES DIGITAL NETWORK (BISDN)	Plan to offer high bandwidth (for example, 600 Mb/s) intelligent digital services to customers over optical facilities.
BUILDING CABLE	Term used to describe in−building plant cable as opposed to OSP cable. Building cable typically will in the outside plant. Building cables are constructed from non−flammable grade materials.
BUTTING	The stripping away of the cable sheathing exposing the inner connectors of the cable
BX CABLE	A form of armored cable, used for AC service, where the armor is flexible
CABLE BINDER	A sector division within a cable, dividing that cable into groups of conductors

CABLE DUCT	A single pipe, tube, or conduit.
CABLE ENTRANCE FACILITY (CEF)	Primary entrance point for cables into the building, typically where conduits from the street end. The CEF usually has a framing structure for the organization of splices and cables.
CABLE HOLE	An opening through which cables are run. This opening can be in a floor, ceiling or wall. In most cases cable racks are run to these structures.
CABLE LABEL	A tag used to identify a cable
CABLE MANAGEMENT SYSTEM	A total cable pathway system from point–to–point within the Wire Center designed so that cable placement will be clear and growth will be easy to accomplish.
CABLE RACK	Metallic structure, in a ladder configuration, on which cables are to be run
CABLE SLOT	An elongated opening through which cables are run. These openings can be in the floor, ceiling or walls and are usually applied to main distributing frames and secondary power distributing points.
CABLE SPLICING KIT	A kit consisting of the material and equipment necessary to repair cut cables. Contains circuit tracing equipment to identify individual cable pairs.
CAPACITY MANAGER	BST Representative responsible for the planning and provisioning of switch, transport, and power equipment.
CENTRAL OFFICE (CO)	A telephone company building typically housing a switching system and other transmission equipment. Also know as Exchange Center or Wire Center.
CENTRAL OFFICE GROUND BUS	A ground bar that is connected into the Central Office Ground System to provide for multiple connections on a particular floor.
CENTRAL OFFICE GROUND SYSTEM	A system of ground cables and connections that brings all metallic points within the office to the same ground potential.
CENTRAL OFFICE TERMINAL (COT)	Equipment used for multiplex/demultiplex and analog/digital conversion functions at the central office end of the loop T–carrier circuit. The COT may be provisioned to provide line–powering (that is, interface directly with loop T–carrier) or to interface with a DS1 signal at the DSX.
CHANNEL BANK	Equipment that combines a number (for example, 24) of voice channels into a digital signal (for example, DS1).

CIRCUIT	A group of electronic components and their interconnections
CIRCUIT BREAKER	A mechanical re−setable unit that disconnects power to equipment at a specifically defined current level
CLEI	Common Language Equipment Identification Code
COAXIAL CABLES	Coaxial cables have two conductive paths−−a solid center conductor and a thin outer shield. Coaxial cables are used in unbalanced transmission systems.
CONDUIT	A circular metal channel which encircles metallic electric conductors
CONNECTING BLOCK/PANEL	The basic component of a distribution frame that typically holds an array of connectors that allow repeatable connections. These blocks range in functionality from simple interconnection to providing monitoring and jack−arrangements for signal redirection.
CORE	The central region of an optical fiber through which light is transmitted.
CRIMP	A mechanical method of terminating conductors to connectors
CRIMPING SLEEVE	An inner and outer circular ring which is crimped to bond the outer sheath of a shielded cable to a ground
CROSS−AISLE TIE CIRCUIT	An interconnection between physically separated
CROSS−TALK	The transfer of a signal onto an adjacent signal caused by electromagnetic coupling directly between physically separated circuits.
DC	Direct Current
DDM−2000	A digital multiplexer manufactured by AT&T Network Systems that interfaces DS1 signals with either electrical DS3 signals and/or optical signals such as OC3, OC12, etc.
DIGITAL	A technology that deals with discrete levels rather than constantly varying levels
DIGITAL LOOP CARRIER	A carrier system used for pair gain in loop applications.
DIGITAL MULTIPLEXERS (MUX)	Equipment that provides an interface between different bit rates in the digital network. Multiplexers combine a number of individual channels into a common bit stream for transmission. Multiplexers also do demultiplexing, (See DDM−2000).

DIGITAL SIGNAL CROSS−CONNECT (DSX)	A centralized termination, interconnection, and test point for digital equipment at a particular digital signal bit rate. These capabilities enable a DSX frame to provide several operational functions, including equipment interconnection, test access, and patching. DSXs are identified by the transmission rate of the signals terminated on them. The DSX−1 is for DS1 signals, the DSX−3 is for DS3 signals, etc. All equipment terminated on a DSX must conform to the industry standards for the DS transmission rate.
DIGITAL SWITCH	A central office switch whose internal workings are based on digital technology (ex. DMS−100, #5ESS).
DISTRIBUTING FRAME	A physical piece of hardware where mechanical cross connects are performed.
DISTRIBUTING FRAME	Generally describing the main distributing frame in the Wire Center (see MDF). May also describe the Fiber Distribution Frame.
DRESSED CABLE	Cable that is organized by sewing or tie wrapping to support equipment terminations.
DSX BAY	A supporting structure called a frame and all the DSX apparatus mounted on it.
DUCT WORK	Channel in which cable is run.
DUMMY BLOCK	Spacers that are used for rigidity in specific types of distributing frames.
EARTHQUAKE BRACING	Various methods of supporting central office equipment, whose inherent design is based on surviving earthquakes.
ELECTROMECHANICAL SWITCH	A central office switch whose internal workings are based on analog switching technology (ex. Panel, Step−by−Step, X−bar).
ELECTROLYTE	A mixture of distilled water and acid that is used in storage batteries.
ELECTRONIC SWITCH	A central office switch whose internal working are based on electronic switching circuits (ex. 1AESS).
ELECTROSTATIC DISCHARGE (ESD)	The discharge of high voltage, caused by static charging, through central office equipment.
EQUIPMENT/FAULT GROUND	A metallic path from equipment to ground
EQUIPMENT FRAMES	Structures of various heights to mount central office equipment (ex. relay racks, bays)

ESD	Electrostatic Discharge
ESS	Electronic Switching System
EXPRESS TROUGH	A wireway, typically placed near the top and/or bottom of a bay, that allows jumpers to be routed past the bay.
FACILITY	A transmission circuit between two central offices, or between a central office and a remote terminal.
FANNING	The spreading out of cable in preparation for its termination on equipment
FC CONNECTOR	A threaded optical connector sometimes found in the Wire Center.
FIBER	Any filament or fiber, made of dielectric materials, that guides light.
FIBER DISTRIBUTION FRAME (FDF)	A cross−connect and/or interconnect system using fiber optic jumpers and cables.
FIBER GROWTH ENHANCEMENT	Process of planning and engineering a significantly improved fiber distribution network for the Wire Center including; non−flammable cables, Fiber Distribution Frame, Fiber Protection System, etc.
FIBER OPTIC CABLE	A transmission cable that is made up of glass fibers
FIRE STOPPING MATERIAL	Nonflammable material specifically designed to block cable holes and ducts, thereby limiting the propagation of a fire.
FORMING	The process of combining cable or wire, in an organized arrangement, that is to be terminate on central office equipment
FT−2000	A fiber optic transmission system that operates at up to 1.7Gb/s, and interfaces electrically at the DS3 digital signal rate.
FUSE	A unit in a power circuit that detects current flow and opens the power circuit when a preset current level is reached. These replaceable units are used to protect equipment from high current levels.
FUSE AND ALARM PANEL	A panel that is wired to central office battery (typically −48 volts DC) to provide fused power to other panels mounted on an equipment bay.
FUSE CLIPS	Projections that physically hold fuses in place

FUSE RECORD SHEETS	Records of equipment assigned to specific fuse positions in fuse bays
FUSE SPLICE	A splice method which joins ends through fusing the two glass surfaces together.
GROUNDED CONDUCTOR	A system or circuit conductor that is intentionally grounded. Examples: "Neutral" in AC circuits, "−48V Battery Return" in DC circuits.
GROUNDING	Process of providing a low resistance path for electrical signals to earth potential.
GROUNDING CONDUCTOR	A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode(s). Examples: Vertical and horizontal equalizers, Alternating Current Equipment Ground (ACEG), also called the "green wire", grounding wires used to interconnect frames of telecommunications equipment, and the grounding wires used to interconnect the shields of telephone cables.
GROUND BARS	A metal bar on which ground cables of equipment are terminated
GROUND BUS	Metal conductor, of various forms, onto which equipment grounds are terminated
GROUND WINDOW	A 6 foot sphere with the Main Ground Bus at its center. Typically a single point ground window used to isolate the sensitive electronics associated with the electronic switching system.
HEAT SHRINK	A plastic tube insulator that goes around conductors, then is heated with a heat gun. This heating causes the tubing to shrink around the conductors
HORIZONTAL EQUALIZERS	A large conductor connecting battery returns from separate DC power distribution cabinets.
HOUSE SERVICE PANEL	AC power supply for lighting, outlets etc.
INSTALLATION SUPPLIER	A vendor who is qualified to do installations in BellSouth central offices
INSULATORS	A non−conductive material used to isolate two conductors (ex. outer covering on wiring, fiber washers mounted on equipment anchors)
INTEGRATED GROUND PLANE	A grouping of equipment that is grounded at multiple points

IRONWORK	Metal structure above equipment; including earthquake structure, cable racks, etc.
ISOLATED BUSHING	Insulating washers that are installed between equipment frames and equipment frame floor mounting anchors
ISOLATED GROUND PLANE	A grouping of equipment that is grounded at one point
JOB DOCUMENTATION	The specification that defines a specific job and all the drawings that are defined in the specification. Also, included is any documentation that is given to the installation vendor by the Capacity Manager
JOB NUMBER	Control number (Con Number)
JUMPER	A manually placed wire, cable, or fiber connection between two terminations, usually on some form of distributing frame. The connection may be single or multi–conductor. A jumper is also called a cross–connection.
KILOVOLT–AMPERE	A measure of power related to central office power equipment
LADDER TROLLEY	That portion of the rolling ladder assembly between the ladder and the rolling ladder track. The trolley assembly rides within the ladder track.
LIGHTGUIDE CABLE	An optical fiber, multiple fiber, or fiber bundle which includes a cable jacket and strength members, fabricated to meet optical, mechanical, and environmental specifications.
LIVE CABLE	Cable that has power or electronic signals going through it.
MAIN DISTRIBUTING FRAME (MDF)	A framework used to cross–connect outside plant cable pairs to central office switching equipment, but also carrier facility equipment such as office Repeater Bays and SLC(R) Carrier Central Office Terminals. The MDF is usually used to provide protection and test access to the outside plant cable pairs.
MAIN GROUND (MGB)	Same as "Ground Window"
MASONITE HARDBOARD	A sheet of material that is non–conductive, and flame retardant. Used to protect equipment and floors during installation and removal work.
MASTER AGREEMENT	A written contract of terms and conditions between the installation vendor and BellSouth.

MATERIAL ID	This consists of the HECI/CLEI code or the Standard Bellcore nomenclature.
MATERIAL DESCRIPTION	This is a noun description of the material being ordered or provided.
MCM	A measure of the diameter of a conductor. This term is generally used to define power cables.
MECHANICAL/CONNECTORS	A connector that is terminated by mechanical means. Normally this is a thread pressure type connector.
METALLIC SHIELDS	A metallic circular conductor around a central conductor or conductors.
METHOD OF PROCEDURE (MOP)	A document that specifies the specific sequence of events that will occur on a specific job. Also included are any specific caveats.
MONITOR JACK	A jack that allows access to a DSX output signal without disturbing that signal. The Mon jack is typically used for testing and 'hitless' patching of signals. Plugging into the Mon jack also activates the tracing lamp circuit.
MOP	Method of Procedure
MULTIPLEXER	A device that combines several digital signals (for example, 28 DS1 signals) into a higher bit–rate signal (for example, 1 DS3 signal), and vice–versa.
NATIONAL ELECTRIC CODE	A code that spells out the requirements for electrical equipment and is applied to central office installations.
NEC	National Electrical Code
NETWORK	A system of elements connected by links, that is, telecommunication network.
NETWORK ELEMENTS	Key electronic or optical equipment placed in the network such as switching or transmission equipment.
NEUTRALIZING	A process that mixes bases with acids to result in a neutral solution.
NO–0X	A specific type of non oxidizing compound that is used in electrical installations to prevent metal oxidation.
NON–CONDUCTIVE MATERIAL	An insulator such as fiber sheeting, rubber etc.
NON–CREEP BOLT	A special bolt used at specific locations of the ladder track to keep it from creeping.
NON–OXIDIZING COMPOUND	A compound such as NO–OX that is used to prevent oxidation.

NYLON TIES	An apparatus that is used to bind wires, cables etc. together.
OFFICE DRAWINGS/RECORDS	Documentation that supports a job specification related to a specific central office.
OFFICE PRINCIPLE GROUND POINT (OPGP)	The principle ground point/bus that is directly connected to the office ground array or water pipe.
OHM	A unit of electrical resistance
OPGP	Office Principle Ground Point
OSHA	Occupational Safety and Health ACT. A Federal and State program that addresses health and safety in the work place.
PDC	Power Distribution Cabinet
PHASE LEADS	Electrical conductors that have a specific AC phase
POLARITY	Positive or negative in a DC circuit
POWER PLANT	A system of batteries, rectifiers, and control units for suppling power to active network elements.
PROTECTIVE RING	A physical ring on a cable cutting tool that protects other cables from being cut
PROTECTOR	A module that plugs into a protector block, on a distribution frame, that shorts to ground any high voltages that may harm personnel or equipment in a central office.
PROTECTOR FRAME	A type of distributing frame dedicated totally to protector blocks.
RACEWAYS	Metallic channels that hold wires, cables and bus bars
REMOTE SITE	A usually unattended equipment location, away from the CO or central maintenance center.
REMOTE TERMINAL	Equipment that provides multiplex/demuhiplex and analog/digital conversion for loop carrier systems,located at the subscriber end of the loop T−carrier circuit.
RISER (VERTICAL RISER)	A large conductor that starts from the Main Ground Point and rises to the top of a building. This conductor is used as the ground reference on each floor.
SCAFFOLDS	Portable platform
SCHEMATIC DRAWING	A drawing that depicts an electrical circuit.

SEWED CABLE	Cable that is secured to a cable rack or support, by sewing with twine.
SHEET FIBER	An insulating material that comes in sheet form.
SHIELDED CABLE	A cable whose outer conductor is made of circular mesh or foil. This outer conductor acts as an absorber of electromagnetic radiation that may influence the center conductor.
SHINER	A wire−wrap that has a distended unprotected metallic conductor between the last wire−wrap and the wire insulation.
SKINNING	The removing of the outer sheath from a cable.
SPARE LEADS	Wires that are not terminated in a cable.
STANCHIONS	Floor support pipes for overhead framing, when no equipment frames are installed.
ST® CONNECTOR	The ST® is a high performance optical connector used throughout the Wire Center.
STRAPPING	Method of tying terminals together electrically.
STRIPPING	Removing the outer insulation from wire conductors or removing the outer sheath on a cable.
SWITCHBOARD CABLE	Mult−conductor cable used to interconnect switching equipment.
SYNCHRONOUS OPTICAL NETWORK (SONET)	A set of standards for transmission systems operating over optic fiber. The SONET standard is based on the DS3 signal with added bits for overhead information, etc. The basic building block is the Synchronous Transport Level−1 (STS−1) or the Optical Carrier Level−1 (OC−1) at 51.84 Mb/s. The standard provides for higher bit−rate transmission of STS−N and OC−N, where N=1, 3, 9, 12, 18, 24, 36, 48.
TELEPHONE EQUIPMENT ORDER (TEO)	An order generated by the Capacity Manager that defines in general terms what equipment is to be added or removed. This order, in most cases, goes to the Detailed Engineering Center.
TERMINAL BLOCK	A physical unit containing wire−wrap pins, solder points or punch down terminals, that is use to terminate wires.
TERMINAL STRIPS	Same as “Terminal Blocks”

TIE CIRCUIT	Typical cable and jumpers used to connect circuits with terminations on separate frames or line ups. (See also cross−aisle tie circuit.)
TINNED WIRE	Copper wire whose outer layer is plated.
TRACING LAMP	A lamp or Light−Emitting Diode (LED) provided as part of a standard DSX patch and cross−connect circuit that aids in locating the two ends of a cross−connect. Inserting a plug into the Mon jack at one end of a cross−connect causes the tracing lamps at both ends of the cross−connect to illuminate.
UNISTRUT	A form of iron work that supports equipment cable racks from above. Normally is embedded in the ceiling.
UNTINNED WIRE	Bare copper wire
VERTICAL EQUALIZERS	See Riser
VERTICAL EQUALIZER	A part of the Central Office ground system that equalizes the potential from one floor to the next.
VERTICAL TROUGH	A jumper pathway that is provided between adjacent bays or modules in a frame, allowing jumpers to run vertically on the frame from one panel location to another or between a panel and the upper or lower express trough.
VOM	Volt−Ohm−Meter, an electrical measuring tool.
WATERFALL CABLING	A method of routing cables between overhead cable racks and the DSX panels that employs the full width of the rear of the DSX frame, as opposed to just the area between the flanges of adjacent bays.
WIRE CENTER	A telephone building where all local subscriber facilities converge for service by switching systems. Also Central Office or Exchange Center.
WIRING COLOR CODES	Colors used to identify specific wiring sequence. Note that there are several color codes used in the communications industry.
WRIST STRAPS	An electrically conductive band that is wrapped around an individuals wrist. The other end of the strap is terminated through a fixed resistance to an equipment frame through a jack. This is used to protect equipment from electrostatic discharge.
Y−SPLICE	A direct tap of a pair of wires onto another pair of wires carrying a signal. Y−splices are used to bridge a circuit to another location.

ENGINEERING AND INSTALLATION STANDARDS
CENTRAL OFFICE EQUIPMENT

CONTENTS

ENGINEERING AND INSTALLATION STANDARDS CENTRAL OFFICE EQUIPMENT

1. General Information

1.1 This publication provides BellSouth's general administrative, engineering, installation and removal standards. They are necessary to ensure equipment is installed safely and efficiently and that newly installed equipment operates in accordance with the design parameters in a Central Office Environment.

1.2 This publication, as a technical reference, is not intended to provide the "how to" information related to engineering/installation services. It is the sole responsibility of the services supplier to provide qualified installers and engineers and documentation to complete the assigned undertaking.

1.3 It must be understood, by all installation suppliers, that BellSouth reserves the right to stop installation activity when it is apparent that generally accepted practices, adequate safety (both personal and fire safety) and/or standards are not adhered to. Installation activity may not resume until deficiencies are corrected.

1.4 Individual Contracts or General Purchase Agreements specify the warranty applicable to installation services.

1.5 These standards are subject to revision or change without notice. BellSouth reserves the right to review a supplier's documentation, such as handbooks, practices, and/or manuals for conformance to generally accepted practices and this publication.

1.6 BellSouth Standard Drawings and the figures illustrating installation standards are in general not duplicated from the equipment manufacturer's drawings. Omission of these standards from the manufacturer's drawings shall not be regarded as modifying or conflicting with BellSouth Standard Drawings.

2. Proprietary Information

2.1 When the need for proprietary information is considered essential to the installation and testing of a product, the supplier should be prepared to provide the information following a formal request by BellSouth.

2.2 Technical information which is proprietary or confidential in conjunction with the installation, removal, operation, maintenance, or repair of any equipment manufactured by a third party will contain a Nondisclosure agreement with the installer.

(Reserved for Future Use)

(Reserved for Future Use)

FIRESTOPPING REQUIREMENTS FOR FLOOR AND WALL OPENINGS−ENGINEERING PROCEDURES

CONTENTS

FIRESTOPPING REQUIREMENTS FOR FLOOR AND WALL OPENINGS−ENGINEERING PROCEDURES

1. GENERAL

1.1 This section defines the requirements for the firestopping floor and wall penetrations. Firestopping with mineral wool/ceramic products shall be discontinued. Only 3M Firestopping products are to be used in BellSouth central offices.

1.2 All cable holes shall be retrofitted when the current undertaking designates access to an opening. Wholesale cable hole retrofitting is not recommended.

1.3 The most current issue of 3M Fire Protection Products Division's **Applications and Specifiers Guide for Fire Protection Systems** (hereafter, referred to as the Guide) shall be followed for all installations. Every system in the Guide is U.L. listed.

1.4 The engineer shall engineer for all cable holes and furnish all required materials for the installer to install cable hole stopping properly as specified in the Guide.

2. LABEL AND DESIGNATIONS

2.1 The designation of "**SM**" shall be added as a suffix to the cable hole designation on the Cabling and Cable Rack Plan for record purposes to indicate that the cable hole has been retrofitted.

2.2 The firestopping label, form RF−5700, can be ordered directly from Ivan Allen:

Ivan Allen
221 Peachtree Center Avenue
Atlanta, GA. 30303
c/o Geri Swanson or Sherrell Snipes
Customer Service: (404) 332−3200 ext. 407 (Sherrell)

3. RETROFITTING AN EXISTING CABLE HOLE

3.1 FLOOR PENETRATIONS

(1) The major exception to the 3M floor hole requirements (see FB3004 typical) is the option of reusing 12 ga. steel cover plates at the discretion of BellSouth operations.

(2) When the steel cover plate is reused, the bolt spacing shall be 8 inches maximum. **When the steel cover plate is not used, the steel bolt spacing shall be 6 inches maximum**. For retrofitting an existing floor hole, additional bolt holes, steel bolts and 1−1/4 inches diameter fender washers for the steel bolts may be required.

3.2 WALL PENETRATIONS

(1) The spacing between the bolts shall be **6 inches maximum**. For retrofitting an existing wall hole, additional bolt holes, steel bolts and 1−1/4 inches diameter fender washers are required. Please see CAJ4003 or WL4004 for more detailed instructions.

(2) **Where the seams of the intumescent sheets reaches the wall, the 2" wide 26 Ga. galvanized steel strip shall be held down by two 1/4" diameter by 1−1/4 inch fender washers.**

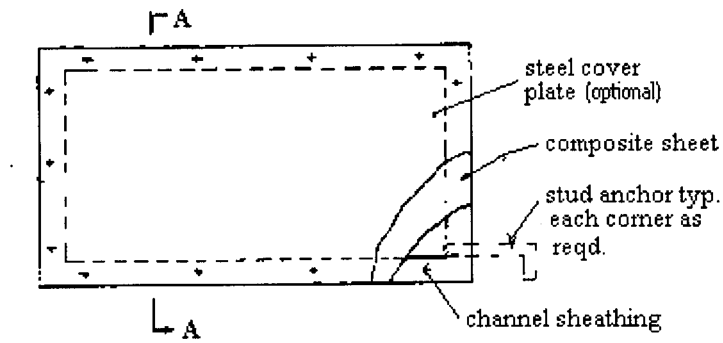
(3) The rest of the steel strip shall be secured by sheet metal screws on each side of the seam at maximum 3" on center. The 1/4" by 1/4" sheet metal screw, as shown on Figure 8, is in error. Standard sheet metal screws of either #6 or #8 by approximately 1/2 inches long shall be used. Note also that a bead of 1/8" thick and 1/2" wide outty shall be placed over the seam before attaching the steel strips.

4. NEW CABLE HOLES

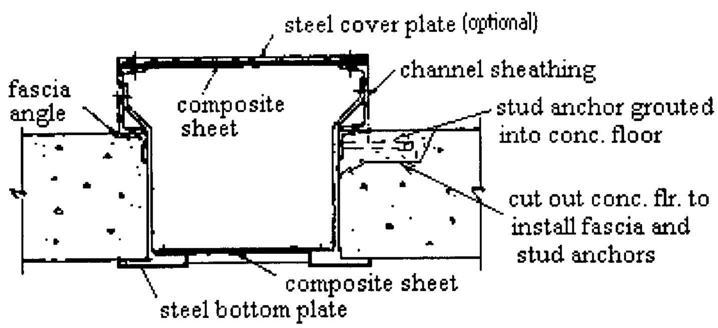
4.1 BellSouth Property & Services Management (P&SM) will construct new cable holes with properly installed and sealed floor and wall cable holes. The new cable holes will have the proper number of bolts and fender washers installed ready for the installation of cable racking and cables.

NOTE: **The services and supplier vendor working with BellSouth capacity manager will provide the P&SM representative the following information: size of the Cable hole(s), location of the cable hole(s), alignment of wall and floor cable holes, and whether steel cover is required by local operations for floor holes(s).**

4.2 FLOOR HOLES − The floor holes will be installed with steel channel sheathing, steel bottom plate (preferred) or stirrups, and an optional steel cover plate as shown below:

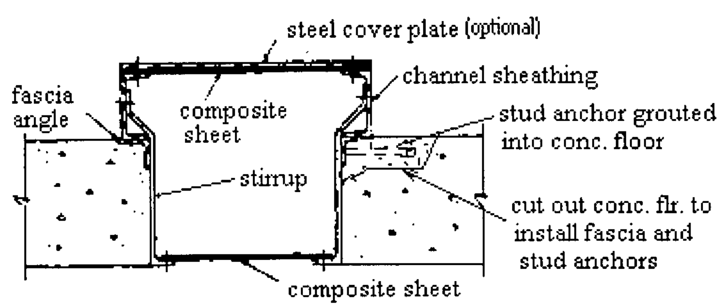


Plan



Section A-A

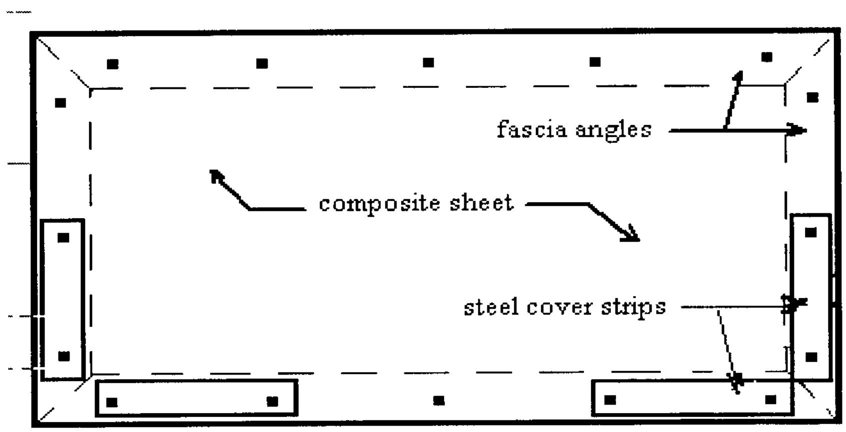
Floor Cable Hole



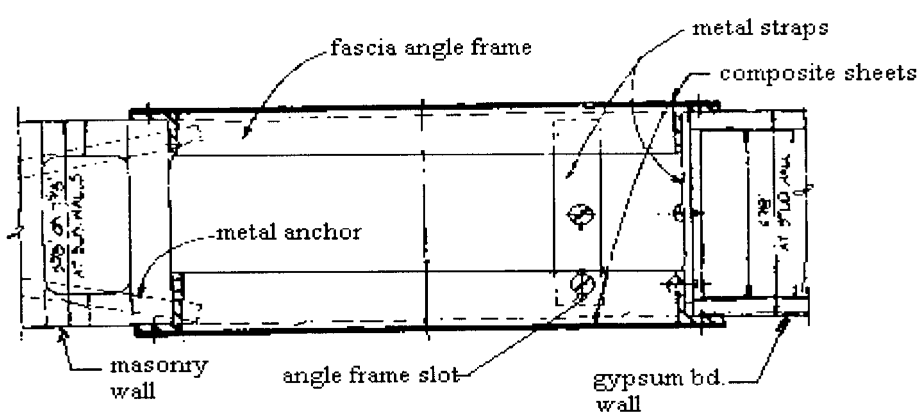
Section A-A

Floor Cable Hole

4.3 **WALL HOLES –** The P&SM will provide wall cable holes with metal fascia angles and composite sheets on both sides of the wall. The bolts will be placed at a maximum 6 inches on centers with 1–1/4" diameter fender washers on top of the composite sheet. Steel cover strips of 2" by maximum 8" will be provided as shown below to provide coverage over the composite sheet joint that will be created when the services supplier vendor places a cable rack and cables through the new wall hole. The steel cover strip will replace the two bolts on both sides of the composite sheet seam. However, the 2" wide 26 Ga. galvanized steel strips are still required to be placed over the seam between the steel cover strip and the cable bundle. A bead of 1/8" thick and 1/2" wide putty shall be placed over the seam before attaching the steel strips and the steel cover strips.



Elevation



Plan

Partition Cable Hole

4.4 Most of the cable holes in BellSouth central offices can be firestopped properly by using the Guide. However, there will be instances where the standard designs can not be used. Please contact the 3M Fire Protection Products Division's representative who will be helping you work with their technical support to come up with a special design.

5. CUSTOMER PREMISES/DLC SITES

5.1 The firestopping requirements for the customer premises and DLC sites that are located in building not owned by BellSouth shall follow the instructions from the owner or owner's representative (usually the architect).

5.2 Please make a copy of the firestopping instructions available to BellSouth representative(s) for project acceptance.

EQUIPMENT/SERVICE PROVISIONING ENGINEERING PROCEDURES

CONTENTS

EQUIPMENT/SERVICE PROVISIONING ENGINEERING PROCEDURES

1. Introduction

1.1 This section provides standards to be used by the engineering suppliers providing BellSouth Telecommunications with material, engineering services, or installation services in a central office environment and other equipment locations.

1.2 Detailed Engineering is required for the Installation, Removal, Relocation or Modification of equipment, cabling, wiring, equipment lighting, racking, and software, in all Central Offices.

1.3 Detailed specifications and the updating/creating of T base drawings will no longer be required for projects outside the Central Office environment(i.e., CEVs, huts, customer premises), unless given written instruction to do so.

1.4 Changes in the project that may affect the order can be communicated to the supplier by means of a written memo or appendix to the original TEO. Such changes may be issued to include supplemental information for plan or record changes, or to request additional material or services. The Capacity Manager should review the project schedules with the supplier prior to placing an appendix which could impact project scheduling and completion.

1.5 When an order is to be canceled, the Capacity Manager will issue an appendix or cancellation memo requesting the supplier to place the order or items on hold pending cancellation, and request the supplier to provide a detail of cancellation charges.

1.6 After the supplier has provided cancellation charges, the Capacity Manager will weigh the alternatives and issue an Appendix stating:

(1) Cancel order in its entirety, or

(2) Cancel specific items, or

(3) Ship material but cancel installation, or

(4) Reinstate order in its entirety, or

(5) Reinstate specific items

1.7 Federal Communication Commission Approval (FCC) is required before work in connection with certain facilities can begin. The face sheet of the Telephone Equipment Order should indicate if a FCC construction permit is required.

2. Categories Of Telephone Equipment Orders (TEO)

2.1 There are different categories of the TEO/Request for Firm price Quote Orders (RFQ). These categories are assigned by the Capacity Manager as follows:

- EF&I − Engineer, Furnish and Install
- E&I − Engineer and Install
- E&F − Engineer and Furnish
- EO − Engineer Only
- FI − Furnish and Install
- FO − Furnish Only
- IO − Install Only

NOTES:

(1) There are situations where BST and/or different suppliers provide the detail engineering, the material and the installation. Each function (E, F, I) performed by a different company will require a separate TEO.

(2) For "IO" orders the installation effort may be provided by an installation supplier or by BST installation forces. In either case a complete detail specification will be provided to the installer.

(3) A "FO: order placed on a product supplier includes only a summary of material sections and associated note that pertain to providing the product. Product Suppliers providing equipment on a furnish only basis not need information pertaining to the installation of the equipment. Plug−ins are considered special FO orders and the BST Capacity Manager will provide specific details.

3. Firm Price Quote

3.1 Some projects or orders may not fall in the Model Base Ordering or other Capacity Management Tool systems and may require a firm price quote. The Services Supplier after receiving the RFQ may schedule a site visit to review the area of request and determine a firm price quote if requested. The Services Supplier will furnish a price quotation on the work to be done. This quote will contain sufficient information on the material provided, installation effort, and/or engineering to allow the Capacity Manager to evaluate. The firm price quote will remain firm for a specified period of time to allow for an evaluation.

4. Contents Of A Telephone Equipment Order (TEO)

4.1 A TEO is generated by the Capacity Manager to the engineering/installation supplier. The specification is for the supplier to provide engineering, installation, modification and/or furnishing of equipment in a central office environment.

4.2 The TEO will provide general information for the Services Supplier. The following information is typically included in a TEO: scheduling, description of equipment, billing and invoicing information, assignments.

4.3 The contents of the TEO will be depend on the size of the project and the complexity. Some projects may require only a TEO face sheet.

4.4 TEOs may be mechanized and submitted electronically to the supplier, where possible.

5. Capacity Management Ordering Tools

5.1 Model Base Ordering

The BST Capacity Manager responsible for circuit orders will generate a TEO using the FlexDB Capacity Management Ordering Tool which has been enhanced to include a Model Base Ordering System. This system contains a database comprised of models identifying the list of hardware and in some instances plug−in components that are required to install an order. Included with these models are the prenegotiated prices for engineering services, installation services, and miscellaneous material cost associated with the installation.

The TEO package, which can be automatically generated by FlexDB, includes a base TEO order for the Turf Services Supplier the equipment being ordered on the job, and a separate TEO for each of the Original Equipment Manufacturers (OEM) specified.

5.2 Switch Capacity Management Ordering

The BST Capacity Manager responsible for switch orders will input a request into a Capacity Management Tool system, DOPS Mode or 5ESS Growth Hardware and Growth Software Order Process. These management tools apply to the various switches that are deployed in BellSouth. Information regarding the order is populated onto a spreadsheet that is electronically delivered to the services supplier. The services supplier will respond electronically, fax or mail with specific details for authorization. Some switch orders may not be applicable to this process and will follow the process of the issuance of a TEO from the Capacity Manager.

5.3 Power Capacity Management Ordering

The BST Power Capacity Manager responsible for power orders will approve the TEO provided by the Power Strategy Initiative (PSI) Supplier who plans and prepares a TEO by applying standard PSI approved equipment configurations when appropriate. The PSI supplier prices the TEO based on a simplified PSI price matrix. The Power Capacity Manager will issue the Authorization.

6. Firm Schedule

6.1 The service supplier shall within 48 hours contact the Capacity Manager if the requested dates specified in the initial TEO cannot be met and negotiate new service dates. The service supplier will then issue a firm schedule (Exhibit 1) in accordance with the new negotiated dates.

6.2 If BST issues an appendix which effects the dates on the original TEO, the Service Supplier shall within 48 hours contact the Capacity Manager if they are not in agreement with the dates to negotiate new service dates. The service supplier shall then issue a Revised Firm Schedule.

7. Detailed Specification Layout

7.1 The engineering supplier will develop a detail specification as shown in Figures 1 − 4 or of a similar format.

- Cover Sheet − (figure 1)
- Installer's Cable Running List − (figure 2)
- Summary Material − (figure 3)
- Drawing Change Request − (figure 4)
- C. O. Record Sketches and Drawings

7.2 The Detail Specification to the installation supplier must provide the minimum requirements and sufficient detailed instructions for installation. For example, general notes/work items, summary of major material, installer's cable running list (Note: Must include all power cable runs to BDFB/PBD fuse locations and positions), drawing information, alarms assignments, DSX assignments, etc., should be provided to the installation supplier.

NOTE: Assignments are only required to be included in the Supplier Detail Specification when changes have been made to the original assignments provided by BST.

7.3 The requirement of listing major equipment on the Summary of Material is related to the Continuing Property Record(CPR) or Detailed Continuing Property Record.

7.4 Only major items of equipment are required to be referenced in the Summary of Material. Hardwired and plug−in type equipment are considered as major equipment.

7.5 CPR numbers must be provided for major items of equipment on all material invoices submitted to BellSouth for payment. CPR numbers are also required to be included on the Summary of Material in the detailed specification for major items of equipment that are supplied by the engineering/installation supplier.

7.6 Copies of the detailed specification shall be provided to the Capacity Manager and the Installation Supplier.

8. Central Office Drawings/Records Update

General

8.1 The detail engineer, is responsible for updating all the office record drawings that are affected by the engineering, installation and furnishing of equipment for a Central Office.

8.2 The detail engineer must provide a listing of all drawings required to engineer the project. Such listings include Engineering Records and Maintenance Administration System (ERMA) reservations and assignments (Drawing Request Form).

8.3 The detail engineer must update/create the central office record drawings in accordance with TR 73519, TR 73564 and TR 73544.

8.4 If BellSouth is maintaining an assignment record (i.e., Alarms, DSX, LGX, Timing, Fuses, etc.), in a mechanized system, then the appropriate supplier should purge the drawing from the central office records on the next job since these records are maintained in another median. If the Assignment record is not stored in the approved database at a given location, then the detailed engineering supplier should add the assignment records to the database and purge the assignment record drawings or remove the assignment record from a drawing that will retain the block wiring diagram.

8.5 Drawing updates must be made prior to the installation start date, the detail engineer must reserve issue(s) of drawings(s) that will be associated with the project in the Engineering Records and Maintenance Administration System (ERMA).

EXCEPTION: Projects that are due to complete in six weeks or less after the receipt of a Telephone Equipment Order (TEO) must have ERMA assignments reserved prior to job start. However, it is not required that ERMA issues be reserved at the start of the job. The supplier will have 30 days from the actual completion date to reserve issues and send drawings in to the Central Office Drawing Maintenance Vendor (CODMV).

8.6 A copy of the associated drawings should be requested from the Drawing Control Group (DCG). The detail engineer will mark the requested drawing(s) according to the TEO Specifications, and mail one copy of marked drawing(s) to the CODMV. The supplier is to make every effort to eliminate sending 17” X 22” drawings to the field by including all installation information in the supplier’s specification, and all required notes as outlined in TR 73519. Sketches are to be placed in a section of the supplier’s specification if written information is insufficient. Record update’s should be completed one week prior to job completion, thus eliminating constant record changes. The updates are to be coordinated between the Turf E&I supplier, the drawing Maintenance Vendor, and the BellSouth Drawing Control Center. The sketches or drawings that must be sent to the installer are to be of the 8 1/2” X 11” size and included as a section in the supplier’s specification.

8.7 Conflict between central office base drawings or existing office conditions that affect office records, such as duplication of assignment, locations or designations, shall not be corrected and/or reassigned without the concurrence of the Capacity Manager and the detail engineer who will provide the specific installation instructions. The detail engineer will ensure that all associated drawing(s) are corrected. Depending on the change, additional drawings may be required, i.e., Cabling Plan, Frame and Aisle Lighting Plan, grounding Schematic, Front Equipment, Wiring List, etc.

8.8 In the event of any change in plan and/or changes made by the installer (Installer’s Marked Print), the detail engineer shall reserve an issue(s) and update all drawings affected by the change.

8.9 The detail engineer must send the new marked drawing(s) of changes as indicated in TR 73564 to the CODMV.

In order to establish a consistent process of handling DSX Assignments throughout the region, improve and preserve the integrity of BellSouth’s DSX assignment database, improve vendor effeciency, and reduce engineering review costs from the Central Office Drafting Maintenance Vendor (CODMV) DSX assignment drawings should be handled as stated in paragraph 8.9 below which has been added to TR73503, Section 5.

8.10 Switching suppliers are to maintain the Switch Specific Drawings. Switch Specific Drawings are all that are associated with the switch, except for the cabling and floor plan within the switch area. All other C. O. Record Drawings will be referred to as Common Drawings. Common Drawings are those drawings that are common to different offices (i.e., Cabling Plan, Frame and Aisle Lighting Plan, Grounding Schematic, Front Equipment, Wiring List, etc.). The switch detail engineer will be responsible for updating all common drawings effected by switching equipment installation. All switch suppliers will house the switch specific drawings in a 8 1/2" X 11" binder. One copy of the switch specific drawing will be sent to BST Switch Capacity Manager, and two copies of the binder will be sent to the installer. One copy of the switch specific drawing will be updated and left on the job site. The switch specific drawing sheets will be updated in accordance with Section 17 of TR 73503.

9. Real Time Reservations

9.1 The detail engineer must establish real time reservations when performing engineering activity for BellSouth prior to installation start (no exceptions). Real time reservations are assignments such as Fuse Boards, Battery Distribution Fuse Boards, Power Boards, distributing frame, or BTAS. These types of reservations must be made to ensure that there will be no conflict with other active orders.

9.2 The Capacity Manager responsible for the specific installation instructions (TEO) must be notified in writing of any changes generated by the installer which affect BST maintained C.O. Record systems such as DSX−OD and FOX−OD assignments, DCD 400 Timing assignments, and BTAS. The supplier's installer is to treat these assignment sheets as C. O. Record drawings and update in accordance with Section 17, TR 73503. The installer will forward a marked copy back to the detail engineer. The detail engineer after reviewing will then send the marked copies to the originating Capacity Manager for database updating. The Capacity Manager will update the system immediately upon receipt of these changes.

10. Product Drawings

10.1 The detail engineer must provide a listing of all product and interconnect drawing(s) associated with the project.

10.2 Product drawings are to be obtained by the detail engineer directly from the product manufacturer. TR 73521 provides a description of the format for these drawings.

10.3 For cases where an interconnect drawing does not exist, a Job Cabling Figure must be created. Job Cabling Figures must be created in accordance with TR 73529.

11. Shipping and Invoicing Information

11.1 BellSouth requires all Engineering/Installation suppliers of products/materials to submit Packing Slip/Receipt and Invoice information to names that appear on the TEO for Installations Papers and Billing information as shown in Figures 5 and 6.

FIRM SCHEDULE REVISED:

REPORT DATE: ___________ TYPE ORDER E( ) F( ) I( ) ISSUE NO. ______

BELLSOUTH TELECOMMUNICATIONS
BST ADDRESS: SHIP TO ADDRESS:

_______________________________________ ____
_______________________________________ ____
_______________________________________ ____
_______________________________________ ____

TELEPHONE NUMBER: ___________________

ORDER DATE INFORMATION

DATE ORDER RECEIVED _______________

BELLSOUTH REQUESTED DATES: ENGI/INSTALL SUPPLIER SCHEDULE DATES:

BELLSOUTH REQUESTED DATES	ENGI/INSTALL SUPPLIER SCHEDULE DATES
SHIP ________________________________	SHIP_____________________________________
ON JOB ______________________________	ON JOB___________________________________
COMPLETE ____________________________	COMPLETE_________________________________
ADV COMPLETE ________________________	ADV COMPLETE_____________________________

CONTACT NAMES

BELLSOUTH REPRESENTATIVE:	ENGI/INSTALL SUPPLIER:
NAME ________________________________	NAME _____________________________________
PHONE NUMBER ________________________	PHONE NUMBER _____________________________

REASON FOR CHANGE IN SCHEDULE

____
____
____
____
____
____

WHEN TO USE THIS PAGE

Firm schedules are required for all orders placed with an Engineering/ Installation Supplier if the date change from those originally requested on the TEO. Upon receipt of the TEO suppliers will verify that the information contained on the face sheet is complete per contract agreements, firm schedule, acknowledgment, tentative ship date(s), etc., for major units of equipment will be forwarded to the Capacity Manager.

The Engineering/Installation Supplier will issue a firm schedule in a time frame specified by the contract. From the time the TEO is received until the issuance of the firm schedule, the Engineering/Installation Supplier is responsible for securing from their engineering, manufacturing, and installation organizations, commitments that are compatible with the required BST schedule as agreed to in contractual negotiations. If the requested completion date cannot be met, the Engineering/Installation Supplier should discuss alternatives with the Capacity Manager prior to issuing the firm schedule. If BST changes dates on the original TEO, the Engineering/Installation Supplier must issue a revised firm schedule if they are not in agreement with the dates.

The supplier of software will provide shipping schedules for software. The software schedule will be issued at the same time the hardware firm schedule is issued if both are provided by the same supplier. Some dates that are dependent on parameter configurations will not appear on the first issue of the firm schedule for growth jobs. However, all software schedule daters will be furnished on subsequent firm schedules to be issued at a specified time after receipt of order.

Exhibit 1 − Firm Schedule

COVER SHEET

BST ORDER NO. __________________ APPX NO. ___________ PAGE ___ OF ___

SUPPLIER ORDER NO. ___________________ DATE OF ISSUANCE _____________________

ORDER LOCATION: ______________________ PROJECT START DATE ___________________
ORDER ADDRESS: _______________________ PROJECT COMP. DATE ___________________
____
____

BST REPR:
NAME: _______________________
ADDRESS: ____________________
____
____
TEL. NO.: __________________

SUPPLIER ENGINEER:
NAME: ___________________________
ADDRESS: _______________________
____
____
TEL. NO.: ____________________

SHIP MATERIAL TO INFORMATION:
NAME: _______________________
ADDRESS: ____________________
____
____
TEL. NO.: __________________

SEND PAPERS TO INFORMATION:
NAME: _______________________
ADDRESS: ____________________
____
____
TEL. NO.: ___________________

DESCRIPTION OF JOB:
____
____
____
____
____

WHEN TO USE THIS PAGE

This sheet is to be furnished with all detail engineered jobs.

Figure 1 − Cover Sheet

INSTALLER’S CABLE RUNNING LIST											
ORDER NO. (1)		SPEC (2)	APPX (3)		REFER ENG QUES TO (4)						PAGE (5)
RUN NO	CKT. REF.	AMOUNT IN FT.	NO CA	CODE	CKT. NBG or CA NO	RR or FRAME	CA DES,	EQPT LOC.	RR or FRAME	EQPT LOC.	ROUTE
(6)	(7)	(8)	(9)	(10	(11)	(12)	(13)	(14)	(15)	(16)	(17)
				T7C018–49 FIG. 28 MTM1H2OBRA (X3 FORMED PER ED–1C865–21 G56 QTY 1)							
		100	1	287A	T, R SIDE A 1 TO 96	HMDF	TT3		RR101.01	FC	1X17,1AK
1				T7C510–31 FIG. 1 SNMAGB34RA (4–24883–0590) (X3 FORMED PER ED8C724–20 G–301 QTY 6)							
1.1		115	1	613C	SHLF 1, MULD A, IN	RR110.08		FB	RR125.13	FB	1K,12,1P
1.2		115	1	613C	SHLF 1, MULD A, OUT	RR110.08		FB	RR125.13	FB	1K,12,1P

HOW TO COMPLETE THIS PAGE

FIELD	ENTRY
1	BellSouth Order Number
2	Spec Number: The detailed engineering specification section number.
3	Appendix Number.
4	Refer Engineering Question To: Detail Engineer’s Name.
5	Page Number:
6	Run Number: Reference number assigned to each cable run.
7	Circuit Reference: Alpha designated notes that provide additional information about the cable run.
8	Amount In Feet: Show the length of the cable.
9	Number of Cables: Identical cable runs may be shown together.
10	Code: Show the cable code, piece part number, CK number, etc.
11	Circuit Numbering and/or Cable Number: Show the circuit numbering and or the cable numbers as shown on the Front Equipment drawing, relay rack and or wiring list drawing.
12	From: Relay Rack or Frame where the cable ordinates.
13	Cable Designation: Cable designation as shown on standard drawings.
14	Equipment Location: The vertical and shelf for distributing frames, mounting plates for relay racks, and fuse row and number for fuse panels.
15	To: Relay Rack or Frame where the cable terminates
16	Equipment Location: See 14
17	Route: The cross sections through which the cable will be routed. This use of this field is optional. If the field is not used, cables must still be separated by type and route, such as, power cable on a separate rack, fiber optic cable in a fiber optic rack and other special conditions required by office characteristics.

NOTE A: The heading for a Cable Running List entry should show drawing, main unit wiring figures, and other figures and options related to cabling.

wHEN TO USE THIS PAGE

This page is required for fiber optic, alarm, switching power distribution cable,power cable from the power plant to the PDC, PF, GPDF,BDFB, etc.,transport power distribution cable, switchboard cable and other miscellaneous cable and wire listed on this page. No Exceptions!

Figure 2 − Installer’s Cable Running List

SUMMARY OF MATERIAL				
ORDER NO. (1)			APPX NO. (2)	PAGE(3)OF
ITEM			DESCRIPTION	
NO.	NOTE	QTY	MATERIAL IDENTIFIER	MATERIAL DESCRIPTION
(4)	(5)	(6)	(7)	(8)
0001			(Eqpt. Number)	Basic List No.
			Description	
			Location (RR#, Col#, etc.)	
			CLEI/HECI	
			E/W (Connector)	
			Additional List/Grp	
			Piece Part No.	
			Connectors (E/W & P/O, & C/O)	
				Apparatus Code & Description
				Ck Spec. List & Description
				Material Code & Description
				BST Dwg, List/Grp & Descript
				Additional List/Grp & Descript
				Units of Measure (Ft, Gal, Etc.)

HOW TO COMPLETE THIS PAGE

FIELD	ENTRY
1	BellSouth Order Number
2	Appendix Number
3	BellSouth Order Number with the next number in sequence.
4	Item: Number the items in ascending order beginning with 1.
5	Note: Enter the alphanumeric designation. (ST – Stamp the 10 digit CLEI/HECI or Maximum for the Eqpt.) T – BST Furnished Material to be provided on TEO BHBA12345
6	Quantity: Enter the required number of units on each line containing an ordering entity. Use whole numbers only. All Quantities are assumed to be pieces unless a different denomination is identified in the MATERIAL DESCRIPTION field.
7	Material Identifier: This field is used to list material provided on this job by equipment number, etc. Equipment located on the same bay, frame, cabinet, etc., should be grouped together and the location should be identified. The 10 Digit – Common Language Equipment Identification Codes (CLEI/HECI) Codes must always be furnished for those items that have them. If product identification number(s) belongs to a supplier other than the one the order is being placed on, specify the Manufacturer also.
8	Material Description – List the Name or title (Bracket, 400A shelf), Manufacturer’s List or Group number, BST drawings and specifications used to order material, Units of Measure (Feet, Gallons, etc.,).

HOW TO USE THIS PAGE

1. Provide a listing of all major equipment.
2. Specific location (Relay Rack) information.
3. Provide the 10 digit CLEI/HECI code.

BST FURNISHED MATERIAL

The outline TEO from the BST engineer will provide a list of all material to be provided by BST. The Outline TEO will provide the following information:

(a) List of Material: The material furnished shall be listed by item, quantity, CLEI/HECI, and equipment description in the Summary of Material.

(b) Lettered Notes: Lettered notes in the Summary of Material Notes shall be used to designate the source or disposition of material.

Figure 3 − Summary of Material
Page 1 of 2

SUMMARY OF MATERIAL				
ORDER NO.			APPX NO.	PAGE OF
ITEM	NOTE	QTY	DESCRIPTION	
NO.			MATERIAL IDENTIFIER	MATERIAL DESCRIPTION
			EXAMPLE OF HOW TO FORMAT CODED, CATALOG NO. EQPT	
1	T	2		E87442
			560 MB LTM SHELF W/FAN (NECA)	
	ST		F5MTD044RA	
			RR 105.13	
			EXAMPLE OF HOW TO FORMAT BAY/PNL WITH MULTIPLE LIST	
2		1	J99386F–1	L–7
			MFT BAY	
	ST		MTBOP10RA	
			RR 101.01	CKT 1 TO 84
			E/W	
		1	L–2	
	ST		MTM2G45ARA	
		1	L–C	
		1	L–F	
		1	L–K	
			EXAMPLE OF HOW TO FORMAT CODED APPARATUS	
4		10		70A FUSE
			1 1/3 AMP	
			5 FBD	
			5 SPARE	
			EXAMPLE OF HOW TO FORMAT KS/CK EQUIPMENT	
5		5		KS14174 L–1
			DESIGNATION OF PINE WHITE	
			5 FBD	

Figure 3 − Summary of Material
Page 2 of 2

BELLSOUTH
DRAWING CHANGE REQUEST

Engineering Vendor
Address
Date

CODM Vendor
Address

On behalf of BellSouth, we have been authorized to create or revise the following central office drawings. They have been assigned issue numbers in ERMA as indicated below:

DRAWING NUMBER	ERMA–COR ISSUE	ASSIGN DATE	DRAWING NUMBER	ERMA–COR ISSUE	ASSIGN DATE

These drawings are associated with:
BellSouth Order No.: ____________________ Vendor Order No.: ______________________________
City: _________________________ Office: ____________________________ State: ____________
Bill all drafting charges to BellSouth Order No: (If different from Main TEO shown above)

Provide paper copies/35 mm microfilm diazo aperture cards for verification to:
(BellSouth or Vendor Engineer)
(Address)
Originated by: (BellSouth or Vendor Engineer)
Approved by: (BellSouth Engineer's Name)
(BellSouth Engineer's Address)

Mail Installer's Copies to:
(Address Shown on TEO Face Sheet to Send the Final Drawing to the Central Office)
Telephone No.: _________________________
Telephone No.: _________________________
Comments: _____________________________
____
____

For CODMV: DCR Received ____________________________ Due Repro _________________________

Figure 4 − Drawing Change Request

CABLING AND WIRING − ENGINEERING PROCEDURES

CONTENTS

CABLING AND WIRING − ENGINEERING PROCEDURES

1. Introduction

1.1 This section specifies the requirements for selecting wire and cable. The engineering supplier must meet or exceed these requirements.

1.2 In general, specifications, drawings, or other supplementary documents specify the types and gauges of wire to be used for a particular product. In some cases, particularly in switching systems, these requirements have been formalized into drawings which govern the use of wire within these systems. Normally the color code of the wire to be used is also given. The requirements given in these documents should be followed unless specified otherwise in the Telephone Equipment Order. The standards that follow are to be used when the equipment manufacturer does not specify the type of wire and cable to use.

General Considerations

1.3 Internal type−cables engineered and/or installed in environmentally controlled BellSouth locations shall consist of bare solid copper (untinned) wire. This requirement will typically apply to switchboard and shielded−type cabling. Where this technical reference specifies specific cable types, those requirements will supersede.

1.4 The majority of wire used in Telephone Company applications utilizes solid conductors. Wire with stranded conductors is available and may be specified when its use is advantageous, such as where flexing or vibration may occur.

1.5 Unless otherwise specified, American Wire Gauge (AWG) sizes will be used.

1.6 Insulation must meet the fire and abrasion resistance requirements of Section of this document. When voltages on both sides of ground are employed, wire should be insulated for the maximum potential difference between them.

1.7 The maximum rated operating temperature must be higher than the sum of service ambient temperature and temperature rise caused by operating conditions.

1.8 The maximum current−carrying capacities recommended by the manufacturer should not be exceeded. When using wire and cable, the allowable ampere capacity for the wire and cable shall be based on the approved National Electric Code ratings.

1.9 A light gray polyvinyl chloride (PVC) jacket is recommended, unless otherwise specified.

1.10 Selection of a suitable type of wire requires consideration of such electrical factors as voltage drop, transmission properties, frequency, capacitance, inductance, voltage breakdown, and corona. Mechanical factors include abrasion−resistance, possible damage from soldering heat, conductor breakage under severe handling or operating conditions, tensile strength, and ease of making termination. Cost should also be considered in the selection of wire and cable. Certain types of wire are Underwriter's Laboratories (UL) listed or approved. If so, specific usage should be in accordance with UL documents.

Uses Of Cable And Wire

1.11 In selecting large cables to be spread over several equipment units, consideration should be given to the amount of stripped cable that can be handled conveniently.

1.12 Another consideration in selection of large cables is the necessity of isolating certain leads. There are five types of wiring that require segregation. They are designated C, C1, C2, C4, and C5 (C3 is not used). The following standards are to be used when the equipment manufacturer does not specify segregation requirements.

C WIRING is wiring carrying noise–inducing currents of low intensity which requires limited segregation. Conventions to be followed are:

No segregation is required on wiring run when used as:

- Local cable
- Formed ends of switchboard cable
- Loose wire forms
- Loose wire in fanning rings or other wire–retaining devices
- Wire on cable racks
- Surface wiring within a unit

Wiring must be segregated from C2 wiring and all wiring not marked on the circuit schematic when run as:

- Switchboard cable
- Sewed local power cable

Wiring may be combined in the same switchboard cable or sewed local power cable with other leads designated C or C5, provided the conductors used for circuits of different voltages or with potential on both sides of ground are insulated for the maximum potential difference in the cable.

C1 WIRING is wiring taped and run in a separate cable form for electrical reasons. C1 wiring is placed inside of the regular form, when running it on the outside of the form would interfere with the hinge action or other required movement of the regular form. The same rules for the segregation and grouping of C2, C4, and C5 wiring apply to C1 wiring.

C2 WIRING is wiring carrying noise–inducing currents of high intensity which requires complete segregation throughout the entire length. Conventions to be followed are:

(1) No segregation is required on wiring run when used as:

- Wire on cable racks
- Loose wire forms
- Loose wiring in fanning rings or other wire–retaining devices
- Surface wiring within a unit

(2) Wiring must be segregated from all leads marked C, other leads (except C2 leads in other identical circuits), C4, and C5 leads as well as from all other leads not marked on the circuit schematic when run as:

- Local cable
- Switchboard cable
- Formed ends of switchboard cable
- Sewed local power cable

(3) The only C2 leads that may be grouped together are identical C2 leads from other identical circuits.

C4 WIRING is wiring carrying commercial power within a unit which must be kept separate from all other wiring. Conventions to be followed are:

No segregation is required within the unit on surface−wired equipment.

All C4 leads may be grouped together.

C5 WIRING is wiring carrying noise−inducing currents of medium intensity which requires segregation throughout the entire length, but is not critical enough to require complete isolation from other noise−inducing wiring. Conventions to be followed are:

No segregation is required on wiring run when used as:

- Wire on cable rack
- Loose wire format
- Loose wiring in fanning rings or other wire−retaining devices
- Surface wiring within a unit

Wiring shall be segregated from all leads marked C2 and C4 as well as from all other leads not marked on the circuit drawing when run as:

- Local cable
- Switchboard cable
- Formed ends of switchboard cable
- Sewed local power cable

All C5 leads may be grouped together in the same cable with other C5 leads.

Distributing Frames

1.13 HORIZONTAL SIDE: The leads from one cable may be spread over a maximum of 45 inches. A cable entering the horizontal side from the vertical side, either from above or below, should be butted approximately at the center of the group of terminal strips served or per applicable systems method of cabling drawings.

1.14 VERTICAL SIDE: A cable may be formed over an entire vertical or any portion of it, as required.

Fuse Bays

1.15 A cable may be formed over any number of fuse panels in one bay, regardless of whether or not the panels are adjacent.

Relay Racks

1.16 The leads from one cable may be formed over one or more groups of mounting plates or relay rack units, but should not be spread over more than one relay rack bay except for the following:

(a) Cables employing Irradiated Polyvinyl Chloride (IPVC) covering of 22 and 24 gauge solid conductor may be formed over five adjacent bays or the equivalent. In such cases, the cable should be butted on the cable rack near the center of the group and the leads run as loose wires.

(b) For bay−wired equipments having terminal strips and associated fanning rings or suitable carrying devices at the top to the bay, cables employed other than IPVC 22 and 24 gauge solid conductor (except cables containing shielded pairs) may be formed over more than one bay. For such equipments, one cable may be formed over five adjacent bays or the equivalent. It is preferable to butt the cable at the center of the group.

Wire Not In Switchboard Cable

1.17 Manufacturer's documents should be consulted for the type of wire to be used in a particular system. Otherwise, the following guide can be used in selecting the appropriate type of wire.

(a) Local cable or loose wiring−solder type terminations: Use IPVC 22 or 24 gauge, solid conductor.

(b) Local cable or loose wiring−nonsoldered terminations: Use PVC 22, 24, or 26 gauge, solid conductor.

(c) Local power cable: Use Polyvinyl Chloride, cotton braid, lacquered, (PVC CBL) 20, 22, or 24 gauge, solid conductor.

(d) Surface wiring: Use IPVC 22 or 24 gauge, solid conductor.

(e) Extra strength/abrasion resistance: Use PVC CBL 20, 22, or 26 gauge, solid conductor.

Shielded wire: Use Polyvinyl chloride, cotton, lacquered, shielded, polyvinyl chloride jacket (PVC CL Shielded PVC), 22 or 24 gauge, solid conductor or Polyethylene, shielded, polyvinyl chloride jacket (PE Shielded PVC), 22 or 24 gauge, solid conductor.

Wiring not in switchboard cable run on cable racks: Generally only 1 to 4 leads should be run without using cable. Use PVC CBL, 20, 22, or 24 gauge, solid conductor. Wire run in conduit: Use PVC CBL, 20, 22, or 24 gauge, solid conductor.

1.18 Surface wiring is run loose and dressed near or against the mounting plate or panel, or adjacent to the plane of the mounting surface, the colors generally used are:

- Green − General wiring (except battery and ground wires).
- Red − Battery wires.
- Black − Ground wires.
- Other colors may be used when required for specific purposes or to facilitate manufacturing requirements.

Cross Connect Wire

1.19 Type, gauge, and color of cross−connection wire should be determined from the supplementary specifications and drawings for particular types of frames.

1.20 BST will provide cross−connect wire for distributing frames unless specified otherwise in the order.

2. Cable Openings

2.1 It is the engineer's responsibility to determine where holes are to be opened and to provide materials prior to these openings being made. He may solicit the installer and the building engineer to help survey the job site for unusual circumstances that will require additional materials such as drop in plates and hangers for holes unaccessible from the floor below.

2.2 The engineer shall follow the locations shown on the BST study plans or architect plans whenever possible. BST approval is required whenever there is a deviation from these plans.

3. Coaxial Cable

3.1 Listed in paragraph 3.2 are BellSouth's approved products.

3.2 Distance from Terminal Equipment to Cross−Connect Field. See Table 1 for additional information on approved connectors.

0−250'	251'−455'
AT&T 735A	AT&T 734D
Comscope 5535	Comscope 5568

3.3 Slack from ordering factory connectorized coaxial cables shall not exceed five feet. If ordering such cables, it is recommended to have it connectorized on only one end.

4. Fiber Jumpers

4.1 Ordering "standard length" fiber optic jumpers has a tendency to create excess slack. The engineering supplier shall provide the shortest appropriate "standard length" jumper to prevent excessive slack.

5. Power Cable And Wire

5.1 Refer to Section 28 for additional information on the installation, routing and placement of grounding conductors.

5.2 Basic rules for routing power cable:

Power Plant: Complete isolation is required for all non−fused leads from the rectifiers to the batteries, batteries to the power board, and from one power board to another. These power cables must be secured and run on a separate, dedicated, ladder type cable rack.

Power Plant to BDFB: Unless otherwise specified, power cables shall be secured and run on separate, dedicated, ladder type cable racks.

BDFB to Network Elements: First choice is to run these power cables secured on a separate, dedicated, ladder type cable rack. In cases where a separate, dedicated cable rack is not feasible, an acceptable alternative is to run the power cable on one side of the rack and switchboard cable on the other side. Battery and battery return leads for the same feed should be run in pairs by polarity.

5.3 All power cable not clearly identifiable as Textile Jacketed shall be protected from contact with cable brackets, cable racks, framework, nylon cable ties and sewing twine. Protection shall be accomplished by wrapping the cables with two layers of 1/64 inch sheet fiber or one layer of 1/32 inch sheet fiber.

TABLE 1

Distance from Terminal Equipment to Cross−Connect Field	Type of Cable	Type of Connector		Cable Preparation Tool	Outer Sleeve Crimp Tool	Die Code	Center Pin Crimper	Notes
		Straight Connector	90° Angle Connector					
0−250’	AT&T 735A Comscope 5535	AT&T KS−23558	AT&T KS−23626	AT&T R5865	AT&T R5648 e/w D−2T		AT&T R5761	1
		Kings KS−23558 Speciality KS−23558 L16						
		Trompeter UPL220−026	Trompeter UPLR220−026	Trompeter BCS/C24T31	Trompeter CT3 e/w CD3−15	5	Trompeter 010−0055	2
	Alcatel 735A	Alcatel 357−7523−440	Alcatel 357−0131−060	Schleuniger HC207	Daniels HX3−X577 e/w .160 x .475		Soldered	3
251’−455’	AT&T 734D Comscope 5568	AT&T KS−23558 L15	AT&T KS−23626 L15	AT&T R5865	AT&T R5648 e/w D−2T		AT&T R5761	1
		Kings KS−23558 L15						
		Specialty KS−23558 L15						
		Trompeter UPL220−025	Trompeter UPLR220−025	Trompeter BCS/C24T3D	Trompeter CT3 e/w CD3−15	4	Trompeter 010−0055	2
	Alcatel 734A	Alcatel 357−7523−400	Alcatel 357−0131−050	Schleuniger HC207	Daniels HX3−X577 e/w .255 or T&B WT411 e/w .255		Soldered	3

NOTE: 1. Must be crimped using AT&T center pin crimp tool. All KS−23558 L16 are interchangeable. Tension setting for outer crimp must be at five or six.

2. Must be crimped using Trompeter’s crimp tools. Tension setting for outer crimp must be at five or six.

3. Center pin can only be soldered by certified Alcatel installers.

ALARMS − ENGINEERING PROCEDURES

CONTENTS

ALARMS − ENGINEERING PROCEDURES

1. General Information

1.1 When engineering alarms in a Central Office environment, the detail engineer must consider two categories of alarms, local (audible and visual) and remote (Surveillance Center). Local alarms are considered to be alarms located directly within the central office. Remote alarms are considered to be alarms that are outside of the central office and monitored by a Surveillance Center.

1.2 The Detailed Specification should specify the alarm indications that are desired and the system and/or location that the alarm leads are to be connected to. The detail engineer must consider systems such as BTAS, X.25 and E2A Telemetry when engineering a project. Where applicable, the alarm assignments should be recorded in a mechanized data base. If a data base is not available or applicable, then assignments should be recorded on a central office drawing.

2. Transport Systems Alarms

2.1 The Engineering Supplier should use the revised Digital Transmission System Alarm Plan (BellSouth DTS Alarm Plan Job Aid (JA−BDTS−001BT) Issue B, April, 1994). This document contains all the new Alarm Wiring Figures and Interconnects for CEV'S, Huts, Cabinets, Walk−in Cabinets, etc. and must be used when engineering and installing all transport alarms. These alarms are considered to be TOLL Misc., TOLL Power, DACS etc. and are associated with the Network Monitoring Analysis (NMA).

3. Switch Systems Alarms

3.1 Various Switch Manufacturers will have an internal local alarm system established. However, there may be additional alarm information that is required for the Central Office Environment. This information will be provided by the Capacity Manager, the Surveillance Center and Network Operations when required. These alarms are considered to be switch and power alarms and are associated with Total Network Management (TNM) in the surveillance center and Network Operations when required.

4. Power System Alarms

4.1 Power alarms can not be overemphasized. Provisioning and maintaining the integrity of power alarms is most important.

4.2 When detail engineering power system alarms, the engineering supplier will receive the power alarm, minimum alarm requirements and assignments from the BST Power Capacity Manager. The BellSouth DTS, Alarm Plan Job Aid (JA−BDTS−001BT) Issue B, April, 1994 and Tables 1 and 2 must be considered depending on the request. Power System alarms are considered to be Engine, Battery Plant etc. and are associated with TNM in the Surveillance Center of BST.

4.3 Remote power alarms must be assigned to the Surveillance Center so that appropriate action is taken when a problem occurs.

4.4 The minimum requirements permit wiring PWR MJ and PWR MN signals of collocated power plants together to produce common remote signals. Where sufficient scan points are available, considerations may be given to sending discrete PWR MJ/PWR MN signals for individual plants.

4.5 Where plants are not colocated, additional remote alarms should be transmitted. As examples, if there are two DC plant power rooms, provide separate PWR MJ, PWR MN and BD for each with proper identification (BSMT, 3RD FL, etc.). If a residual ring plant is located in the switch room, assign discrete RING PLT MJ/MN scan points. Each office must be evaluated with due consideration to equipment layout and local factors.

4.6 C. O. Battery Discharge 'BD' Alarms are required for all battery plants and must be arranged to repeat every 15 minutes, if this feature is available (1A, 5ESS, DMS100/200, etc.) and classified as a "critical" alarm.

4.7 For commercial power failure with auto engine with automatic start/transfer engine systems, the remote alarms must be arranged so that no immediate callout is required during power failures when the engine is on−line carrying the load as designed and there are no problems requiring immediate attention. Don't multiple commercial power failure, engine proper operate, etc. to the "power major", which should cover only conditions requiring immediate attention (callout)

4.8 Failure to adhere to the above could result in considerable confusion during an area wide power outage with personnel being dispatched to the wrong locations.

4.9 Grouping/cabling of power alarms leads, historically, have been "grounded" (multiple together) in the power room and the desired leads then run directly to the central office alarm system. On a going forward basis for new power plants and extensive rearrangements to existing power plants all power alarm leads and status indicators from each individual power plant should be run directly to the distributing frame or terminal strip. This will provide for maximum flexibility in grouping alarms and cross connecting to whatever system is required.

4.10 When detail engineering for normally open (NO) vs. normally closed contacts (NC), the Detail Engineer will provide information to the supplier who will wire all power plant alarms to the distributing frame or terminal strip critical alarms on a NO (loop closure for alarm) basis. NO contacts will remain the standard for power alarms, however, Network Operations may, on an exception basis, reterminate the alarm pair at the power plant onto NC contacts. NC contacts are never to be connected in series; they can only be used where one scan point monitors one set of contacts. **Exception:** For Remote Power Monitors (backup BD, etc.), NC contacts are the standard.

4.11 When detail engineering requires alarm provisions for Diesel Engine Alternators, the preferred method is to provide a separate standard Engine Alarm Terminal Panel or Cabinet. See TR 73508 for additional requirements.

TABLE 1		
REMOTE POWER ALARMS − MINIMUM REQUIREMENTS		
Alarm to Transmit	**Alarms to be Multiplied for Transmitting**	**Note**
Power Major	PWR MJ's for battery, converter, inverter and ring plants. Conditions covered: Discharge Fuse High Voltage Low Voltage (or LV2) Control Fuse Multiple converter fail Inverter plant fail Ring plant fail All other power plant alarms classified as Major i.e., requiring immediate response.	1,2
Power Minor	PWR MN's for battery, converter inverter and ring plants. Conditions covered: Rectifier Failure Single Converter Failure Ring plant transfer or loss of redundancy Inverter Run (if not normally on−line) All other power plants alarms classified as minor, i.e., not requiring immediate response. No lost service.	1
Battery Discharge	BD's for all battery plants Condition covered: Low battery voltage. If "BD" not designated on plant, use: Low Voltage (LV1 or LV2) (15X, 111A plants) Float Voltage (303A, 400 series, other plants)	1
Commercial Power Failure	Commercial Power Failure	2,3
Engine Transfer	ATS in auxiliary position (transferred to essential)	4
Engine Major	Engine Failure or Failure to Start AC Standby Major All other Engine alarms classified as MAJOR, i.e., immediate response required.	

Exhibit 1 − Remote Power Alarms − Minimum Requirements (Table 1)
Page 1 of 2

TABLE 1 (continued)		
REMOTE POWER ALARMS − MINIMUM REQUIREMENTS		
Alarm to Transmit	**Alarms to be Multiplied for Transmitting**	**Note**
Engine Minor	Start battery Charger Failure Preliminary High Temperature AC Standby Minor Low Block Temperature All Other engine alarms classified as MINOR	
Low Fuel	Low Fuel Main Tank or Day Tank	
Fuel Leak	Interstitial or other leak detector activated or water in fuel	
ATGS Fail	Automatic Tank Gauging System Failure	
Power Monitor Battery Discharge	Backup Battery Discharge	
Power Monitor Failure	Power Monitor “Watch Dog”	

TABLE 1 NOTES

(1) Multiples are restricted to colocated equipment (same power room, same floor, etc.).

(2) For offices with automatic engines the remote alarms must be arranged and their receipt interpreted so that callouts are not required during power failures when the engine and other systems are performing as designed.

(3) The commercial AC power failure indicator may be obtained from the engine system (engine alarm cabinet SD81223−01 or equivalent) or from undervoltage relays provided by Property Management and mounted in the AC switchgear. For three phase service all three phases of the commercial service shall be monitored.

(4) The “engine transfer” signal comes from the AC transfer switchgear and indicates that the load is transferred to the standby source. Some engines have an “engine run” signal as a standard feature. Either one of these signals may be used to meet the requirements in Table 1. Note that if during a power failure the engine is running but the transfer switch has failed to operate, the battery discharge alarm should be active.

Exhibit 1 − Remote Power Alarms − Minimum Requirements (Table 1)
Page 2 of 2

TABLE 2		
BUILDING ALARM PANEL TERMINAL ASSIGNMENT		
TERM. SET	**DESCRIPTION**	**NOTES**
1−1	Fire Alarm (alarm)	1
2−2	Fire Alarm System Trouble	1
3−3	High Temperature	1
4−4	High Humidity	1
5−5	Low Temperature	1
6−6	Low Humidity	
7−7	Refrigeration Failure	
8−8	Fan Failure	
9−9	Door Alarm(s)	1
10−10	unassigned	
11−11	Compressor−dehydrator	2
12−12	Cable Pressure Monitoring Eqpt.	2
13−13	Lightning Arrestor	3
14−14	Pipe Alarm Meter Panel(s)	2
15−15	Cable Vault Combustible Gas Monitor (alarm)	
16−16	Cable Vault Combustible Gas Monitor System Trouble	
17−17	Sump Pump (high water) Alarm	
18−18	Fuel Tank Leak Alarm	
19−19	ATGS Fail (if applicable)	
20−20	unassigned	
21−21	Engine Major	1,4
22−22	Engine Transfer	1,4
23−23	Power Failure	1,4
24−24	Engine Minor	1,4
25−25	Low Fuel	

Exhibit 2 − Building Alarm Panel Terminal Assignment (Table 2)
Page 1 of 2

TABLE 2 NOTES

(1) These alarms are provided in all stored program central offices.

(2) These alarms are provided by Outside Plant Engineering when required.

(3) Lightning arresters should be provided for all electronic/digital switches (760−400−520SV). When the lightning arresters are equipped with alarm contacts, these should be connected to the central office alarms in accordance with SD81968−01.

(4) The engine and power fail alarms may be either run direct to the CO alarm system or run via the building alarm panel. When the engine is provided by Property Management they will normally be connected to the building alarm panel.

Exhibit 2 − Building Alarm Panel Terminal Assignment (Table 2)
Page 2 of 2

AUXILIARY FRAMING AND CABLE RACK − ENGINEERING PROCEDURES

CONTENTS

AUXILIARY FRAMING AND CABLE RACK − ENGINEERING PROCEDURES

1. General

General Assembly/Floor Plan Layouts And Equipment Location

1.1 This section covers engineering guidelines for the installation of auxiliary framework, cable racks, fiber optic pathways, and rolling ladders.

1.2 Endguards shall be provided and installed at both ends of a lineup.

1.3 Where reference lines are not established by BST, they shall be located from one column center. This column shall be identified on the drawing as a “KEY COLUMN.” When it is impracticable to locate them from column centers they may be located from the inside wall, outside wall, or column edge.

1.4 It is recommended that the reference lines on the upper floors be placed directly over those on the lower floors and located from the same points of the building.

Arrangement Of Auxiliary Framing, Low Type/High Type

1.5 This subsection covers engineering requirements for low−type auxiliary framing over lineups of switching, transmission and power equipment. It also covers the engineering requirements for ceiling−suspended high type auxiliary framing, as well as the frame and rack supports associated therewith.

1.6 The arrangement of auxiliary framing is shown on Office Record Drawings (normally the Cable Rack and Auxiliary Framing Plan).

1.7 Safe load limitations for ceiling inserts, beam clamps, expansion shields, hanger rods, auxiliary framing, etc. may be considered as follows:

Apparatus	Load (lbs)
5/8−11 threaded rods	1200
Ceiling insert(Set in place when ceiling is poured)	1200
Acme beam clamps	800
5/8 inch drop−in anchors	480
3/8 inch drop−in anchors	300
3/8 inch lag screws in wood (2 inches or more)	300
Framing channels (2” x 9/16” x 3/16” steel)	Manuf.
Embedded ceiling channel (Unistrut):	
At any one point	2000
Where two or more loads are within 2’ of each other	2000 total for the group of loads

NOTE: If the building structural design limits are not known, the Installation Supplier shall contact the appropriate Capacity Manager for cable loading and support limits.

Auxiliary Framing

Arrangement Of Auxiliary Framing–low Type

1.8 In general, regular auxiliary framing shall not be placed over main or end aisles except as required for support of ladder track. Where support of main or end aisle cable racks extending into or across aisles is required, the framing shall be arranged as indicated in the paragraphs on cable racks in this section and in section 25.

1.9 Where no ceiling inserts or beam clamps are available for support of the auxiliary framing, it may be run to the wall and fastened. If the distance from the last support does not exceed 6 feet, it shall be supported by means of hanger bolts or other approved means from beams or partitions. Supports attached to columns are not recommended, although in rare cases such supports may be used. In those buildings where it is impracticable to make ceiling attachments, an iron pipe stand may be used to support the framing bars or channels.

1.10 The use of auxiliary framing at battery stands shall be limited to the support of the Bus Bars or the cable rack. The battery stand is self–supporting.

Arrangement Of Auxiliary Framing–high Type

1.11 The location and arrangement of auxiliary framing is, in most cases, controlled by ceiling height. Ceiling heights are measured in terms of minimum clearance under all obstructions.

1.12 Equipment areas are usually provided with beam clamps, ceiling inserts, embedded ceiling channel (Unistrut), or other devices arranged for fastening auxiliary framing to the ceiling.

1.13 Rows of secondary bars or channels shall be located directly under the ceiling inserts and shall be located at right angles to the primary framing brace, as required, to support the framework or equipment.

1.14 The framing bars or channels for an area covered by continuous rows of framing shall be at approximately the same level. Bars or channels at different levels may be used where they are not in continuous rows.

1.15 Only primary framing shall be provided where supports are such that framing bars or channels can be fastened to frames at right angles.

1.16 Splices in framing bars or channels supporting distributing frames shall be avoided, wherever possible. Where necessary, they shall be located within 1 foot of a support.

1.17 Auxiliary framing shall be located as high as practicable above distributing frames to provide cabling clearance and headroom.

1.18 Auxiliary framing shall be provided at cable holes and other openings in floors or walls, as required, to support the cable racks. Care shall be taken that framing will not interfere with the cabling at these openings.

1.19 Where the distance between the framing and the frame top–angles is four feet or more, angle–type braces shall be used.

1.20 High–type auxiliary framing shall not be installed for the support of frames in wood buildings. Where low–type auxiliary framing is not specified, adjustable brace supports shall be fastened directly to the ceiling, wooden beam, or girder using lag screws, or V–bar frame supports. Fastenings to hollow tile arch, to furring, or to suspended ceilings shall be avoided. In such cases, suitable supporting framework attached to nearest beams or girders, shall be provided.

1.21 Where the ceiling construction consists of exposed timbers, beams, or planking, the supports may be attached directly without the use of wood strips.

Cable Racks/Fiber Optic Pathways

1.22 This subsection covers apparatus requirements and engineering considerations for the placement of cable rack and fiber optic pathways over switching, transmission, and power equipment.

1.23 The size, type, height, and arrangement of cable rack and associated bracing is shown on Office Record Drawings (normally the Cable Rack and Auxiliary Framing Plan).

Description And Sizes

1.24 Ladder–type cable racks are manufactured in full lengths (9 feet 8 1/2 inches long) or in half lengths (4 feet 5 1/2 inches long) and in various widths. The actual construction of the stringers can be channel, tubular, or solid. All constructions are interchangeable except for racks that are 2 feet 1 inch and 2 feet 6 inches in width; these racks are only constructed with channel or solid stringers. The fabrication figures in this unit show solid stringers. The straps are 1 x 1/2 inch channel spaced on 9 inch centers and welded to the stringers. The first, last, and each alternate strap of the cable racks that are 2 feet 1 inch and 2 feet 6 inches in width are reinforced with a 1 x 1/4 inch bar.

1.25 "Snap–on" brackets shown in Figure 1, are used with ladder–type cable racks to separate high–level from low–level transmission leads. They may also be used in installations where the concentration of cables is small.

CAUTION: SNAP–ON BRACKETS ARE NOT DESIGNED TO WITHSTAND IMPACT LOADING AND SHALL NOT BE USED TO FORM TROUGHS IN WHICH CABLES ARE PULLED OR DRAGGED.

1.26 Bar–type cable racks are used as standard units of over–aisle, cross–aisle, over–frame, and miscellaneous cable racks, respectively. Bar–type cable racks are made of 1 x 3/16 inch bent steel cross straps on 9 1/2 inch centers welded to stringers that have an outside dimension of 1 1/2 x 3/8 of an inch. The construction of the stringers may be channel, tubular, or solid, and are interchangeable. The fabrication figures in this unit show solid stringers. Thin metal plates are to be provided for covering the bottom of the racks.

(a) Bar–type over–aisle cable racks are typically 1 foot 8 inches wide with a 1 foot 3 inch wide depressed center and are 12 feet long.

(b) Bar–type cross–aisle cable racks are typically 1 foot 10 inches wide and vary in length to suit aisle widths and cable rack levels.

(c) Bar–type over–frame cable racks are typically 1 foot 3 inches wide and 12 feet long.

(d) Bar–type miscellaneous cable racks are typically 5 inches wide and 12 feet long.

(e) Turns, offsets, spirals, and vertical runs used in connection with horizontal bar–type cable racks shall be fabricated with ladder–type cable racks except as shown in Figure 2.

1.27 Spiral cable racks and double turns consist of channel straps fastened at each end with eye–bolts to 5/8 inch bent rod stringers.

1.28 Power cable racks of the type shown in Figure 3 are used for supporting power distribution cables where main or end aisle cable racks are omitted, or where frames are omitted in a lineup and the gap exceeds 3 feet.

NOTE: Use This Cable Rack Only For Additions To Existing Cable Racks Of This Same Type.

1.29 Power cable rack turns are similar in general construction to ladder–type cable racks, except that the stringers are formed to 7 and 14 inch outside radii of 90–degree turns, the straps being on the outside of the turns as shown in Figure 4. Power cable rack turns are available in 10, 12, and 15 inch widths.

Location

1.30 The location of cable racks shall be such that the clearances required for installation and maintenance of the ultimate equipment arrangement will be maintained. Normally 1 foot 6 inches is the desired clearance on the working side of the cable rack. A clearance of 3 inches should be maintained between the side of the cable rack and building columns.

1.31 Cable racks shall not be located close to pipes, radiators, windows, doors, or any other equipment that may subject the cabling to detrimental conditions.

Cable Rack Engineering Requirements

1.32 Horizontal cable racks shall be supported on approximately 5 feet centers, and in no case shall the spacing between supports exceed 6 feet. A support shall be provided within 3 feet of the free end of a cable rack.

1.33 The permissible pile–up of cabling on ladder–type cable racks for the normal and maximum spacing of supports is as follows.

	CABLE PILEUP IN TERMS OF SWITCHBOARD CABLE	
WIDTH OF CABLE RACK	SUPPORTS ON 5’ CENTERS	SUPPORTS ON 6’ CENTERS
5” TO 2’1” inclusive	12”	10”
2’6”	10”	7”

NOTE: The maximum cable pile–up for a cable run is to be limited to a height not exceeding the width of the run on cable racks 12 inches or less in width and to the values given in this table for wider racks.

Cable pile−up on bar−type cable racks is limited by the height of the vertical bars or horns except where the bars of the over−aisle cable rack are extended by tubular extensions as noted in the discussion of cross−strap extensions.

1.34 The maximum width of cable racks for both horizontal and vertical power cable runs shall be limited to 1 foot 8 inches, so as not to exceed the weight limitation of the ceiling supports.

1.35 The permissible pile−up of vertical and horizonal cabling is as follows.

(a) Switchboard cable runs shall not exceed an ultimate pile−up of 12 inches.

(b) Power cable runs shall not exceed an ultimate pile−up of 7 inches which is approximately equivalent to five layers of 750,000 CM cable.

(c) To provide the space required to properly close and firestop a cable hole, the pile−up on all vertical cable racks shall be additionally limited so that cable is not closer than 3 inches to the face of the cable hole.

1.36 Fiber optic cables should be supported at all points in the run within a central office. The cable rack shall be arranged so the fiber optic cable will not be exposed or left unsupported at any part. This includes horizontal runs, vertical runs, bends and turns.

Support Of Cable Rack

1.37 Cable rack associated with frames and racks shall be attached to the uprights or top−angles, or to the low−type auxiliary framing over the frames and racks.

1.38 In wood buildings, the cable rack hangers shall be fastened at the ceiling with lag screws to wood cleats approximately 2 inches thick or to ceiling joists, as shown in Figure 5. The cleats shall be attached to the joists with lag screws or other equally secure devices. In buildings having plastered ceilings where the hangers are attached directly to the joists, 1/8 x 5 x 5 inch steel plates or wood strips shall be employed to distribute the pressure on the plaster. Cable rack hangers shall not be fastened directly to plaster furring or hollow tile, nor to metal or false ceilings.

1.39 In power rooms the use of auxiliary framing for the support of cable racks shall be avoided. Where the use of auxiliary framing cannot be avoided it shall be located near the ceiling. Figures 6, 7, and 8 cover the support of cable racks directly from ceiling inserts, beam clamps, or drop−in anchors.

(a) The spacing of hanger rods used with anchors shall not exceed 5 feet.

(b) Wherever possible, the rack shall be located so that the center, or one side will come directly below a row of standard beam clamps or approved ceiling inserts.

(c) To ensure that the safe load for expansion shields(drop−in anchors) is not exceeded, the switchboard cable pile−up on cable racks supported by expansion shields (drop−in anchors) shall not exceed the following:

Rack Width (Inches)	Max. Pileup (Inches)
12−15	Less than 12 1/2
15	12 1/2
20	15
25	12 1/2
30	10

NOTE: The pile−ups given are for switchboard cables, and in some instances they are greater than those indicated in the previous discussion of permissible pile−up of cabling. The loads discussed here are only to indicate the safe load on expansion shields(drop−in anchors).

(d) Expansion shields (drop−in anchors) shall be used for the support of cable racks and auxiliary framing only where the ceiling is a good grade of concrete. They shall not be used in ceilings of tile arch construction. If racks are to be supported from such ceiling and the use of auxiliary framing between beams is not possible, hanger bolts passed entirely through the ceiling arch to a metal plate on top of the arch may be used.

1.40 Vertical power cable rack runs should be limited to three floors (basement to third floor). If a vertical run of power cable rack must exceed three floors, a horizontal section of rack at least 20 feet in length shall be introduced at intervals not exceeding three floors. This may be accomplished by using cable holes which are horizontally offset from each other by at least 20 feet or by using a horizontal loop in the cable rack if the same vertical path must be used.

Fiber Optic Pathway System

1.41 The Fiber Pathway System is a high capacity guideway system for fiber optic cable and fiber optic jumpers. Designed for both central office and central office type locations, the Fiber Pathway System provides a safe means for routing optical fibers to fiber optic terminal equipment and fiber distribution devices. The fiber pathway system can also be used to house fire−retardant optical fiber cables from the cable entrance facility (CEF) and the fiber distribution frame (FDF). Optical fibers, jumpers, and cables are protected and supported at all points and completely separated from copper cables and wires. This avoids the type of damage that often occurs when fiber is installed in cable trays that were designed for copper cables.

1.42 The basic fiber pathway configurations consist of straight lengths, elbows, downspouts and T's in various sizes. ADC and Lucent are the BellSouth approved fiber optic pathways.

1.43 Fiber pathways should not be located close to pipes, radiators, windows, doors, or any other equipment that may subject the fiber pathway to possible damage.

1.44 The location of the fiber pathway shall be such that the clearance required for installation and maintenance of fiber optic jumpers will be maintained.

1.45 For ladder or bar type racks in existing offices, the fiber pathway is supported by a unistrut base design which may be placed above or below existing racks depending on cable pile up, blockage by building obstructions, conduits, etc. **Using this design, the fiber pathway is supported by brackets spaced not to exceed the recommendations of the pathway manufacturer.**

1.46 The length of the supporting bracket must equal the width of the fiber pathway.

1.47 In digital offices the shield 1 tray of the digital cable rack can be utilized for the over line 2" X 2" fiber pathway. The cross aisle fiber pathways are supported by a cable rack or auxiliary framing placed above the existing racks where ceiling height permits. This prevents blockage of existing racks used for switchboard and power cables.

Rolling Ladders

1.48 The following covers the requirements for rolling ladders and associated equipment such as ladder brakes and ladder track.

Rolling Ladders − Track Type

1.49 Rolling ladders 14 inches in width of the straight type as shown in Figures 9 and 10 or of the platform type as shown in Figure 11 are to be furnished where aisle width will permit. Ladders 12 inches in width may be furnished when aisle widths will not permit the use of 14 inch ladders. Ladders 10 inches in width are considered special and are to be used only at the direction of the Capacity Manager.

1.50 The number of steps for platform−type ladders of particular vertical height may be determined from Figure 11. Platform−type ladders are furnished with eight or fewer steps below the platform.

Rolling Ladder Track

1.51 Ladder tracks shall ordinarily run continuously across aisles so as to permit concentrations of ladders when necessary.

1.52 In wood joist constructed buildings, timbers shall be installed from which the track can be supported. The track supports may be fastened to or suspended by threaded rods from the timbers. Track supports shall be located approximately 3 feet, but no more than 4 feet apart.

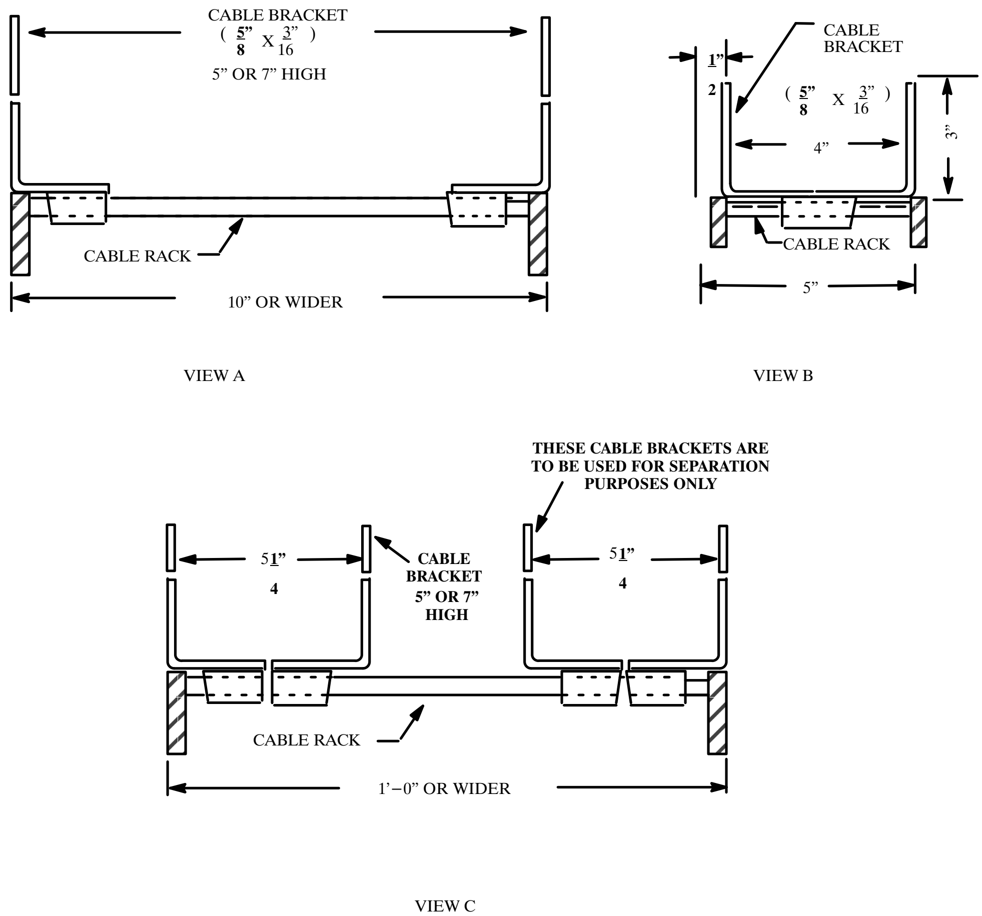


Figure 1 − Mounting "snap−on" Cable Brackets On Ladder−type Cable Racks

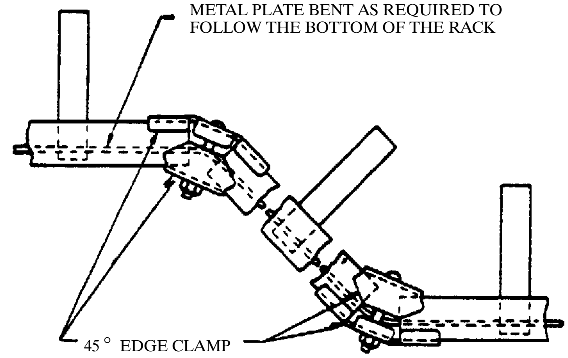


Figure 2 − Offset Greater Than 9 Inches In Parallel Planes Using 45 Degree Edge Clamps − Bar−type Cable Racks

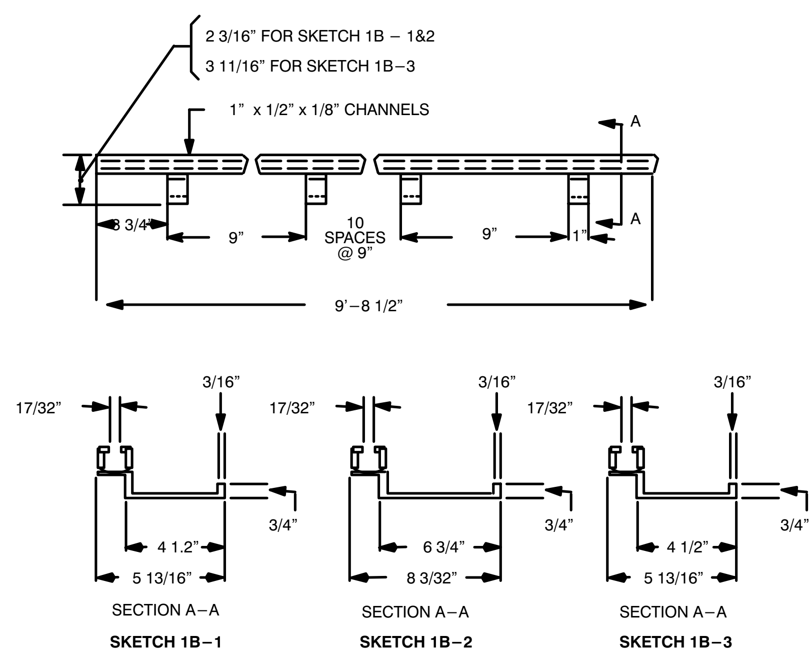
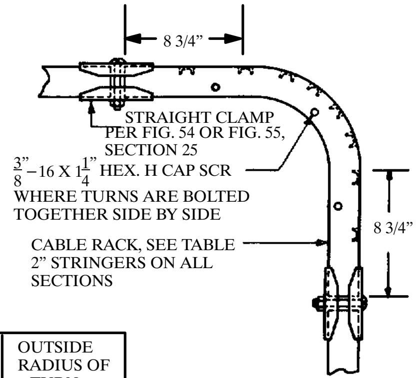


Figure 3 − Cable Rack Section For Power Cables − For Additions Only



WIDTH OF RACK	OUTSIDE RADIUS OF TURN
10”	7”
12”	7”
15”	7”
10”	14”
12”	14”
15”	14”

Figure 4 − Cable Rack Turn For Power Cable Runs

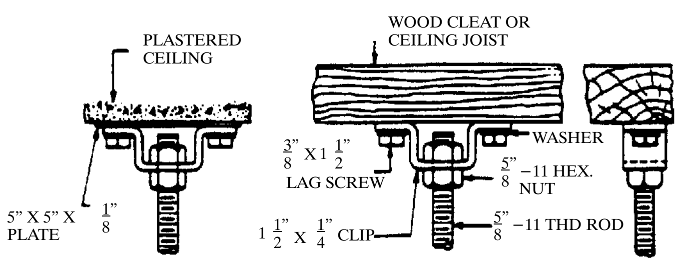


Figure 5 − Hanger Rod Attached Directly To Ceiling

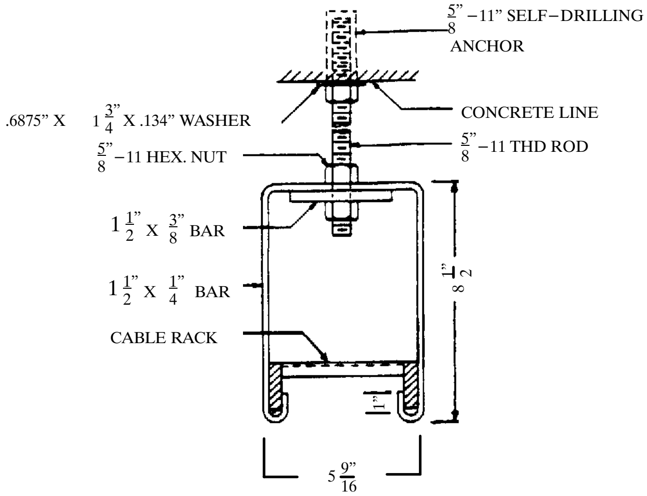
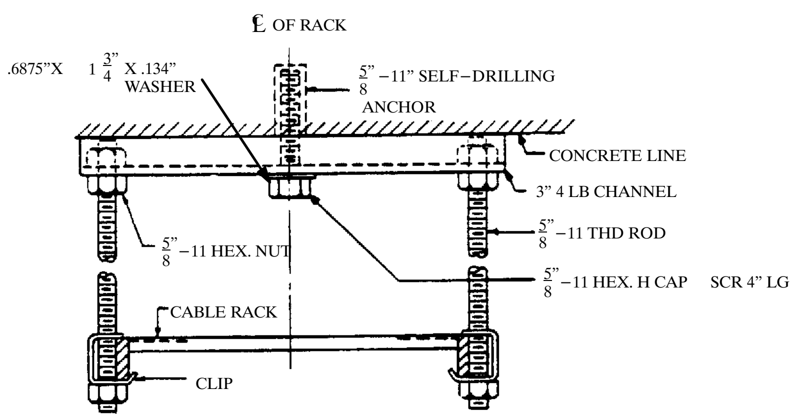
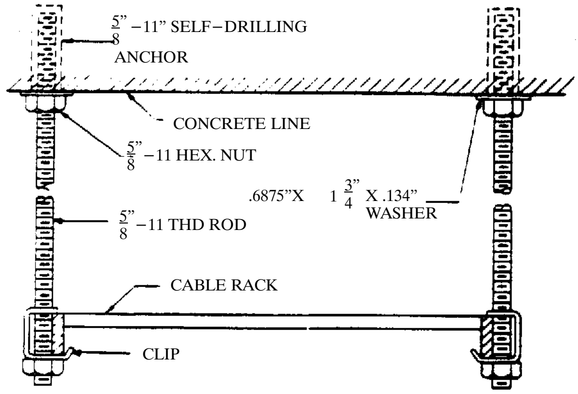


Figure 6 − Supporting 5 Inch Cable Rack From Self−drilling Anchor In Ceiling



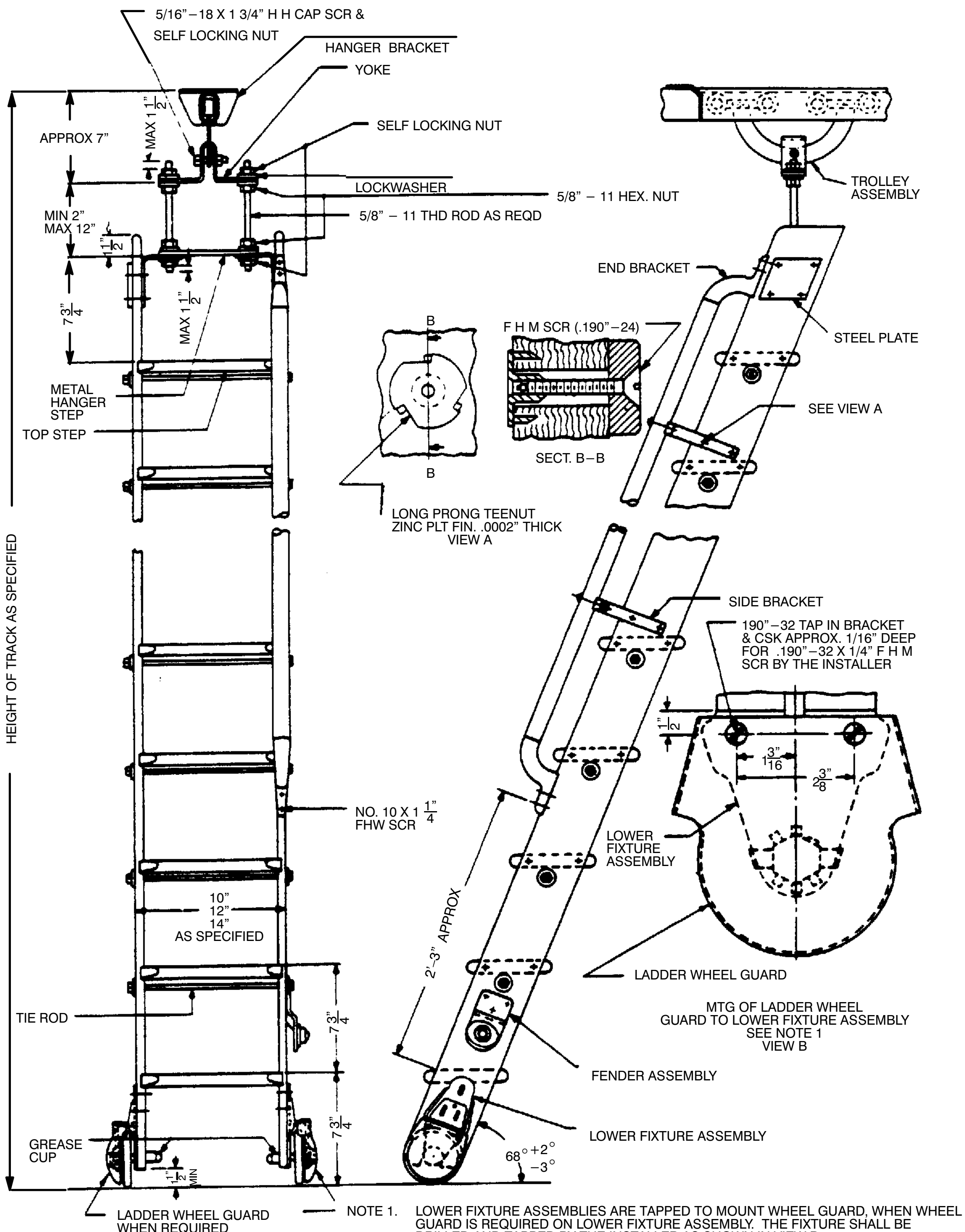
NOTE:
WHERE THE CEILING IS PLASTERED THE CHANNEL MAY BE ALLOWED TO REST ON THE PLASTER. THE EXPANSION SHIELD, HOWEVER, SHALL BE EMBEDDED ITS FULL LENGTH IN SOLID CONCRETE.

Figure 7 − Supporting 1 Foot And 1 Foot 3 Inch Cable Racks From Self−drilling Anchor In Ceiling



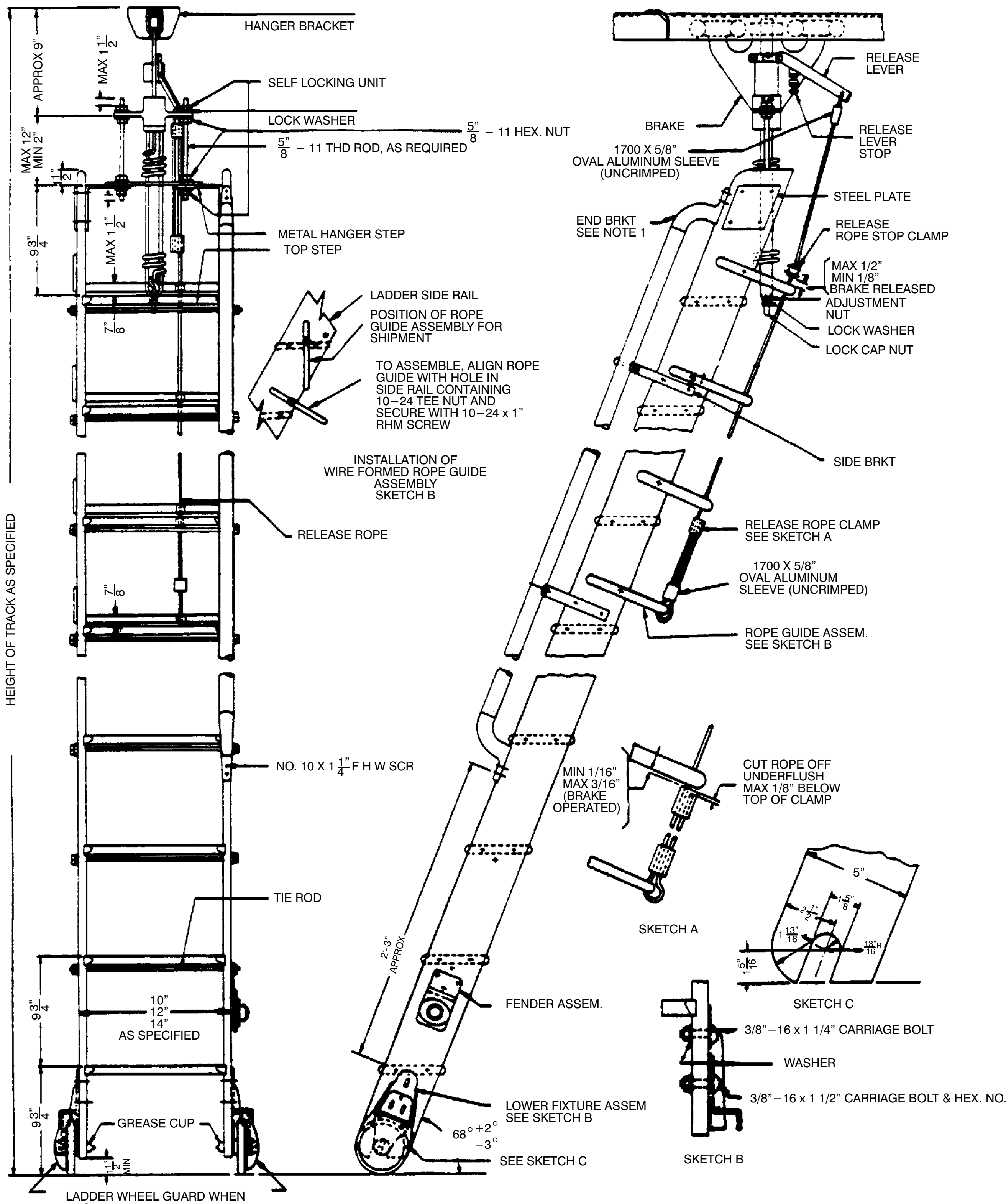
NOTE:
FIGURE 12−4−86 IS THE PREFERRED METHOD FOR 1 FOOT 3 INCH CABLE RACKS. HOWEVER, WHERE THE RUN IS HEAVY, THE EXTRA SUPPORT PER THIS FIGURE MAY BE USED.

Figure 8 − Supporting Cable Racks From Self−drilling Anchor In Ceiling



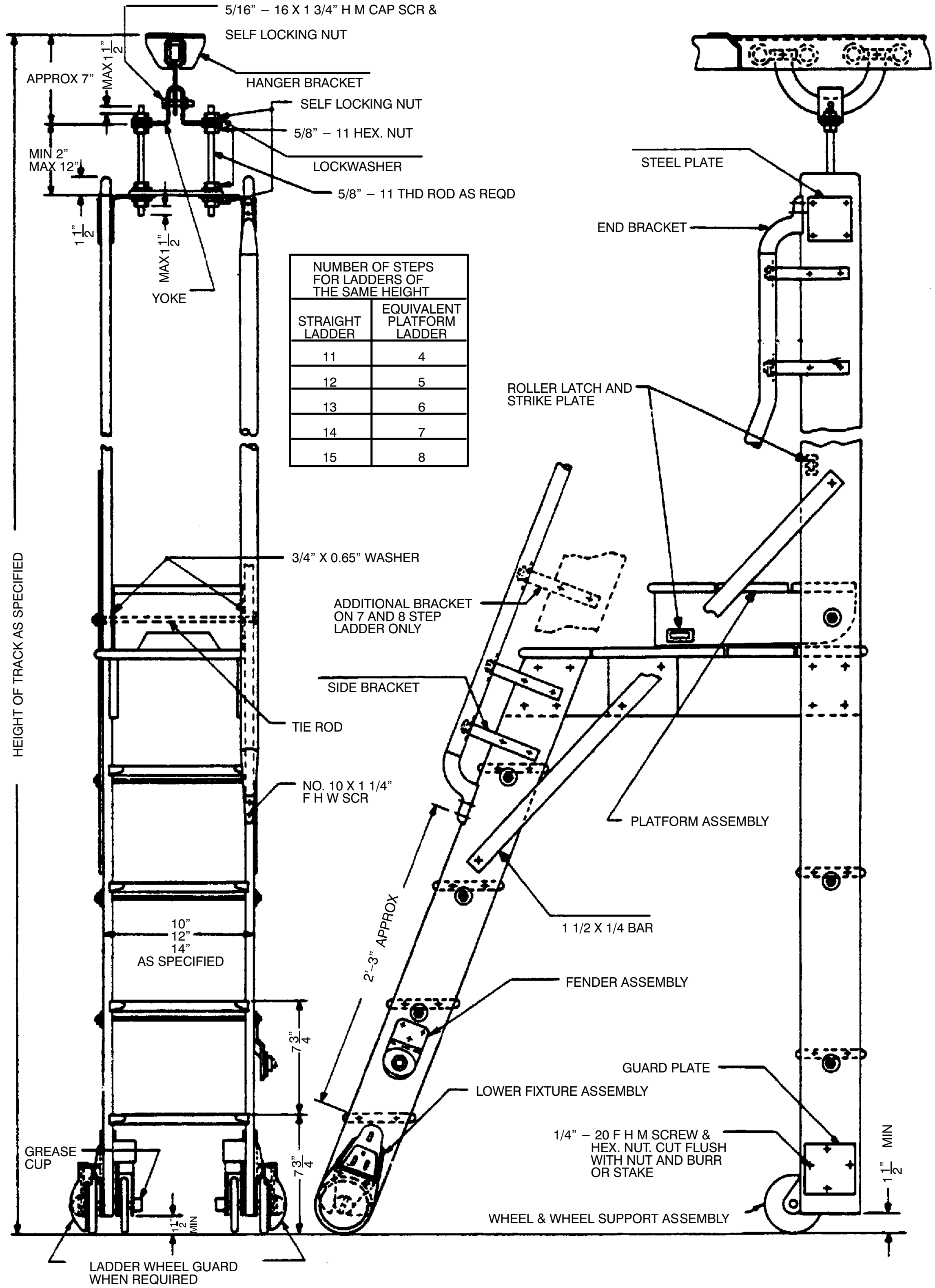
NOTE 1. LOWER FIXTURE ASSEMBLIES ARE TAPPED TO MOUNT WHEEL GUARD, WHEN WHEEL GUARD IS REQUIRED ON LOWER FIXTURE ASSEMBLY. THE FIXTURE SHALL BE DRILLED AND TAPPED BY THE INSTALLER AS SHOWN IN VIEW B.

Figure 9 − Straight−type Rolling Ladder Assembly Without Brake



NOTE:
1. WHEN HAND RAIL IS ASSEMBLED TO THE SIDE RAIL, THE END BRACKETS SHALL BE SO LOCATED THAT THE HAND RAIL IS TIGHT BETWEEN THE TWO END BRACKETS.

Figure 10 − Straight−type Rolling Ladder Assembly With Brake



NUMBER OF STEPS FOR LADDERS OF THE SAME HEIGHT	
STRAIGHT LADDER	EQUIVALENT PLATFORM LADDER
11	4
12	5
13	6
14	7
15	8

Figure 11 − Platform−type Rolling Ladder Assembly

EARTHQUAKE AND DISASTER BRACING FOR CENTRAL OFFICE EQUIPMENT – ENGINEERING PROCEDURES

CONTENTS

EARTHQUAKE AND DISASTER BRACING FOR CENTRAL OFFICE EQUIPMENT – ENGINEERING PROCEDURES

1. General

1.1 This section describes engineering considerations to be taken into account with regard to the supplementary support and fastening of telephone equipment in areas subject to earthquake shocks.

1.2 The engineer should follow the stricter of the manufacturer's recommendation or BST requirements regarding the supplemental bracing of equipment in earthquake prone areas.

2. Building Construction

2.1 The special bracing requirements covered herein are based on standard central office ceiling heights and building conditions. It is assumed that floors and columns will be of a good grade of concrete, preferably with no plaster, on the columns and ceilings, since the method of support called for herein relies upon bracing to columns and the ceilings. For unusual building construction, ceiling heights, and framing conditions, appropriate instructions should be sought from the BST Capacity Manager.

3. Basic Principles

3.1 In general, 11−1/2 foot framework structures for equipment are rigidly secured to the floor at the frame base and braced from the top of the framework to auxiliary framing; 7−foot equipment framework structures are designed to be self supporting and are attached only to the floor.

3.2 Major braces are of flat−bar or angle material to obtain greater stiffness. The threaded rod brace is limited to cable racks and other minor applications. The ends of auxiliary framing bars or channels are not allowed to touch the walls. Cable racks hung by threaded rods are braced both sidewise and endwise.

3.3 Batteries on metal stands have bumpers or rails mounted on them to prevent horizontal movement, and in some cases, the stands are braced to the ceiling. Round cell batteries are generally mounted on plastic stands which are outfitted with a harness−type structure to increase their horizontal stability.

4. New Installations

A. Expansion Shield Type Anchors

4.1 The following expansion shields in the lengths shown are acceptable for use in equipment buildings:

SIZE	LENGTH IN INCHES
1/4−20	1−1/8
3/8−16	1−1/2
1/2−13	2
5/8−11	2−1/2

The following floor expansion anchors are also acceptable

(1) For Seismic Zones 0, 1, and 2(light) use an 18mm expansion floor anchor with maximum 95mm length and rated for 4,000 lbs. average tensile strength**.** If there is doubt about the strength of the floor (min. 3000 psi), or the torque setting of the anchors, use anchors rated at 6000 pounds average tensile strength.

(2) For Seismic Zone 3 use an 18mm floor expansion anchor with a maximum length of 99mm rated for 6000 lbs. average tensile strength. If there is doubt about the strength of the floor (min. 3000 psi) or the torque setting of the anchors, use anchors rated at 10,000 pounds average tensile strength.

Note: Use floor expansion anchors with pre−set torque requirements.

(3) For equipment floors that require a maximum 2 and 1/2 inch hole depth, use a 12 mm expansion floor anchor 65mm long rated for Seismic Zone 2 or 3, as shown in paragraphs 1 and 2**.**

(4) For Seismic Zones 0, 1, and 2 (light) use an 18mm expansion floor anchor with maximum 95mm length and rated for 4,000 lbs. average tensile strength**.** If there is doubt about the strength of the floor (min. 3000 psi), or the torque setting of the anchors, use anchors rated at 6000 pounds average tensile strength.

4.2 The following practices for support of auxiliary framing shall be used for locations within Zone 3 of Figure 2. Standard low−type auxiliary framing, installed in accordance with Sections 8 and 25, shall be used for the support of equipment, except that the special features outlined herein shall be incorporated.

4.3 Bracing: Special braces, as shown in Figures 1, 3, and 4 (page 2 of 2), shall be used for adding rigidity to the auxiliary framing structure. Each line of framing shall be braced at each end as near the ends as practicable and, in addition, intermediate double braces shall be located at approximately column spacing (20 feet).

4.4 Where two adjacent rows of frames are omitted or the framing is otherwise unsupported for a distance in excess of 8 feet 0 inch, supplementary support for the regular framing is required in accordance with Sections 8 and 25 covering the installation of standard low−type auxiliary framing. In the case of two adjacent rows of frames being omitted, the additional supporting bars or channels shall be combined with the supplementary stiffening framing described above by adding 5/8 inch threaded hanger rods, as required, to support one of the sets of stiffening framing as shown in Section 26, Figures 1 & 2. Where possible, the stiffening framing chosen for this purpose should be those located under ceiling inserts.

4.5 For new installations, high−type auxiliary framing, is used for the support of distributing frames over 11 feet 6 inches high and the mezzanine platforms, rolling ladders, cable racks, etc, associated with them. High−type auxiliary framing may also be used as a grid from which low−type auxiliary framing is braced. The primary bars or channels of the high−type framing shall be made continuous wherever possible and shall be stiffened by cable rack or supplementary stiffening framing braced at each end as indicated in Figure 4.

B. Support Of Cable Racks Over 11 1/2 Foot Equipment

4.6 The following practices for cable rack support shall be used for locations within Zone 3 of Figure 2.

4.7 All main− and end−aisle cable racks and all other cable racks not attached directly to the frames or to regular auxiliary framing must be supported by hanger rods from framing at the ceiling as shown in Figure 5. Auxiliary framing used for the support of cable racks must be supported from the ceiling inserts, beam clamps, or hanger bolts in the floor above in accordance with Sections 8 and 25. Expansion shields shall not be used for ceiling support.

(a) Where cable racks are at right angles to the rows of frames (cross aisle racks), it will be necessary to support these racks by means of hanger rods from ceiling inserts if rows of frames have been omitted and the length of the cross aisle rack exceeds 8 feet 0 inch. Where the cross aisle racks between rows of frames are less than 8 feet 0 inch, the racks shall be supported as called for in Sections 8 and 25.

(b) Because of the difference in construction bar−type over−aisle racks will always require a pair of framing bars or channels under the racks for attachment to the hanger rods as shown in Figure 11.

(c) Supplementary stiffening framing above a line where frames have been omitted may be used to support bar−type cross−aisle cable racks in miscellaneous equipment lineups. In such cases and in cases where ladder−type racks are 2 inches above the auxiliary framing to clear conduit, etc, the racks shall be supported by 5/8−11 threaded rods, clips, lockwashers, and nuts, one set at each stringer, tied together with a flat steel bar.

4.8 Hanger−rod−supported racks shall be braced as required to prevent swaying and “whipping” in both sidewise and endwise directions.

(a) Sidewise braces as shown in Figures 6, 7, 8, 9, and 10 on 5−foot 0−inch to 6−foot 0−inch spacing are satisfactory. In the case of main cross−aisle racks, sidewise bracing is unnecessary due to the bracing action obtained by the frame cable racks fastened to it at regular intervals on each side. End−aisle racks require bracing on the outside stringer only.

(b) Normally, one set of brace rods per run of cable rack is sufficient for bracing in an endwise direction as shown in Figures 11, 13, 14, and 15. Brace rods shall be installed on opposite stringers, not necessarily opposite each other, and slanted in opposite directions. Where a hanger−rod−supported cable rack is attached at some point to a frame, auxiliary framing, or other cable rack which is in turn so braced as to resist endwise movement of the cable rack, no additional endwise bracing shall normally be required.

(c) Either standard threaded rod braces, flat–bar braces, or angle–type braces may be used. Rod braces will be satisfactory for very short braces or those located so as to provide bracing in opposite directions. Otherwise, bar– or angle–type braces shall be used.

(d) Hanger–rod–supported cable racks over distributing frames shall be braced in a sidewise direction as shown in Figure 16.

C. Power Equipment

4.9 The following practices for power equipment shall be used for locations within Zone 3 unless otherwise specified.

4.10 Power equipment, in general, shall be fastened to the floor with 3/8–16 expansion shields and studs. The telephone company should arrange to rewaterproof any parts of the floor impaired by the associated drilling.

4.11 Water tanks used with reserve power plants are usually suspended from auxiliary framing or ceiling by hanger rods and straps. They shall be braced both endwise and sidewise as shown in Figure 17 to prevent sway. The associated piping requires no additional bracing.

(a) Fuel Oil Tanks: Inside floor mounted fuel oil tanks shall be securely anchored with steel straps to concrete saddles that are cast integrally with or securely to the floor as shown in Figure 18.

4.12 Numerous vendors provide Batteries and Battery stands that are used in BellSouth. Only those that are on the approved products list should be used. However, if there are existing battery stands in seismic zones that require additional anchoring and/or bracing, the manufacturer should be contacted for the proper method of adding adequate anchoring and/or bracing. If their products are to be used in a seismic zone that requires earthquake and disaster bracing, they should be certified as adequate for the seismic zone in which they are to be installed.

(a) Some figures that apply to specific vendor products are listed herein but this is not a complete list and does not cover all vendors who are contracted to supply batteries and stands (for batteries) to BellSouth. Vendor Documentation should be used only when it has been certified as adequate to meet the requirements of Uniform Building Code (UBC), for the Seismic Zone in which the equipment is to be installed.

(b) Floor anchoring, if not specified by the vendor, should be provided as required for the seismic zone in which the equipment is being installed. Some vendors specifically state this in their documentation as the buyer's responsibility.

4.13 The bus–bar runs between power boards, machines, and batteries shall, if they are supported by vertical hanger rods from the ceiling or auxiliary framing, be provided with sway bracing in both sidewise and lengthwise directions to prevent swaying and “whipping.” Where the bus–bar run is large, more than one set of lengthwise brace rods may be necessary. The braces must run to the hanger rods supporting each line of insulator supports.

(a) On large bus–bar runs (4000 amperes or larger) where the bus runs are supported by insulators from auxiliary framing, supplementary supports shall be placed at approximately 6– to 10–foot centers under the concentrated portions of the run. This is required in Zone 2 (above first floor) and Zone 3 (all floors).

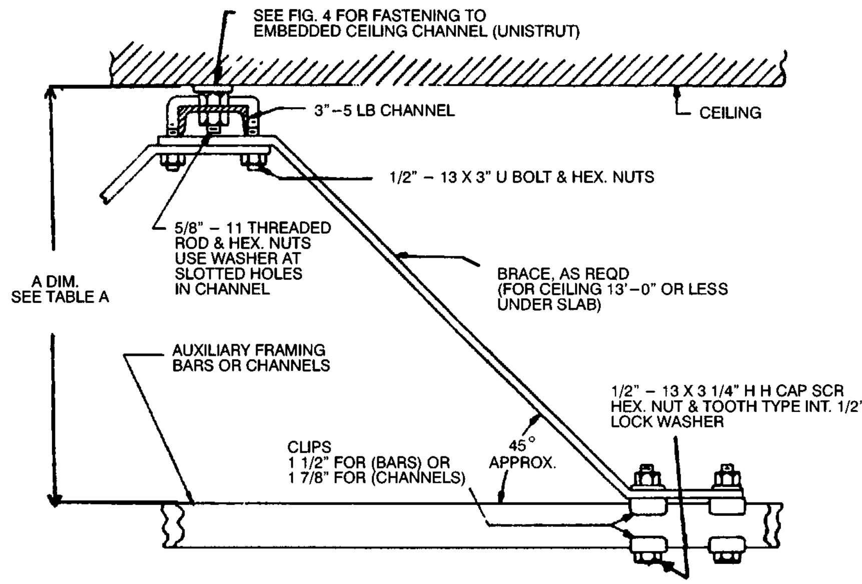


Table No. 1	
Brace Useage	
A Dim.	Brace Type
5" to Less Than 10"	2 x 3/16 Bar
10" to 1'-6" Inclusive	2 x 3/8 Bar

Figure 1 − Auxiliary Framing Brace For Use In Low−ceiling Areas

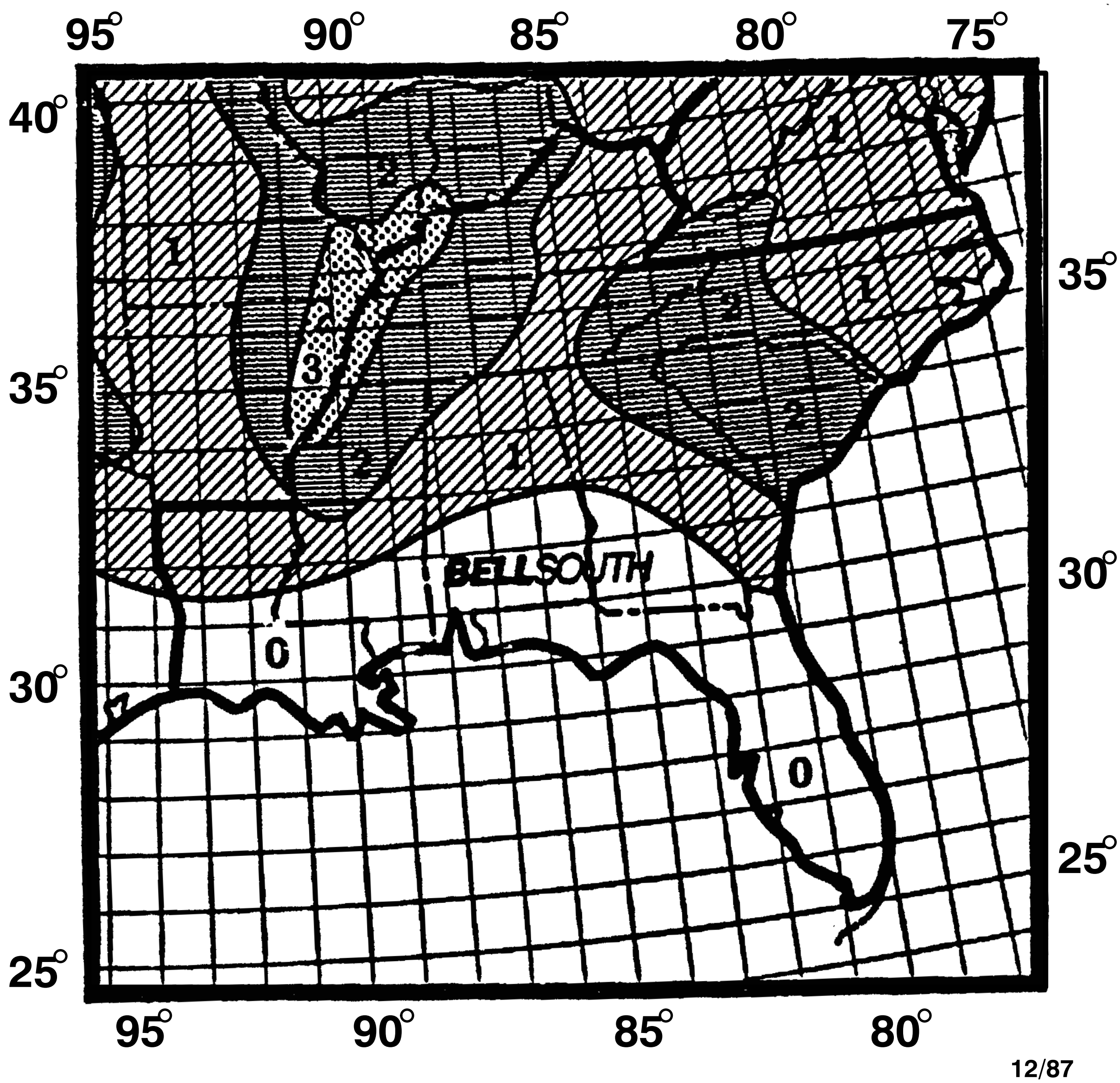


Figure 2 − Bellcore Earthquake Zoning Map Of The Bellsouth Region

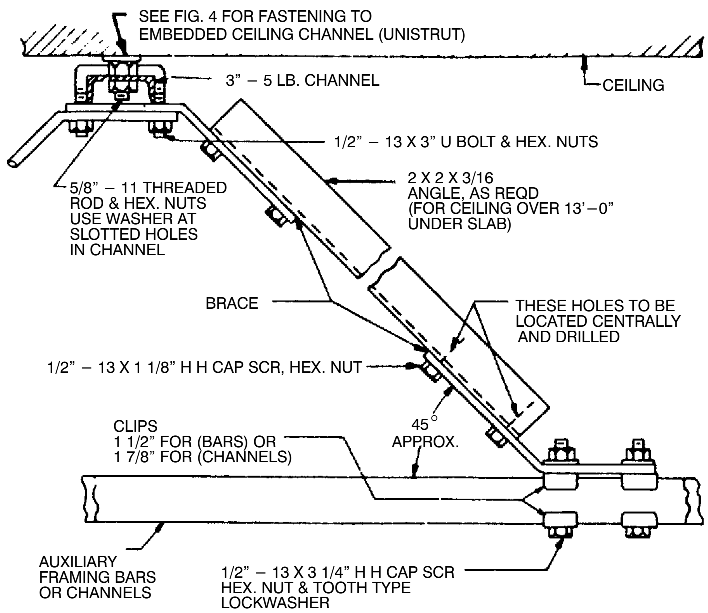
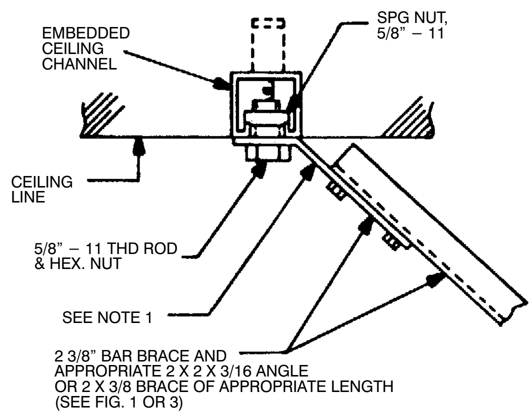


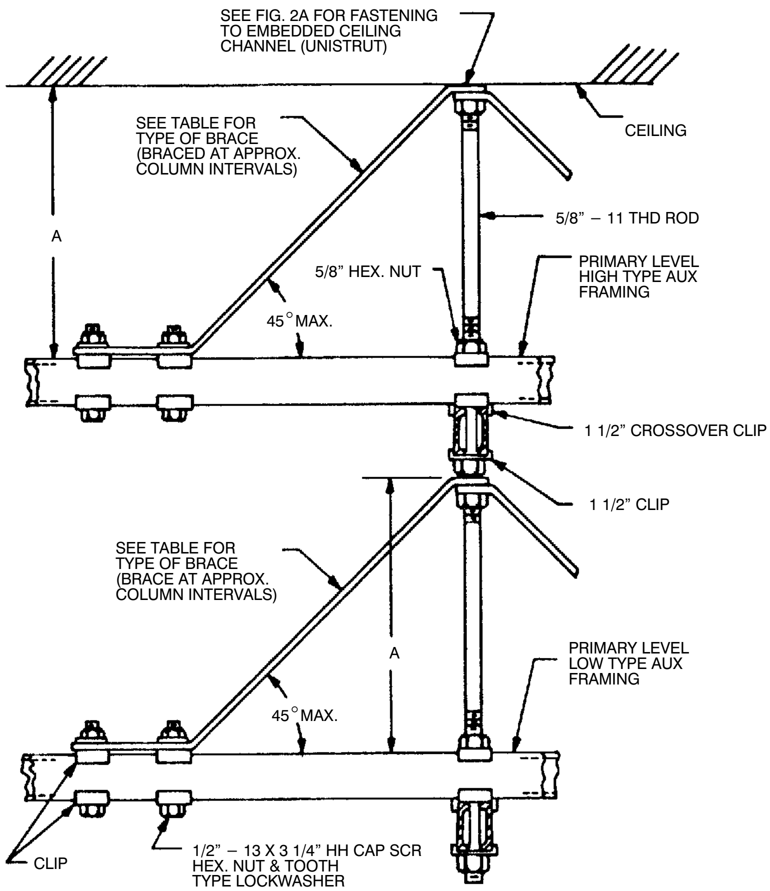
Figure 3 − Auxiliary Framing Brace For Use In High−ceiling Areas



NOTE:

1. WHERE IT IS NECESSARY TO USE PARALLEL BRACING (IN LINE WITH THE UNISTRUT), 2" X 3/8" BRACE AND 2 X 2 X 3/16 ANGLE OR APPROPRIATE 2 X 3/8 BAR BRACE SHALL BE USED WITH 2, 1/2−13 H H CAP SCREWS AND 1/2−13 SPG NUTS.

Figure 4 − Fastening Auxiliary Framing Brace To Embedded Ceiling Channel (Unistrut)
Page 1 of 2



A	TYPE OF BRACE
OVER 5" & LESS THAN 10"	2" X 3/16" BAR, AS REQUIRED
10" TO 1'−6" INCLUSIVE	2" X 3/8" BAR, AS REQUIRED
OVER 1'−6"	2" X 2" X 3/16" ANGLE AS REQUIRED WITH 2" X 3/8" BAR AT TOP & BOT. RESP.

Figure 4 − Low−Type Auxiliary Framing Braced From High−Type Framing
Page 2 of 2

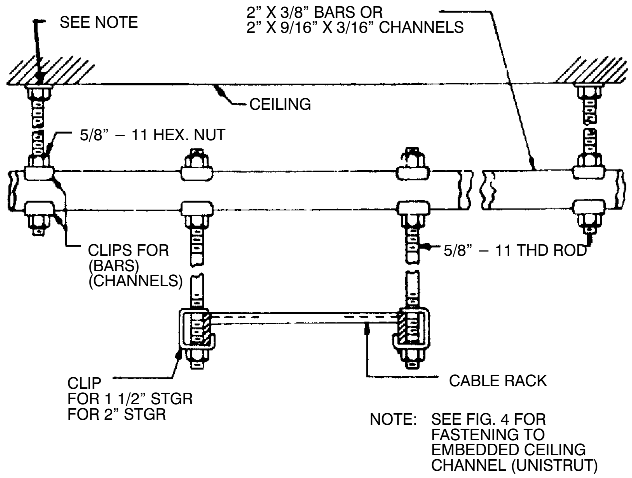


Figure 5 − Support Of Ladder− Or Bar−type Cross−aisle Cable Racks Not Attached Directly To Auxiliary Framing−−ladder Type Shown

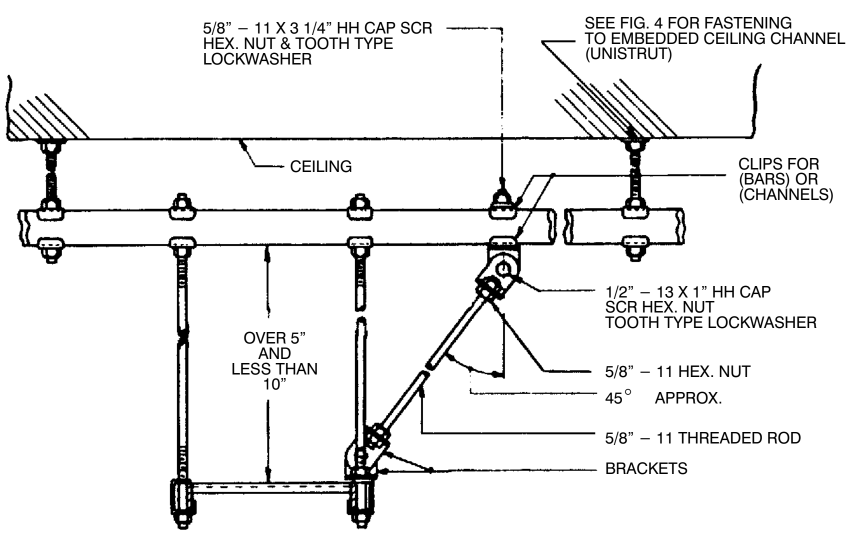


Figure 6 − Sidewise Bracing Of Ladder− Or Bar−type Cross−aisle Cable Rack With Threaded Rod Braces−−ladder Type Shown

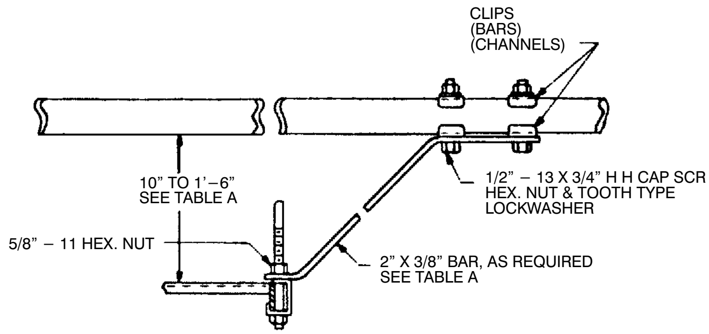


TABLE A	
DIM.	2' X 3/8" BAR PART NUMBER
10"	P−429506
1'−0"	P−429507
1'−2"	P−429508
1'−4"	P−429509
1'−6"	P−429510

Figure 7 − Sidewise Bracing Of Ladder− Or Bar−type Cross−aisle Cable Racks With Flat Bar Braces−−ladder Type Shown

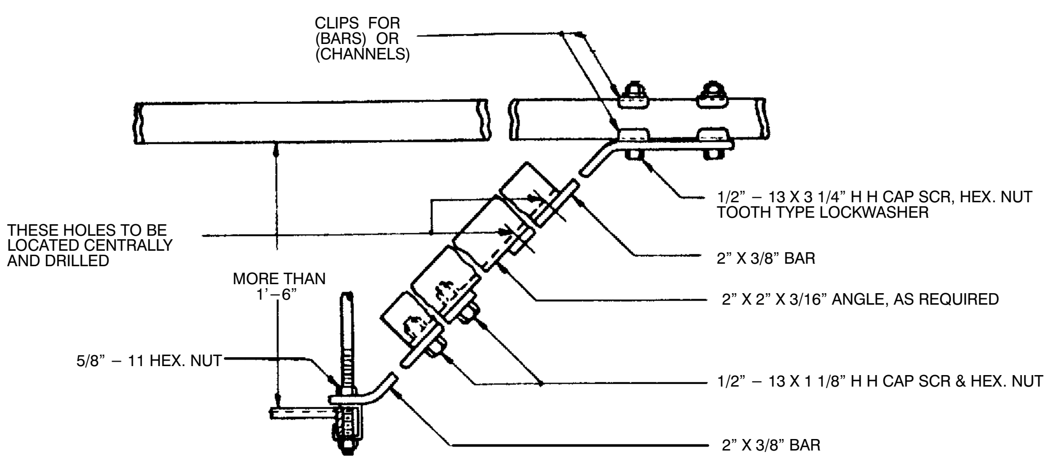


Figure 8 − Sidewise Bracing Of Ladder− Or Bar−type Cross−aisle Cable Racks With Angle Braces−−ladder Type Shown

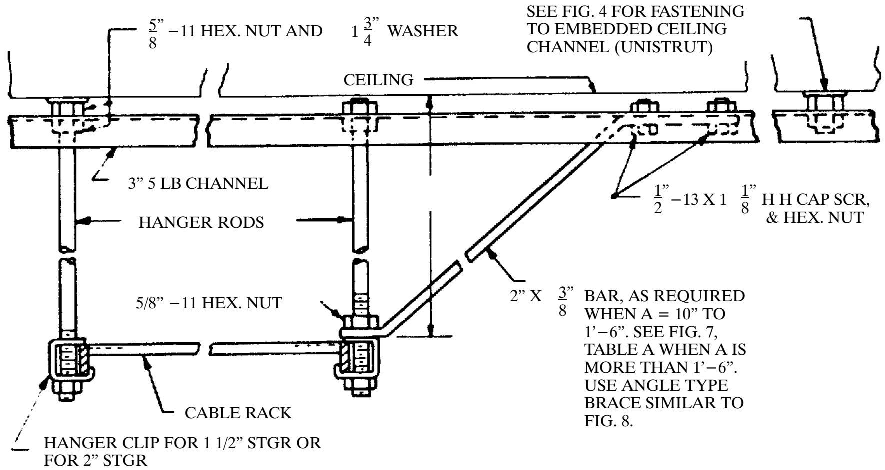
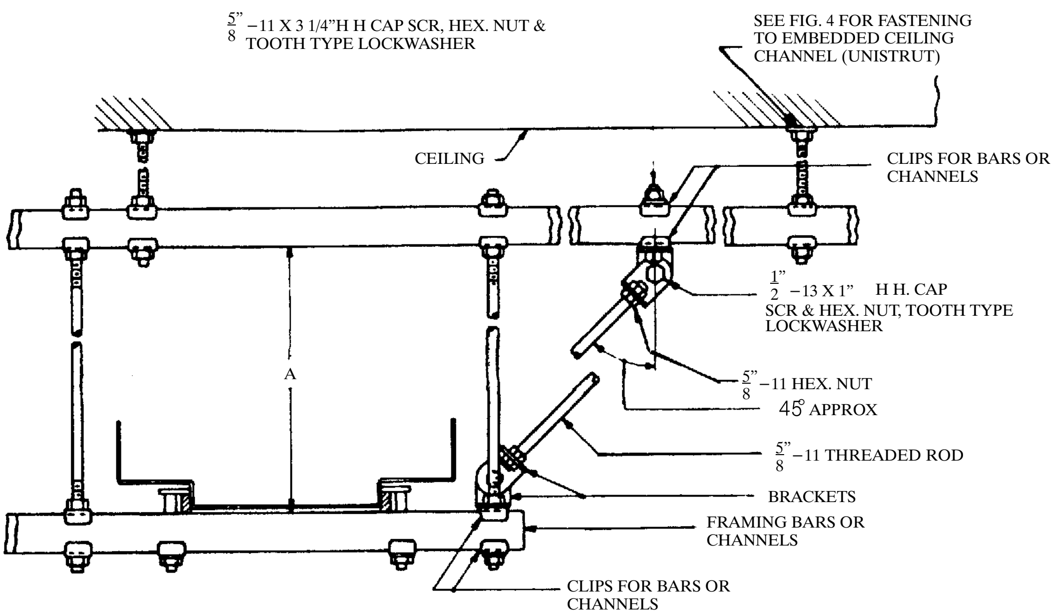
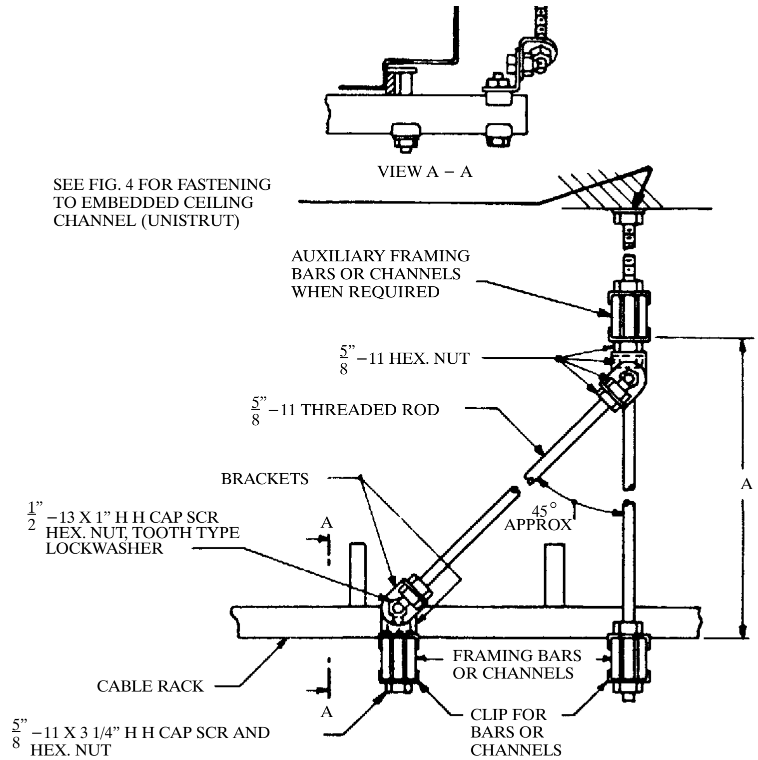


Figure 9 − Sidewise Bracing Of Ladder−type Cable Racks In Power And Operating Rooms



A	TYPE OF BRACE
OVER 5" & LESS THAN 10"	5/8" −11 THREADED ROD & BRACKETS AS SHOWN
10" TO 1' −6"	2" X 3/8" BAR, AS REQ"D SEE FIG. 7, TABLE A
OVER 1' − 6"	2" X 2" X 3/16" ANGLE, AS REQ'D WITH 2" X 3/8" BAR

Figure 10 − Sidewise Bracing Of Bar−type Over−aisle Cable Racks



A	TYPE OF BRACE
OVER 5” & LESS THAN 10”	5/8” −11 THREADED ROD & BRACKETS AS SHOWN
10” TO 1’ −6”	2” X 3/8” BAR, AS REQ”D INSTALLER TO CUT OFF END OF BRACE WITH UNUSED HOLE AND REDRILL REMAIN-ING 9/16” HOLE 11/16”
OVER 1’ − 6”	2” X 2” X 3/16” ANGLE, AS REQ’D WITH 2” X 3/8” BAR AT EACH END

Figure 11 − Endwise Bracing Of Bar−type Over−aisle Cable Racks

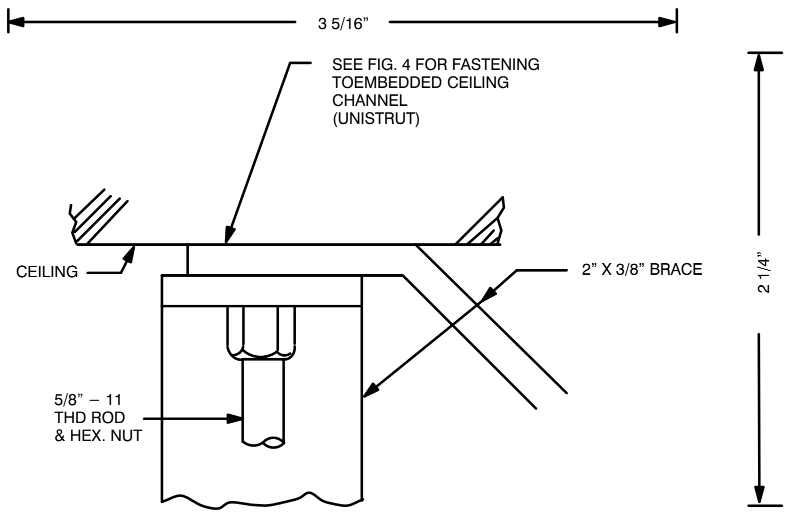


Figure 12 − Perpendicular Bracing Using A Spacer Between Brace Feet

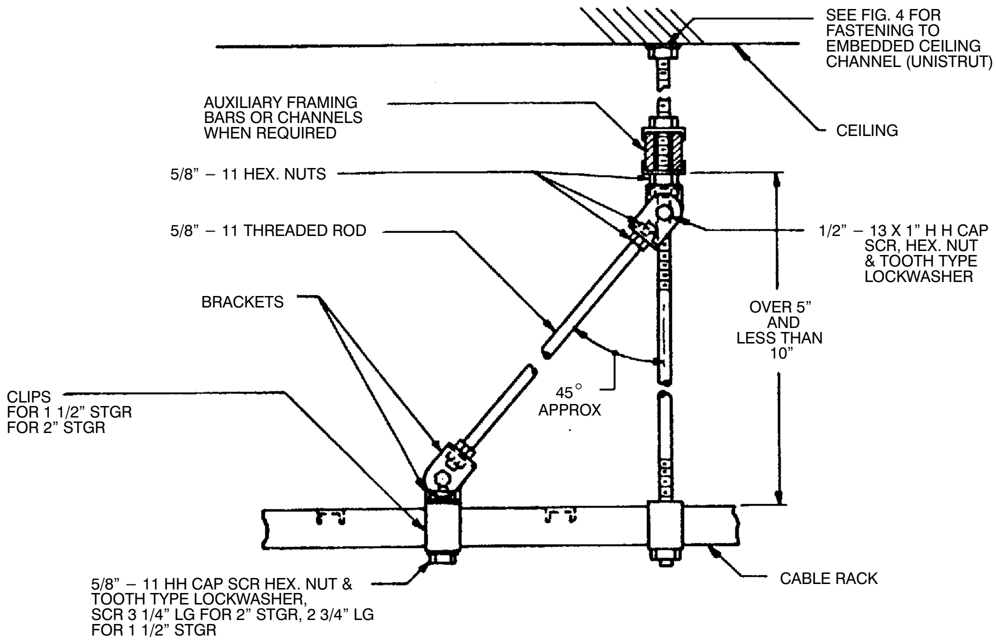


Figure 13 − Endwise Bracing Of Ladder− Or Bar−type Cross−aisle Cable Racks With Threaded Rod Braces−−ladder Type Shown

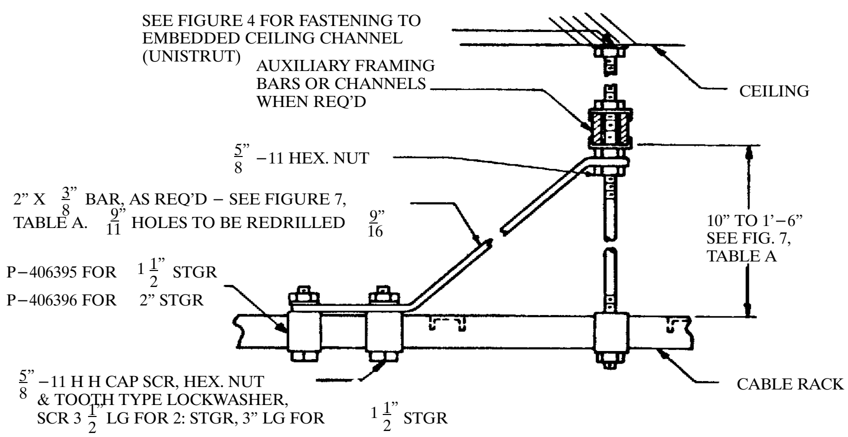


Figure 14 − Endwise Bracing Of Ladder− Or Bar−type Cross−aisle Cable Racks With Flat Bar Braces−−ladder Type Shown

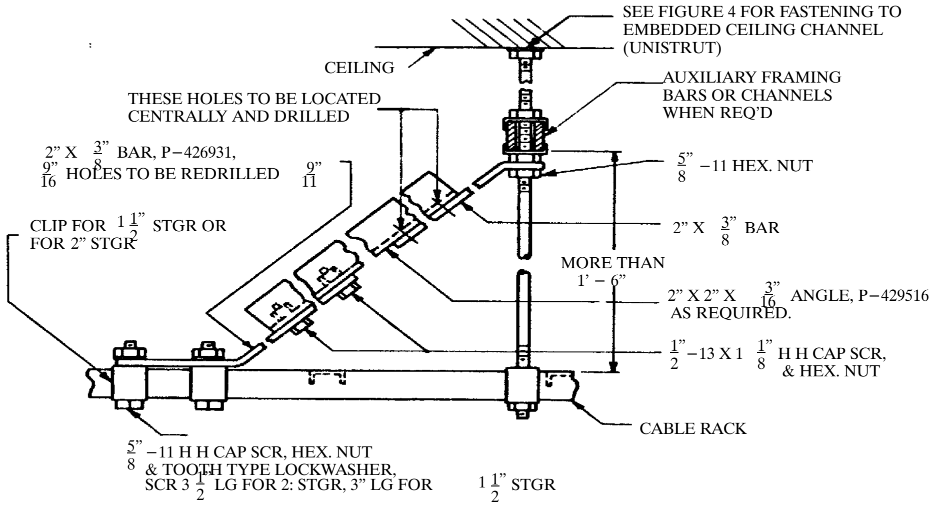


Figure 15 − Endwise Bracing Of Ladder− Or Bar−type Cross−aisle Cable Racks With Angle Braces− −ladder Type Shown

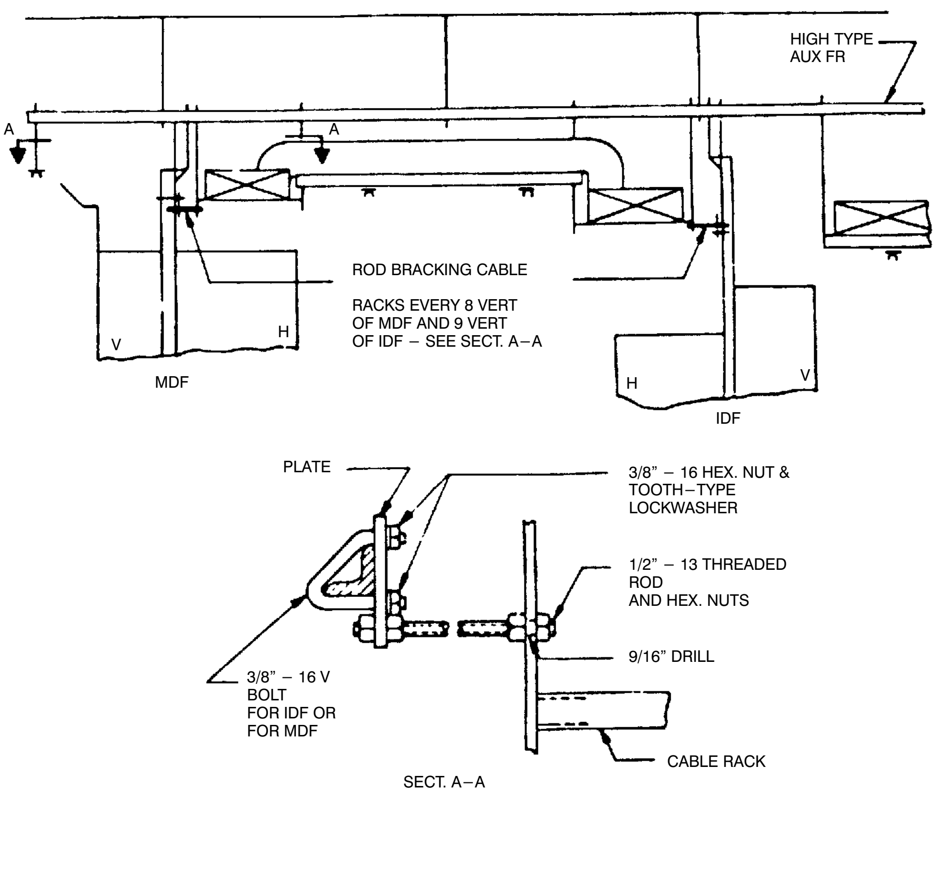


Figure 16 − Bracing Cable Racks To Distributing Frame Verticals

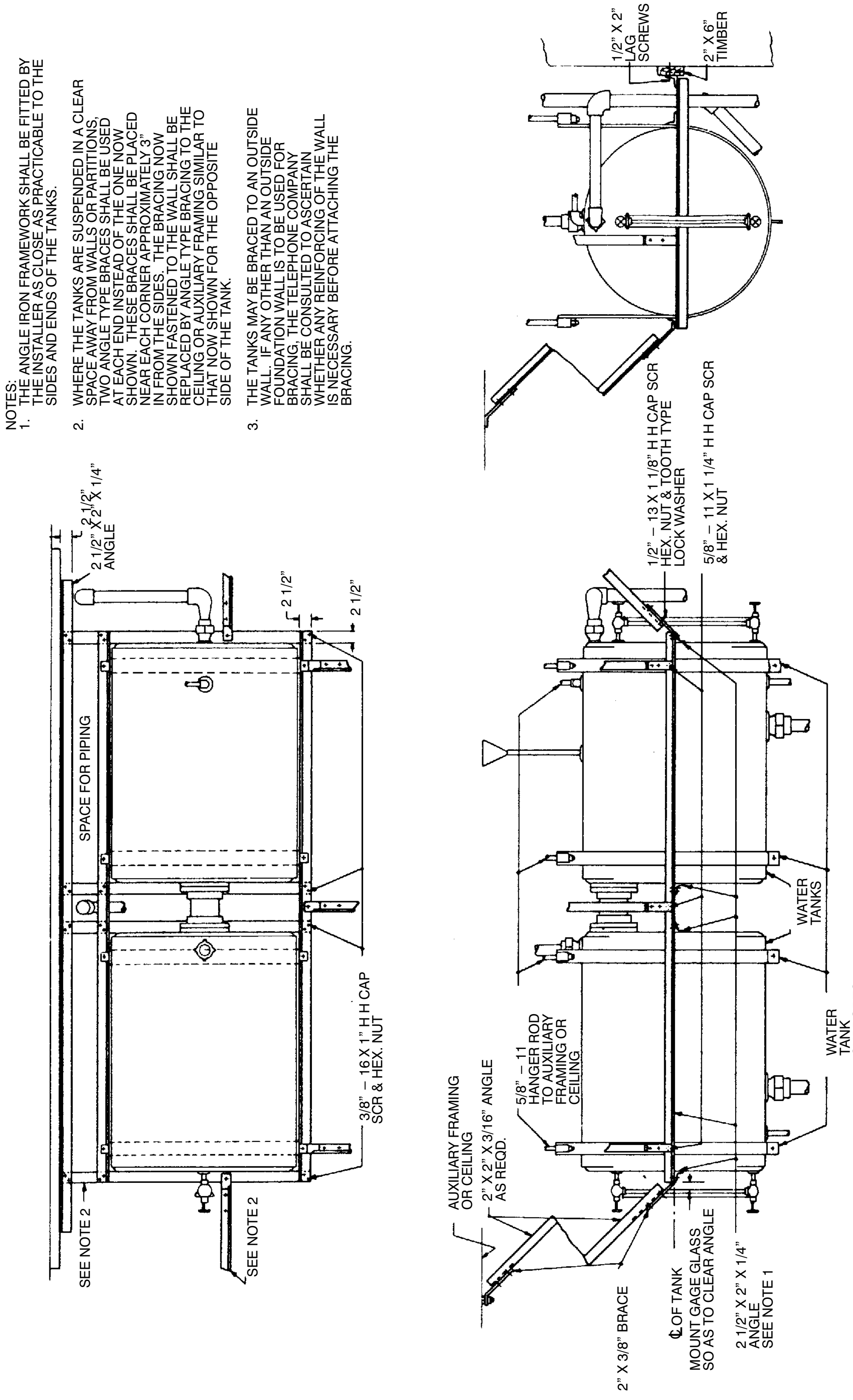


Figure 17 − Bracing For Ks−5400−02 Water Tanks Used With Reserve Power Plants

NOTES:
1. THE CONCRETE SADDLE UNDER EACH END OF THE TANK SHALL, IN THE CASE OF NEW CONSTRUCTION, BE ADEQUATELY ANCHORED TO THE FLOOR, CASTING IT INTEGRAL WITH THE FLOOR WHERE PRACTICABLE USING REINFORCING BARS AS REQUIRED. IN EXISTING BUILDINGS THE CONCRETE SADDLE SHALL BE ANCHORED TO THE FLOOR WITH AT LEAST THREE 1/2”−13 EXPANSION SHIELD ANCHOR STUDS, LARGE WASHERS AND NUTS CAST INTEGRAL WITH THE CONCRETE SADDLES.

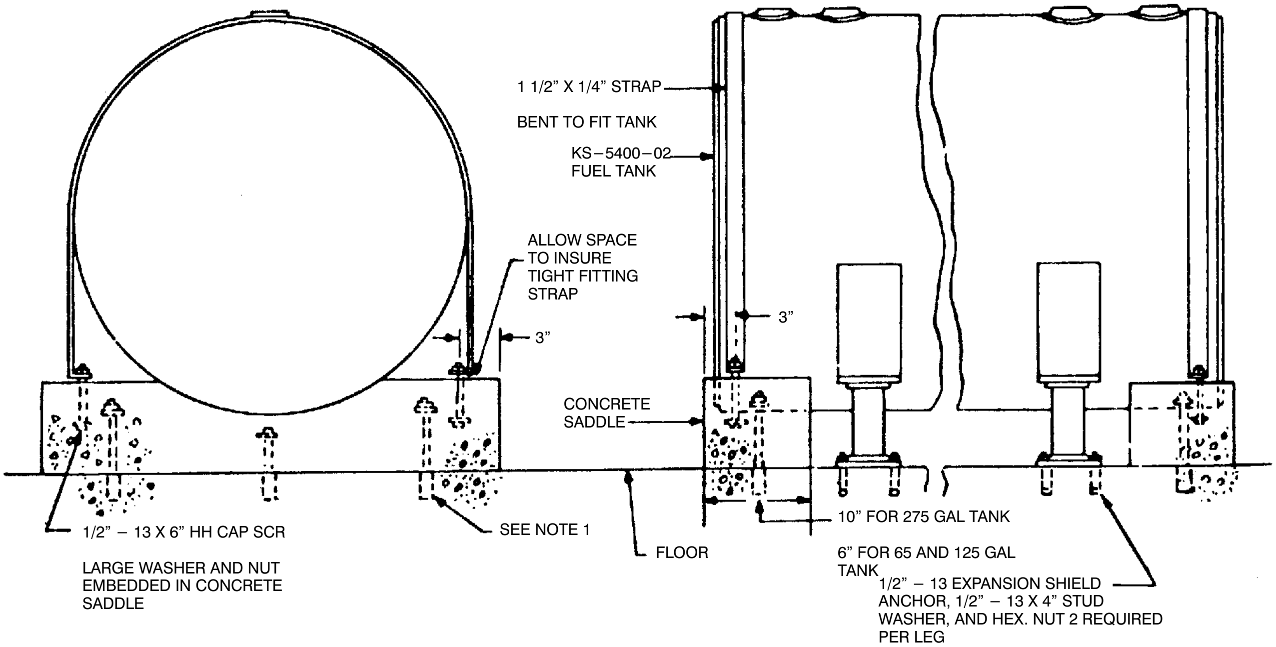


Figure 18 − Fastening Diesel−engine Fuel Oil Tank To Floor

POWER/FRAME AND AISLE LIGHTING – ENGINEERING PROCEDURES

CONTENTS

POWER/FRAME AND AISLE LIGHTING – ENGINEERING PROCEDURES

1. Introduction

1.1 This section addresses the general requirements for the engineering of BST Network DC power equipment, AC circuits, and associated systems. This section is to be used in conjunction with the job documentation and the applicable sections of the BellSouth Engineering and Installation Guidelines for Central Office Equipment.

1.2 The requirements in this section are general in nature and not all inclusive.

2. General

2.1 All AC electrical equipment and materials specified shall be listed by the Underwriters Laboratories, Inc. (UL). The current National Electric Code (NEC) shall be followed in any work involving AC power. When local laws or ordinances (city, county, or state) apply more stringent requirements, then the power detail engineer shall adhere to the local law or ordinance.

3. Assembly

A. General

3.1 Refer to Earthquake and Disaster Bracing for supplementary measures to be followed in the supporting and fastening of power equipment areas subject to earthquake shocks.

B. Battery Stands/Racks

3.2 Battery stands for flooded lead acid batteries are supplied from various manufacturers and consist of metal or polyester−glass construction. On a going forward basis, only shelf type battery stands shall be used for flooded lead calcium type cells 1680 Ampere hour capacity or less. The following are minimum guidelines for the installation and safe operation for stationary batteries.

(a) Metal stands shall be finished with an acid−resistant paint.

(b) Shelves of battery stands shall be made of or protected with a non−conductive, acid−resistant plastic/rubber liner under each tier of batteries.

(c) Valve Regulated Lead Acid (VRLA) batteries used in remote applications generally use relay rack mountings in the bottom of the bulk power plant bay.

C. Bus Bar

3.3 Aluminum bus bars shall be used only to extend or supplement existing aluminum installations. New bus bars shall be copper.

3.4 Bus bar joint, fastening and support bolts, screws, nuts, washers, clips, etc., shall be either zinc plated or copper finished. Bus bar supports, clips, bolts, nuts and washer shall be zinc, stainless or cadmium plated plus a chromate treatment. Bus bar supports shall consist of epoxy glass or phenolic insulators with metal inserts. These supports shall be supported by auxiliary framing or other details as provided in the bus bar plan or specifications.

3.5 Bus bar runs shall be supported on 6 foot, 0 inch centers maximum.

3.6 Bus bar runs supported by ceiling inserts, threaded rods (5/8 inch) and/or auxiliary framing channels shall be braced on both sides and lengthwise.

3.7 Horizontal bus bar runs installed over passage/walking areas shall be at a minimum height of 7 feet, 0 inch above finished floor.

3.8 Space between different bar voltages shall be a minimum of 3 inches.

3.9 Except for fastening to the supports with 2 inch isolators, bus bar runs shall be installed at least 3 inches from metal pipes, cable racks, auxiliary framing channels, etc.

4. Overcurrent Protection Devices (Fuses & Circuit Breakers)

4.1 Primary sources furnished by the Power Board (PBD), and secondary sources furnished by a Battery Distribution Fuse Board (BDFB), Battery Distribution Circuit Breaker Board (BDCBB), Battery Distribution Board (BDB), or Fuse Board (FBD) shall follow the requirements covered herein. Secondary sources are fed from the power board with large fuses or circuit breakers and divided into smaller circuits at the BDFB, FBD, etc.

4.2 When network elements are protected with a fuse, the fuse should be sized at approximately 150% of the peak current specified by the network element manufacturer (commonly referred to as the "List 2" drain). When network elements are protected with a circuit breaker, the circuit breaker should be sized at approximately 125% of the List 2 peak drain. Generally the detail engineer should round up to the next standard protection device size. Protectors should not be sized based solely on the ampacity of the cable.

4.3 Distribution leads from secondary sources are always taken from the top of the bay except in a raised floor environment, such as computer room, where all leads are taken from the bottom of the bay. Incoming power leads from the primary source may enter from either the top or bottom of the assembly, as desired.

4.4 Various panels are available for mounting circuit breakers and fuses. Vertical bus bars are furnished to interconnect the individual panels. In a secondary source, all the panels connected to one supply lead must be in one group on each bay, but there may be several groups on one bay which are connected to different supply leads. Alarm fuses shall be supplied for each load fuse.

4.5 The maximum protection device capacity at the primary source (PBD) shall be a 400 ampere circuit breaker or a 600 ampere fuse. The maximum protection device capacity serving a new BDFB or switch load shall be a 225 ampere circuit breaker or fuse.

4.6 The largest fuse to be mounted in a BDFB shall be 60 amperes.

4.7 A BDFB or fuse bay located on one floor shall not be used to supply equipment located on another floor.

4.8 The primary source overcurrent protection device (discharge fuse or breaker) serving a secondary source shall be not less than 400 percent respectively of the largest secondary fuse.

4.9 Every 225 ampacity breaker furnished by a vendor with a power plant shall be provided with the appropriate number of lugs for the termination of the maximum number of 4/0 cables per the standard termination method of that plant. (Any power plant which will directly terminate any size leads without the use of non−standard termination lugs are exempt from this requirement.)

4.10 All breakers of 100 amperes or greater must be 100% ampacity rated, and be equipped with the following:

(a) Capacitive load precharge circuitry.

(b) A shunt to facilitate the remote reading of the drains associated with that distribution unit.

(c) Covers or protection brackets, sufficient to prevent breaker from tripping from casual contact with the breaker handle.

(d) Clearly marked ON and OFF labels, in contrasting colors to make them easily readable from the front.

4.11 Fuse Board and Power Ring And Tone Distribution bays are designed to provide a centralized location for equipment to obtain power of small amperage. A fuse board can be provided with power from the BDFB, PBD, and/or Ring and Tone Plant.

4.12 Whenever a Power Board, BDFB, or Fuse Board which uses fused distribution is installed, a spare fuse panel shall be provided. This panel shall be stocked with at least one spare of every size of fuse that is used in the associated plant, and those spares shall be treated with NO−OX−A before being placed on the holder.

4.13 Spare fuses shall be provided as follows:

Quantity	Spare	
0 – 60 ampacity	1–10	100%
	11–80	25% (10 minimum)
	81–up	10%
61 – 100 ampacity	1–5	100%
	6–up	25%
101 – up ampacity	any	25% (minimum 1)

4.14 Blank Panels on BDFB shall be placed in the following locations:

(a) Between loads of different voltages or polarities.

(b) Unequipped positions.

4.15 An assignment table shall be added to the Central Office Record drawings for all miscellaneous fuse panels (usually for transmission equipment). The table shall include the following information:

(a) Designed capacity of the fuse panel by load (A or B).

(b) The fuse capacity assignments by load.

(c) The maximum drain for each fused load.

4.16 All fuses and circuit breakers greater than 100 ampere, except for the main switch (such as DMS, ESS, EWSD), shall be monitored. This applies to only one switch per central office.

5. Cable Sizing

5.1 The engineer sizes each DC power feeder cable for the ultimate aggregate List 2 drains it will carry. A List 2 drain is the peak current for a circuit or group of circuits under worst case operating conditions. Cables should be sized using the following equation:

$$CM = \frac{IL2 * DISTLOOP * K}{V_{LOOP}}$$

Where:

- CM = Circular Mils, usually expressed as MCM or kcmil for thousand circular mils
- IL2 = Sum of all List 2 currents expected in the cable
- $DIST_{LOOP}$ = Length of circuit loop in feet
- K = Conductivity factor of circuit conductors (typically 11.1 for copper)
- V_{LOOP} = Allowable voltage drop for the circuit loop

5.2 The allowable voltage drop (V_{LOOP}) is found using the vendor specified minimum emergency voltage (MEV) for the equipment being served (current Network Equipment Building System [NEBS] standard is 42.75V) and the minimum volts per cell (MVPC). For most new power plants serving electronic switching systems, MVPC should be 1.86V. MVPC of 1.84V may be more appropriate for some remote switching locations and MVPC of 1.88V may be more appropriate for some locations where the switch and power plant are widely separated. The MVPC chosen by the detail engineer shall be documented on the office record drawings.

$$V_{LOOP} = (MVPC * \#\ of\ cells) - MEV = V_{d1} + V_{d2} + V_{d3}$$

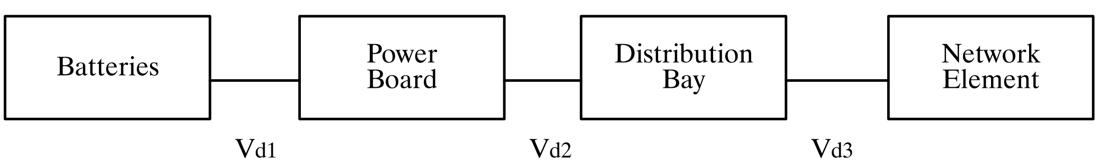


Figure 1 − Block Diagram Depicting Various Voltage Drops

5.3 Reference Figure 1 for the following paragraphs. The voltage drop from the batteries to the power board (V_{d1}) shall be 0.25 V per loop length (0.2 V + 0.05 V shunt). The voltage drop between the power board and distribution bay is called V_{d2}. The Capacity Manager should specify V_{d2} when the distribution bay is engineered. If the distribution bay is relatively close to the power board as compared to the network elements being served, then minimizing V_{d2} and maximizing V_{d3} will result in the most economical cable sizing for the system. If the distribution bay is relatively close to the network elements as compared to the power board, then maximizing V_{d2} and minimizing V_{d3} will result in the most economical cable sizing for the system. Some network element manufacturers suggest a value for V_{d3}, usually 0.5 V loop (typical 1 V max). In most CEV and hut locations, V_{d2} will be zero, since the power board and distribution panel are co−located. The allowable voltage drop of all power distribution sections of a power distribution system (V_{d1}, V_{d2}, V_{d3}) and the MVPC will be furnished to the vendor by the BST Capacity Manager. This information shall be included on the drawings of the plant that are prepared by the vendor.

5.4 In the following example, the given scenario is the addition of power feeders from a power board to a distribution bay. The distribution bay is relatively close to the network elements being served, so we will specify 0.5 V loop for V_{d3} and calculate V_{d2}. The voltage drop from the power board to the distribution bay (V_{d2}) (BDFB, PD, PCD, etc.) is:

$$V_{d2} = (\text{MVPC} * 24 \text{ cells}) - (\text{MEV} + V_{d1} + V_{d3})$$

therefore,

$$V_{d2} = (1.86 \text{ V} * 24) - (42.75 + .25 + .5)$$
$$V_{d2} = 44.64 - 43.5$$
$$V_{d2} = 1.14 \text{ volts loop}$$

5.5 Continuing this example, and assuming an aggregate I_{L2} = 200 A and cable length of 200 ft:

$$\text{CM} = (200 \text{ A} * 200 \text{ ft} * 11.1) / 1.14 \text{ V} = 389{,}474 \text{ CM}$$

Therefore, this example would require the next available size power cable (500 MCM).

5.6 There are other means for determining appropriate power cable size. These include computer programs, look up tables, circular slides (power wheel), and horizontal slip sticks, which incorporate the equations set forth in paragraphs 5.1 through 5.5.

5.7 Cable cost increases as minimum emergency voltage (MEV) increases and voltage drop decreases.

5.8 The cables between the rectifiers and their termination at the power plant or originating battery stand shall be engineered for a one volt loop voltage drop, but in no circumstance shall the cable size be made smaller than the NEC and cable specifications will allow for 115% of the rated rectifier output (e.g. A 100 ampere rectifier cable shall not be smaller than the NEC cable specifications allow for 115 amperes.)

5.9 The cabling between a power board and the bus bars above the originating (“A”) battery stand must be sized to carry the full capacity of the power plant without exceeding the allowable voltage drop between them, unless the Capacity Manager specifies another capacity in the specification. This requirement does not apply to power plants where cables connect battery strings directly to the power board.

5.10 Size 4/0, flexible welding type cable (CK20921), is the standard size and type to be used on all sizes and types of cells. Size 350 MCM, flexible welding type cable, is acceptable on 3500 amp−hr. cells. See Table A.

5.11 CK−5482−01, CK−5482−H, and CK−20921 (aka KS−5482−01 and KS−20921) are the approved types of power wire and cable for DC applications in BST. Regardless of the cable sizing techniques previously specified, the maximum allowable ampacity ratings for these cables are as follows:

Nominal Cable Size Ampacity Rating

AWG	CK-5482-01	CK-20921	CK-5482-H
14	15	NA	20
12	20	NA	25
10	30	NA	35
8	45	35	50
6	65	55	65
4	85	75	85
2	115	95	115
1/0	150	140	150
2/0	175	150	175
4/0	230	210	230
350 MCM	310	290	310
500 MCM	380	360	380
750 MCM	475	430	475

Notes: **Operating temperature of 75º C(167º F) and ambient temperature of 30º C(86º F) for CK−5482−01 and 40º C(104º F) for CK−20921 are assumed. Refer to the actual manufacturer specifications if these assumptions are not valid.**

6. Batteries

A. General

6.1 All new cell containers shall have an LOI rating of 28 or greater.

6.2 When installing cells which have 4 posts or 2 terminals per polarity, the same quantity of conductors, run between the cell post and the bus drop plates, shall be installed for inter−tier and inter−shelf connections. Table A shows the standard quantity of cables used per cell size.

TABLE A

CONDUCTORS FOR INTER−CELL AND BUS DROP TO POST PLATE: SINGLE (1 POST ON EACH SIDE) OR DUAL POST CELLS (2 POSTS ON EACH SIDE)

CELLS amp-hr. cap. 8 hr. rate	CONDUCTORS inter-tier & shelf qty.	size	CONDUCTORS between bus & post qty.	size
420	1	4/0	1	4/0
420	2	4/0	2	4/0
840	2	4/0	2	4/0
840	4	4/0	4	4/0
1680	4	4/0	4	4/0
2525	6	4/0	6	4/0
3500	6	4/0	6	4/0
3500	4	350MCM	4	350MCM

B. Hardware And Accessories

6.3 All connection hardware (bolts, nuts and washers) on cell post connections shall be stainless steel, grade 316 and marked 316 accordingly. Washer thickness shall be 1/8 of an inch nominally. The washer inside diameter shall allow the nut and bolt head to properly contact the designated surface area.

6.4 Straps for connecting cells shall be lead plated copper. Recommended nominal strap sizes by cross sectional area:

(a) 1680 amp−hr. or smaller − 1/8 x 1 inch (for use with seismic type commercial racks)

(b) 1680 amp−hr. or smaller − 1/16 x 1 inch (for use with pre−divestiture type battery stands)

(c) Larger than 3000 amp−hr. − 1/4 x 2 inches

6.5 Each flooded lead acid battery string shall be supplied with the following accessories:

(a) Explosion proof vents with dust caps per cell

(b) Two thermometers per string (non−mercury, with specific gravity correction scale)

(c) One Hydrometer with holder per string (scale: no more than 2 points/division)

(d) Withdrawal tube assemblies with removable caps or rubber stoppers

6.6 All new batteries of 840 Ampere−hour capacity or greater must be arranged with a redundant set of inter−cell straps, and inter−tier and inter−row cables in such a manner that one set of straps can be removed for maintenance purposes without interfering with the second set of straps, i.e. without opening continuity of the string. NOTE: Redundant straps sharing bolting hardware on the same battery post do not satisfy this requirement.

6.7 Compression connectors for battery cells shall have a closed barrel transition at the cell end.

C. Moving And Installing

6.8 Installation vendors shall specify and order only matched cells for installation at the job site. Cells are matched by putting them through a constant current at the factory and grouping them by voltage so they all have similar float characteristics.

7. Converter Plants And Miscellaneous Power Supplies

7.1 All common equipment, i.e. non−imbedded, converters must be fed directly from the main −48 volt power source. Feeds from a dedicated fuse panel located in the converter bay are not acceptable, as the loss of a single fuse can cause the loss of the entire converter plant.

7.2 Output fuses on converter plants shall be no larger than the total full−load output of all of the equipped converters, less the spare unit capacity (example: a plant with two−five amp converters and two−six amp converters shall have no output fuses larger than 5+5+6+6−6(spare) =16 amperes).

7.3 Many converters, ringing generators, and inverters are factory equipped with a strap between the frame and the input ground terminal (for polarity protection). This strap must be removed in all instances, prior to turnover to BST. If the removal of this strap causes the unit's case to be isolated from the ground connection of the plant framework in which it is mounted (float), then a new strap from the unit frame ground stud to the plant framework ground connection must be provided.

8. Ampacity And Sizing Of AC Conductors

8.1 National Electric Code Section 310 covers conductors for general wiring requirements.

8.2 Conductors shall have as a minimum the same current carrying capacity as the overcurrent protection device. National Electric Code (NEC) Tables 310−16 through 310−19 are to be used in determining the ampacity of conductors.

8.3 All branch circuit wiring shall be a minimum No. 12 American Wire Gauge (AWG) solid copper wire per NEC Table 310−5. No aluminum conductors shall be used for branch circuits.

8.4 When more than three conductors are run in a single conduit, the feeders will have to be derated per NEC Article 310 Note 8, 10A and 11. Wireways and Gutters, such as those used with CK 22088 cabinets, cannot be filled beyond 20% capacity. If more than 30 conductors are run, derating per Article 310 Note 8 is required (Refer to NEC Article 362−5 and/or 374−5,6).

8.5 Feeders may also need to be sized based on voltage drop requirements. Generally, it is not necessary to calculate the size of feeders based on voltage drop requirements for branch circuits sixty−five feet or less in length (one way). However, when calculations are required to determine wire sizes based on voltage drop requirements, the voltage drop across conductors should not exceed the following:

A. For telecommunication equipment and motor loads:

(1) From House Service Panel (HSP) to load 5%

(2) From HSP to Power Distribution Service Cabinet (PDSC) 3%

(3) From PDSC to load 2%.

B. For lighting and data processing circuits:

(1) From House Service Panel (HSP) to load 3%

(2) From HSP to Power Distribution Service Cabinet (PDSC) 2%

(3) From PDSC to load 1% (Capacity Managers may refer to BSP 790−100−667SV for additional information)

9. Color Coding AC Branch Circuits

9.1 The following is BellSouth's color coding scheme for all AC branch circuits which shall be used in all telephone offices.

(a) 120V, 2−wire circuit: Grounded Neutral − White; Hot Leg − Black.

(b) 240/120 V, 3−wire, single−phase circuit: Grounded Neutral − White; One Hot Leg − Black; One Hot Leg − Red.

(c) 208/120 V WYE, 4−wire, three−phase circuit: Grounded Neutral − White; One Hot Leg − Black; One Hot Leg − Red; One Hot Leg − Blue.

(d) 240V Delta, 3−wire, three−phase circuit: One Hot Leg − Black; One Hot Leg − Red; One Hot Leg − Blue.

(e) 240/120 V, 4−wire, three−phase High Leg Delta Circuit: Grounded Neutral − White; High Leg (208 V to Neutral) − Orange; One Hot Leg − Black; One Hot Leg − Blue.

(f) 480/277 V WYE, 4−wire, three−phase circuit: Grounded Neutral − Gray; One Hot Leg − Brown; One Hot Leg − Orange; One Hot Leg − Yellow.

(g) 480 V Delta, 3−wire, three−phase circuit: One Hot Leg − Brown; One Hot Leg − Orange; One Hot Leg − Yellow.

(h) The AC Equipment Ground (ACEG) lead is required and shall be one of the following:

(1) Green

(2) Green with one or more yellow stripes

(3) Bare copper if part of the cable assembly (i.e., armored cable).

10. Conduit

10.1 The size of conduit and the number and gauge of wires to be carried therein shall be in accordance with the requirements of the NEC Chapter 9.

Electric Metallic Tubing (EMT)

10.2 EMT is acceptable for rigid aluminum conduit in those instances where the NEC, local ordinances (city, county, or State), and physical requirements permit. The TEO will specify if a local ordinance does not permit the use of EMT.

Raceways

10.3 Metallic raceways are approved for use in BellSouth. The use of nonmetallic raceways (i.e., Schedule 40 electrical PVC) for AC Distribution in BellSouth is not approved.

Fittings

10.4 Compression type fittings are approved. Set screw type fittings are not to be used in BellSouth. Twist lock AC plugs for rectifier inputs are acceptable at remote locations when specified by the manufacturer.

11. Armored Cable

11.1 Armored cable per CK20785 (BX is not approved) can be used when it is segregated from insulated type cable. A separate bare or green insulated lead enclosed in the armored cable shall be used as the ACEG.

12. Approved Cable And Wire

12.1 THHN, THWN, or THW are BellSouth's approved wire for use in dry and wet locations. These wires are not approved for use on cable racks or on or across similar support structures. The thermoplastic (polyvinyl chloride) insulation cold flows under pressure; therefore, its use is restricted to applications where it is run in conduits or raceways.

12.2 CK5482H is intended primarily for use in the telephone power plants in conduit or on cable racks.

12.3 CK20921 is intended primarily for use when super flexible conductor is required. This cable primarily shall be used for tapping down from cable rack to equipment.

12.4 CK20785 Armored Cable is intended for use in telephone power plants, aisle lighting, convenience outlets, and general applications where specification grade armored cable is desired to handle power up to 600 volts.

13. Unistrut

13.1 Unistrut is permitted in the power and engine rooms for the support of AC cable racks and conduits where there is no auxiliary framing. It shall be made of hot dipped galvanized steel. The threaded rods supporting the unistruts shall be also made of hot dipped galvanized steel and shall be a minimum of 1/2" in diameter.

13.2 For the support of a single AC conduit, it is permitted to use 1/4" threaded rods with conduit clamp.

14. Engine

14.1 The engine isolators shall be connected to the floor. See the manufacturer's documentation.

Frame And Aisle Lighting–Engineering Procedures

15. General

15.1 All frame and aisle lights shall be located so as not to interfere with cable racks, rolling ladders, ladder tracks, and auxiliary framing or other obstructions. The lighting units may he placed on either side of the ladder tracks. If lighting is required for a frame on only one side of the aisle, locate the lighting on the side of the ladder track away from the frame, if ladder track is present.

15.2 All structurally concealed conduit will be installed by BST. Wiring shall be run in this conduit only when specified or approved by the Capacity Manager.

15.3 Lighting equipment and appliance outlet circuits supplied by polyphase service shall be assigned in such a manner as to balance the load on the different phases as closely as practicable.

15.4 Lighting equipment and appliance outlet circuits shall not be supplied by the same branch circuit. Wiring for both shall be run in the same conduit wherever possible. Motor wiring shall be run in a separate conduit. A maximum of ten trolley–type appliance outlets may be installed on a single–branch circuit.

15.5 Control switches with associated pilot lights shall be provided on the originating end of the distributing frame lineup for "trolley type" bus duct, and shall open the live side of the circuit.

15.6 The Specific Installation drawings and CO Base Drawings shall provide the installer a current Frame and Aisle Lighting drawing associated with the proposed location of light fixtures, outlets, conduit and supporting details. Frame and Aisle Drawings will completely identify all equipment and apparatus items, piece parts, fittings and conduit either by direct reference or by reference to drawings on which this information is provided.

15.7 When adding fluorescent light fixtures and receptacles greater than 120 volts AC, (Example: 277 volts) the installer shall have each end of the conductor identified with a "277 Volt Circuit Marker".

15.8 An assignment table is located on the frame and aisle lighting drawing that provides the installer an assigned circuit breaker (amperage), voltage (120/277) and the number of light fixtures and allowable wattage assigned to each circuit.

15.9 All lighting equipment and the entire conduit system shall be permanently and effectively grounded.

15.10 The general lighting in apparatus and wiring aisles, except distributing frame aisles and aisles less than 15 feet in length, is to have two−point control by means of 3−way switches. These switches are to be located on the left lineup end/guard as you enter the aisle. If the left lineup is incomplete, the switch shall be mounted on the right end/guard. When the left lineup is complete the switch shall be relocated to that end/guard. Transverse aisle lights are to be controlled by single−pole switches. The switches are to be mounted in the aisle end guards. Armored cables are to be used for risers to the overhead rigid conduit supply runs.

15.11 The maximum circuit capacities for terminal and apparatus, power, battery, engine room, frame and aisle lighting should be 1500−lamp watts total with a 15−ampere fuse or 1920−lamp watts total with a 20−ampere fuse.

16. Fluorescent Type Lighting

16.1 This unit outlines engineering requirements for framework supported lighting systems employing fluorescent fixtures.

16.2 In some cases, fluorescent lighting is provided as an integral part of equipment. In such cases the manufacturers specifications for lighting should be followed.

16.3 Track integrated lighting fixtures are approximately 53 inches long and employ two 40−watt rapid start fluorescent lamps. An additional fixture, approximately 29 inches long and using two 20−watt lamps may he used primarily as a fill−in unit in confined locations. These are not to be used unless specifically approved by the Capacity Manager.

16.4 All new installations shall use T−8 fluorescent lamps with a color temperature of 3500 degrees Kelvin. Single T−8 lamps shall be used where possible (This may require a high performance reflector, please consult the Property, Procurement, Services Management (PPSM) planners for its availability).

16.5 All new and replacement ballasts shall be electronic ballasts. Whenever possible, wire four T−8 lamps per electronic ballast.

16.6 Conduit between fixtures is to be fastened to the auxiliary framing channels by means of conduit clamps.

16.7 General low−intensity lighting is to be provided by connecting two fixtures in alternate apparatus aisles to a single switch. For large offices where this load may require several branch circuits, the switch is to operate a 48 V−AC contactor. The contactor is normally located near the center of a block of frames. The high−intensity lights in each apparatus aisle are to be controlled by a 3−way switch at the end of each aisle.

16.8 Feeders for supplying lighting in accordance with this specification may be calculated on the basis of 3 watts per square foot at 90 percent power factor for the equipment area. The feeders may be terminated at ceiling outlets convenient to the distribution cabinets or at a single cabinet for extension as required.

16.9 When branch circuits are 120 volts, 1280 lamp watts (ballast watts not included) is the maximum fluorescent load that shall he connected to a single branch circuit using 12 gauge wire on a 20−ampere fuse. However, the maximum load connected to a single switch shall be as follows: 480 lamp watts on a 10−ampere 125−volt T−rated switch, 960 lamp watts on a 20−ampere 125−volt T−rated switch, 1280 lamp watts on a 20 ampere 120 to 277 V−AC only switch, 1280 lamp watts on a 15−ampere 120 to 277 V−AC only switch, 1280 lamp watts per circuit on DC contactors.

16.10 When branch circuits are 277 volts, 3040 lamp watts (ballast watts not included) is the maximum fluorescent load that shall be connected to a single branch circuit using 12 gauge wire on a 20−ampere fuse. However, the maximum load connected to a single switch shall be as follows:

3040 lamp watts on a 20 ampere 120 to 277 V−AC only switch, 2800 lamp watts on a 15−ampere 120 to 277 V−AC only switch, 3040 lamp watts per circuit on a DC contactor.

16.11 All ballasts are to be designed for operation on 112 to 127 volts or 255 to 290 volts, 60 cycles.

16.12 If the line of frames is less than 15 feet, but it is to be extended at a later date, a 3−way switch shall be provided at the originating end. Initially, this switch is connected for single−pole operation, when the lineup is extended, another 3−way switch shall be provided for the growing end and the switches shall he connected for 3−way operation.

16.13 All control switches shall open the live side of the circuit.

16.14 The front of all lineups shall be lighted. The rear of lineups may be lighted at the request of BellSouth Operations or manufacturer specification.

17. Incandescent Lighting

17.1 No new incandescent lighting shall be installed in BST Central Offices.

18. Appliance Outlets

18.1 All appliance outlets shall have 15−ampere, 125−volt, 3−wire parallel polarized receptacles, of the duplex type. Grounding and polarity verification of all AC service is required.

18.2 Risers shall be located at the non−growing end of partial lines of frames and at either end of complete lines. Locate outlets so as to avoid center uprights of 2−bay frames. Avoid locating an outlet adjacent to an end guard, when practicable. Where possible, avoid locating outlets under encased equipment. Do not locate an outlet on a fuse bay. On single sided distributing frames locate an outlet in the first frame work unit and one every third unit along the line.

18.3 On all frames with angle−type guard rails the plane of the face of the receptacle shall be horizontal so as to be readily accessible from either side of the frame lineup.

18.4 Appliance outlets for equipment frames shall be spaced approximately every six feet front and back. When only one bay is furnished initially in a lineup, provide an outlet in this bay.

18.5 Appliance outlets shall be located on both sides of double sided distributing and protector frames and on front of single sided frames. The outlets are to be located at the base of the frames. Conduit risers shall be located at the non–growing end of partial lines of frames and at either end of complete lines. The plane of the face of the receptacle shall be vertical at the base of the frames. Distributing frame receptacles should be spaced approximately every ten feet.

18.6 Mount tumbler switch for controlling distributing frame appliance outlet circuits, and the associated pilot lights, on the end guard at the head end of the distributing frame unless otherwise specified. Locate at center of end guard on double sided frames and near side toward the front of single sided frames.

19. Emergency Lighting

19.1 This unit covers requirements for battery type emergency lighting equipment used in BST facilities.

19.2 The preferred emergency lighting arrangement is stand–alone rechargeable wall and ceiling mounted units. Such units will be obtained and engineered in accordance with the Capacity Manager's recommendations.

19.3 Stand–alone units must meet the Life Safety Code, NFPA–101, ANSI A9.1 and be installed in accordance with the National Electrical Code (NEC), NFPA 70, ANSI C1. Order from National Fire Protection Association (NFPA) at 1–800–344–3555.

19.4 Existing emergency lighting systems may operate from the 48 volt central office batteries. These systems are covered herein only for extending emergency lighting in older telephone facilities.

Emergency Lighting Placement

19.5 Emergency lights are to be placed to enable the maintenance forces to find their way around the Central Office (CO) in case of a power failure. For this purpose, lamps are usually placed near two diagonally opposite corners of the room thus insuring some light on all four walls. Additional lights are placed where directed by the Capacity Manager, usually near exits or on elongated aisles.

19.6 In power rooms emergency lights shall be located in position to illuminate all the power equipment, particularly the control board. One or two emergency lights are to be used in battery areas and located so as to give the best light distribution throughout the room.

19.7 A single emergency light is used in the standby engine room and located to enable starting the engine during a power failure.

19.8 The emergency lighting systems may be controlled either manually or automatically as specified by the Capacity Manager. For small emergency lighting installations manual control is generally provided by means of switches, while for larger installations, automatic control may be provided.

Emergency Lighting Equipment Requirements

19.9 For stand–alone, rechargeable units, the manufacturer's specifications shall be followed.

19.10 All battery and ground leads from the power board to the relay switch and from the relay switch to the distribution cabinets may be run open on cable racks or in conduit. All wiring from the distribution cabinets to lamps or manual control switches shall be run in rigid conduit. All service leads shall be run in conduit.

19.11 Surface type relay switch and distribution cabinets shall be mounted on the wall or column at a distance of approximately 4–6” above the finished floor. This applies to the lower cabinet only when two or more cabinets are mounted one above the other.

GROUNDING − ENGINEERING PROCEDURES

CONTENTS

GROUNDING − ENGINEERING PROCEDURES

1. Purpose And Scope

1.1 This section defines the minimum generic requirements for the grounding and bonding of network equipment within BellSouth central offices, huts and Controlled Environment Vaults (CEVs).

1.2 BellSouth has adopted Bellcore's TR−NWT−000295 (TR 295), "Isolated Ground Planes: Definition and Application to Telephone Central Offices" as the grounding standard for electronic switches and the associated isolated ground planes and power supplies. BellSouth has adopted Bellcore's TR−NWT−001275 (TR 1275) Section 18, "Central Office Environment Installation/Removal Generic Requirements − Workmanship Requirements − Bonding and Grounding − Integrated Ground Plane" as the standard for workmanship requirements for bonding and grounding in the integrated ground plane. To order these documents call 1−800−521−2673.

1.3 This section is not a stand−alone document; it must be used in conjunction with TR 295, TR 1275 Section 18, vendor documentation, and the Telephone Equipment Order (TEO) to establish specific job requirements.

1.4 This section contains some duplication of information found in TR 295 and TR 1275 Section 18, where clarification is required. This section also contains requirements for the integrated ground plane not found in TR 295 or TR 1275 Section 18.

2. General Requirements

Grounding Conductor vs. Grounded Conductor

2.1 Grounded Conductor is a system or circuit conductor that is intentionally grounded.

Grounding Conductor is a conductor used to connect equipment or the grounded circuit of a wiring system to grounding electrode(s).

Examples of these two types of conductors can be found in the glossary.

2.2 Product specific grounding/bonding requirements more stringent than this section, TR 295, or TR 1275 Section 18 shall be adhered to. NOTE: Conflicts between product requirements and this section, TR 295, or TR 1275 Section 18 shall be referred to the Capacity Manager for resolution.

Grounding Conductor Wiring Type

2.3 All exterior buried (ring ground) wire is to be #2 AWG bare solid tinned copper.

2.4 Interior grounding conductors which terminate on the COGB or GRD WD/MGB shall be a minimum #6 AWG insulated, stranded copper and green insulated per CK5482−H unless the system specifies otherwise. See sub−section 6, Integrated Ground System Requirements, for additional information.

Grounding Conductor Wiring Methods

2.5 Reference TR 1275 Section 18 when reviewing the following paragraphs.

2.6 Grounding conductors shall not be run on cable racks. They may be supported by brackets attached to the ironwork or run in non−metallic conduit. Individual grounding cables #2/0 AWG or smaller may be strapped (using non−conductive ties) to the outside of the cable rack stringers. Dedicated grounding racks are allowed. However, if dedicated racking is used, a note is needed to the installer stating that cable rack(s) are to be stenciled at ten foot intervals with "**GROUNDING CONDUCTORS ONLY**."

2.7 Non−metallic sleeves are required when routing grounding conductors through walls or between floors. Grounding conductors (except for ACEG) shall not be run in metallic conduits or sleeves. For older buildings with existing grounding conductors in metal conduit, both ends of the conduit must be bonded to the conductor(s) with a #6 AWG stranded conductor as they enter and leave the conduit. This applies to only conduit of less than 3 feet. Metallic conduits longer than 3 feet must be removed. (This is per NEC).

2.8 Metallic supports which totally encircle grounding conductors are prohibited. When routing cable, it is permissible to engineer grounding conductors from the switch through a 12" X 24" cable hole.

2.9 Detailed specifications shall include wiring drawings for specific connecting information of all shielded wire/cables.

Hardware Requirements

2.10 All cable termination lugs, two−way splices, and "H" type connectors shall be of the compression or wedge−pressure type and shall be listed by a nationally recognized testing laboratory (such as Underwriter's Laboratory). Barrel (in−line) cable splices are not to be used in BellSouth.

2.11 145C number plates or equivalent shall be provided for all grounding conductors terminated at the OPGP, COGB and MGB busbars. Please refer to Number Plates in Section 29 for additional information regarding the use of number plates for grounding and power applications.

3. Overview Of Central Office Ground System

3.1 The CO ground system is provided by the BellSouth Property Management group (Building Engineers) and consists of a grounding electrode system, Office Principal Ground Point (OPGP), vertical risers, horizontal equalizers and CO ground bars as shown in Figure 1. The CO ground bars (or Combined OPGP/COGB) are normally the line of demarcation between what Property Management provides and what the network equipment vendor provides.

Grounding Electrode System

3.2 The grounding electrode system consists of the principal and supplemental earth electrodes and the conductors connecting them to the building interface point known as the Office Principal Ground Point. Suitable grounding electrodes are:

(a) Ground rings or grids

(b) Ground rods or ground rod arrays

(c) Structural steel ground grids

(d) Well casings

(e) Any combination of the above. Other types of grounding electrodes are listed in NEC 250−81.

Office Principal Ground Point (OPGP)

3.3 The OPGP consists of a copper bar located near, preferably within ten feet, but external to the AC Service entrance switchgear. In the past the OPGP was usually located where the commercial/utility cold water pipe entered the building. With the extensive use of non−metallic water pipes and insulating bushings, the utility cold water pipe can no longer be relied on as the principal grounding electrode. Typical connections to the OPGP are shown in Figure 1. For small single story buildings where all equipment is within 100 feet of the OPGP, a single bar may be provided to serve both OPGP and COGB terminations. The OPGP can always be used to terminate any lead which would otherwise be run to the COGB when it is convenient to do so (more direct, shorter run).

Central Office Ground Bus (COGB)

3.4 COGB's are an extension of the OPGP and are provided on each floor of multi−story buildings with equipment. A single bus may serve a square superimposed on a circle with a 100 foot radius centered at the bus, see Figure 2. Any reference to the COGB shall be interpreted as meaning the nearest same floor COGB or the OPGP if the OPGP is closer than the COGB.

Horizontal/Vertical Equalizers

3.5 Equalizers are required to bond the OPGP and the COGB's together. Equalizers shall be 750 MCM except for single story buildings where a #2 AWG may be used for up to 25 feet (hut, CEV, etc.) or a #4/0 AWG for 25 feet to 60 feet. In multi−story buildings the vertical equalizer (riser) shall be a continuous length of 750 MCM. For larger buildings requiring more than one COGB per floor, separate 750 MCM risers are required for each bus. The risers must be bonded together with horizontal equalizers every third floor.

Ground Window/Main Ground Bus (GRD WD/MGB)

3.6 The GRD WD/MGB is located within the ground window that provides the single point of connection between the integrated and isolated ground planes. On any job where a new GRD WD/MGB is established, a certified power vendor should provide a 750 MCM grounding conductor between the GRD WD/MGB and the nearest COGB. Busbars shall be mounted in such a manner that all connector holes (top, bottom, front, and back) can be utilized.

Isolated vs. Integrated ground planes

3.7 Network elements should be engineered and installed on the ground plane specified by the manufacturer. Many network elements, including some digital switching systems, are being designed by the manufacturer for installation on the integrated ground plane.

4. AC Service System Grounding

4.1 The AC service entrance in BellSouth buildings is grounded by Property Management in accordance with NEC 250−94. Metal Oxide Varistor (MOV) type lightning arrestors should always be provided at the service entrance of equipment buildings.

4.2 Every receptacle mounted on the isolated ground plane shall be powered from an inverter within the isolated ground plane. These receptacles are not intended for general use and shall not be accessible except by way of doors or covers.

4.3 Special−purpose receptacles(Orange), defined as receptacles in which the grounding terminal is purposely insulated from the receptacle's frame, shall not be used.

4.4 The size of the ACEG shall be sized in accordance with the NEC and be run continuous from the source to load. The color of this lead per NEC standards is indicated in section 29.

5. Cable Entrance Facilities (CEF)

5.1 All cables, including fiber optic cables, shall have their sheaths bonded to the central office ground system at or near where they enter the cable vault/building.

5.2 There shall be a direct low impedance path between the CEF and the OPGP and the CEF and the Main Distributing Frame (MDF). A minimum #0 AWG cable shall be run from the CEF directly to the ring ground or OPGP (or COGB if the overall distance to the OPGP is not significantly increased) and from the CEF to the MDF.

6. Integrated Ground System Requirements

6.1 The integrated ground system consists of all equipment not part of an isolated ground plane. This includes the CO ground system, ACEG system, toll/circuit equipment, radio equipment, most power plants, distributing frames, operator positions, etc.

6.2 Integrated ground systems are most effective when numerous short bonding paths, both incidental and planned, exist between the various members. This insures that near members are close to the same potential during transients.

6.3 The most basic requirement for integrated ground plane equipment is that all telecommunications equipment (i.e., bays, cabinets, frameworks, power plants, battery stands, engines, etc.) shall have an engineered connection to the CO ground system.

6.4 Historically, most problems with the integrated ground plane have been related to the removal of equipment without regard to the grounding system. The detail engineer must ensure that the removal of equipment bays does not impair the integrity of the grounding system.

Bays, Cabinets, etc.

6.5 The minimum size grounding conductor for grounding bays, cabinets, etc. is #6 AWG (stranded). If the grounding conductor is installed by the supplier, then an insulated conductor shall be installed, preferably green in color. Network and Unequal Flange Duct Type bays that come equipped with a #6 AWG ground assembly are acceptable. The ground assemblies do not have to be changed to a green #6 AWG conductor.

Line–up or similar group of members (Toll area)

6.6 Frame junction pipe shall no longer be used for grounding new lineups. The #2 AWG (green) grounding conductor is the preferred method. Additions to existing line–ups should continue to deploy the grounding scheme used in that line–up. The wholesale retrofitting of central offices from the 1 inch junction pipe is not recommended.

6.7 An insulated #2 AWG stranded grounding conductor shall be run along the length of the line–up (present and future frameworks). If the grounding conductor terminates directly at the COGB or GRD WD/MGB, then the insulation shall be green in color. If the grounding conductor does not directly terminate at the COGB or GRD WD/MGB, then green insulation is preferred, but not required.

Distributing Frames

6.8 Minimum #1/0 AWG stranded green insulated grounding conductors from distributing frames (MDF, IDF, TDF) to the COGB and GRD WD/MGB (if located on the same floor).

Main Aisle Ground Feeders

6.9 Minimum #2/0 AWG stranded green insulated grounding conductor for a main aisle ground feeder "equalizer" connecting several lineups to the COGB.

BDFB Grounding Conductors

6.10 Minimum #2/0 AWG stranded green insulated grounding conductor from the BDFB to the COGB. BDFBs with battery return bus bars electrically connected to the framework require 750 MCM stranded green insulated grounding conductor from the BDFB to the COGB. The grounding conductor may be a continuous run or it may be a branch tap from a same size or larger horizontal equalizer serving other BDFBs or main aisle ground feeder in a floor segment.

Power Board And Power Plant Framework Grounding Conductors

6.11 Power plants serving isolated ground planes shall be grounded per TR 295 section 5.3.1 with "Conductor A as a redundant fault–clearing conductor" and "Conductor A as a coupled bonding conductor" considered as requirements. In addition, Conductor A should be a #2/0 AWG minimum, except when the minimum sizes specified in TR 295 Table 5–2 Size 2 exceed #2/0 AWG. This requirement results in Conductor B (from power plant framework to COGB) minimum #1/0 AWG and Conductor A (from power plant framework to GRD WD/MGB) minimum #2/0 AWG except as noted in TR 295 Table 5–2 Size 2. Power plants serving equipment in the integrated ground plane only shall be grounded using a minimum #2/0 green insulated grounding conductor from the power plant to the COGB.

Rectifiers, Battery Stand and other Power Framework Grounding Conductors

6.12 Power plant framework not containing distribution fuses or breakers and battery stands can have a minimum #6 AWG grounding conductor tied to a minimum #2/0 AWG main aisle grounding conductor leading to the COGB. All power plant framework, rectifiers, and battery stand grounding conductors shall be green and insulated.

6.13 The system specification shall always be adhered to when grounding conductors larger than the minimum specified in this section are called for. In particular, any power plant, distribution bay, toll system, etc. with a non−insulated battery return bus directly connected to the framework may specify a larger grounding conductor to accommodate the return currents.

Radio Systems

6.14 Radio systems require special protection from lightning strikes. They employ an interior #2 AWG ring round system designed specifically to create minimum impedance to the flow of lightning induced current and a method of bonding between metallic components of the station that suppresses arcing. The ring ground system provides an equipment grounding function in radio stations similar to that of the CO ground system in central offices. BellSouth specifies (via drawings) interior ring grounds for all types of equipment installations.

Operator Positions

6.15 Operator positions are always part of the integrated ground plane. Bonding and grounding at operator positions to limit potential differences between AC power, telephone lines, equipment (including headset) is critical for personnel safety reasons. Due to the wide variety of operator equipment configurations, the Capacity Manager should evaluate each new operator facility in accordance with the latest recommendations and then specify the grounding requirements.

Neutral Grounding of Standby AC Systems

6.16 When the standby AC neutral is switched by a transfer device, the standby AC system is classified as a separately−derived AC source. Service grounding for such systems shall conform to the provisions of the NEC governing separately derived systems, including Articles 250−5, 250−25, and 250−26. When local codes differ from the NEC, the most stringent code shall be used.

Standby sets whose nominal line voltage is greater than 480 volts, can have their neutral solidly or resistively grounded. A direct and continuous connection should be made from the neutral (or output of the ground resistor) to the nearest building ground by means of a grounding conductor which meets NEC size requirements of Table 250−94. A second independent connection should be made between the neutral (or output of the ground resistor) to the metal frame of the set.

When the standby AC neutral is not switched by an automatic transfer device, the following provisions should apply. For standby sets of 480 volts or less,where a solidly grounded commercial power system is used, the neutral of the set shall not be grounded by connecting it to the equipment ground conductor of the set. An acceptable method of grounding the neutral of the set is to connect it to the neutral of the commercial power at the OPGP. In addition, the neutral and phase lead(s) of the set should be the same size.

Equipment Grounding of Standby AC System

6.17 Standby engine−alternator sets should always be equipped with an AC equipment grounding (ACEG) conductor in the conduit or raceways that contain the phase leads for the set. The ACEG conductor(s) should terminate within the standby control cabinet. The termination may be made on a bus bar or a ground stud electrically bonded to the cabinet as well as directly to the cabinet interior using compression terminal lugs. This requires that the cabinet be electrically connected to the set frame by a bonding strap or equivalent to provide ground continuity between the entire set and the ACEG conductor(s).

The primary control cabinet for the standby set shall be bonded to the metallic sub−base or chassis. These bonds should be made with bare, stranded, or ribbon connectors designed and installed to withstand the vibration generated by the standby engine set.

Figure 16 shows a general framework grounding scheme for an engine−alternator room. The following shall be bonded to the COGB using a minimum #2 AWG green insulated main feeder and minimum #6 AWG branch grounding conductor.

(a) metallic fuel tanks (day and/or main)

(b) metallic fuel piping

(c) start battery racks, and

(d) start battery charging rectifiers not integral to the standby set

Engine chassis should be connected to the COGB using a minimum #2 AWG branch grounding conductor as shown in Figure 16.

If the AC control panel is not attached to the engine chassis and is a stand alone unit, a #6 AWG connected to a #2 AWG collector grounding conductor is required.

7. Digital Switch Grounding

7.1 Digital switches, isolated ground planes, and associated power supplies shall to be grounded in accordance with TR 295 supplemented by this section. Where differences exist between this section and TR 295, this practice governs. Specific instructions in the TEO supersede both.

7.2 All parts of the isolated ground plane shall be located not more than one floor above or below the Ground Window and no further than 100 feet horizontally. The farthest member of the isolated ground plane from the MGB shall not exceed 200 feet.

7.3 To minimize isolation violations, the Isolated Ground Zone (IGZ) should be kept as small as practical, i.e., limited to the switch cabinets and lineups. To accomplish this:

(a) Do not run AC conduits to the switch when it can be avoided. Place lighting fixtures on the integrated rather than the isolated ground plane. Use DC for modems and other equipment. Use inverters embedded in the switch for the remaining AC requirements.

(b) On additions and new installation, no conduit, raceway or other part of the Isolated Ground Plane shall be installed under a raised floor or above a hung ceiling unless it is completely covered with an insulating material.

(c) Spare circuit pack cabinets shall be part of the integrated ground plane and connected to the CO ground system with a minimum #6 AWG stranded. An exception is if the cabinet is located in a switch lineup and is attached to the isolated framework, then it must be part of the isolated ground plane and treated accordingly.

(d) Work stations for all new installations shall be a part of the integrated ground plane. This includes all printers, VDT and any other device that lets a person communicate with the switch. Connection to the switch shall be by modems, fiber optics, current loop (20 milliamps) or any other means that opens the ground connection from the isolated ground plane. AC power for these work stations shall be provided from the integrated ground plane. Most existing work stations are located in the Isolated Ground Zone (IGZ) and must be maintained in the IGZ or modified to locate in the integrated ground zone.

(e) Local test cabinets, remote from the switch, shall be installed as part of the integrated ground plane. This will require that all external supplies to the cabinet: −48v, 103v, ringing, etc., be provided from sources external to the switch.

(f) Metal parts of the isolated ground plane shall not be connected to the integrated ground plane without first passing through the Ground Window and bonding to the MGB.

(g) All conductive integrated ground plane members located within 6 feet of the isolated ground plane shall be bonded to its MGB with a #6 AWG stranded copper conductor to minimize surge potential differences between nearby members of the two ground planes. Such integrated ground plane members include, but are not limited to the following:

(1) Metallic stands, desks, and pipes.

(2) Equipment frames.

(3) Auxiliary framing and ironwork. (It is not necessary to place a ground strap around connecting hardware.)

(4) Air ducts.

(5) Lighting fixtures and AC raceways that are not part of the isolated ground plane.

8. Digital Loop Carrier − Remote Terminal Sites − Huts And CEVS

8.1 The exterior ring ground system employs driven ground rods(ground electrodes) encircling the hut or CEV. The exterior ring ground is a series of driven 5/8 inch diameter, 8 feet long, stainless or copperclad steel ground rods connected with #2 AWG bare tinned solid copper wire that rings the entire building buried to a depth of a least 18 inches below grade. All connections buried in earth shall be either exothermic welded or a "HIGH COMPRESSION" connector that is UL approved for buried applications. The exterior ring ground shall be connected to the CO ground bar with two #2 AWG bare tinned solid wires as illustrated in Figures

12 and 13 (HUTs) and Figures 9 and 11 (CEVs). The exterior ring ground system is also used to ground the AC disconnect via the grounding electrode conductor (NEC 250−94).

8.2 Installing the exterior ring ground system may vary from site to site depending on the easement and back fill required, but should follow the minimum guidelines as illustrated in Figure 12 (HUTs) or Figure 9 (CEVs). These figures require that the exterior ring ground be installed at least 2 feet beyond the sides of the Hut or at least 5 feet beyond the sides of the CEV. If easement requirements do not allow at least 2 feet from the sides of a Hut or 5 feet from the sides of a CEV, the exterior ring ground may be installed under the Hut or CEV,as an option. Ground rods/electrodes shall be driven a minimum of 10 feet apart and shall not exceed a maximum of 15 feet apart. The turns or bends in the exterior ring ground shall comply with a 12 inch minimum bending radius.

8.3 Refer to Figures 5−15 for methods of grounding Mini Huts, Maxi Huts, CEVs, Concrete Huts, and customer premise locations. These figures were provided from BSP 631−600−243BT, “Bonding and Grounding Methods for Digital Loop Carrier − Remote Terminals”.

8.4 All framework, cable rack, and other metallic objects throughout the structure shall be grounded. The cable rack shall be electrically continuous. The size of the conductor/wire can vary according to the application and type of equipment. (minimum of a #6 AWG).

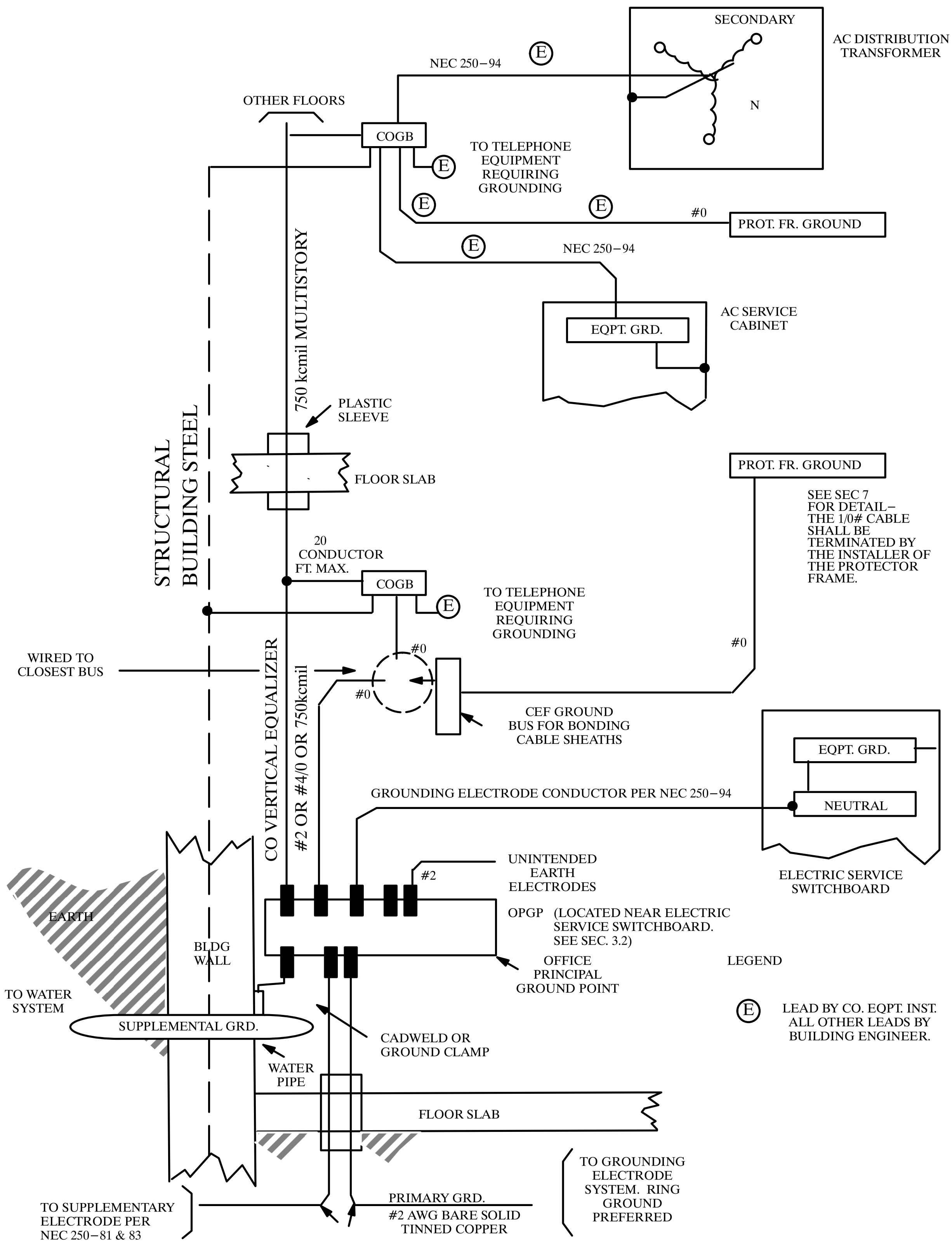
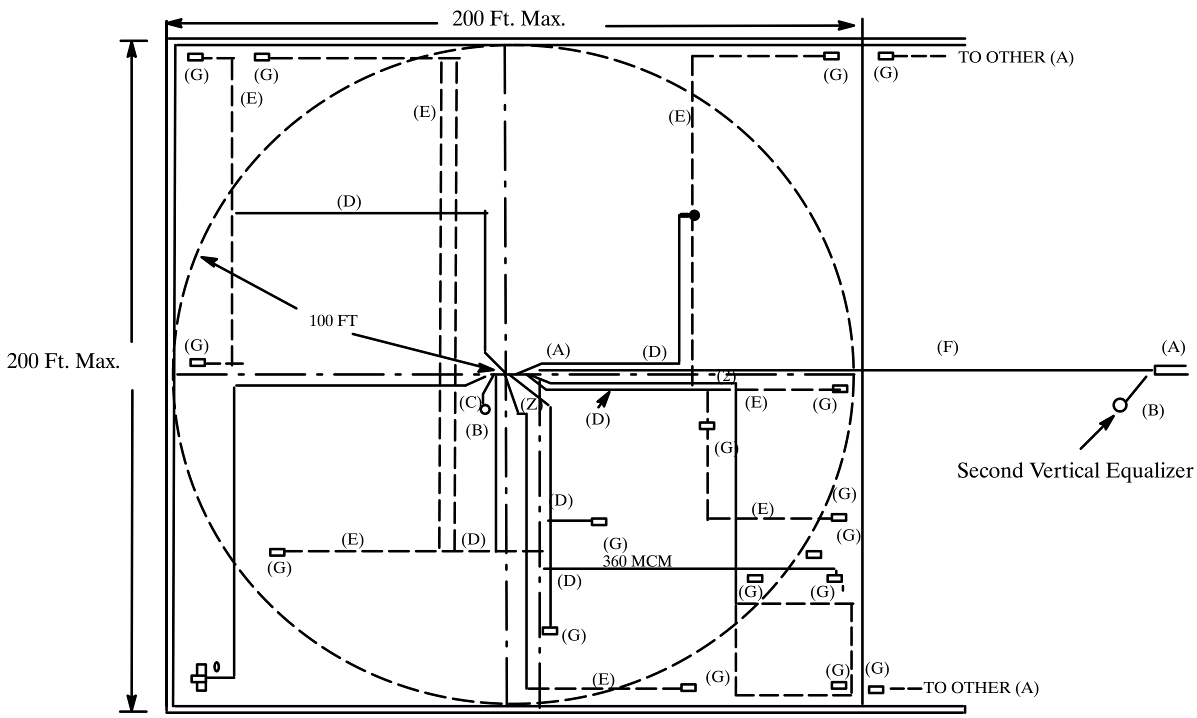


Figure 1 − Typical C. O. Building Grounding Schematic



LEGEND:
(A) CO Ground Bus
(B) 750 MCM Vertical Equalizer
(C) 750 MCM Bond
(D) 750 MCM Horizontal Equalizer
(E) Conductive Ground Paths
(F) Horizontal Equalizer to Other Vertical Equalizer
(G) Unit Requiring Equipment Grounding

Figure 2 − Representation Of Maximum Area To Be Served By A Single Central Office Vertical Equalizer

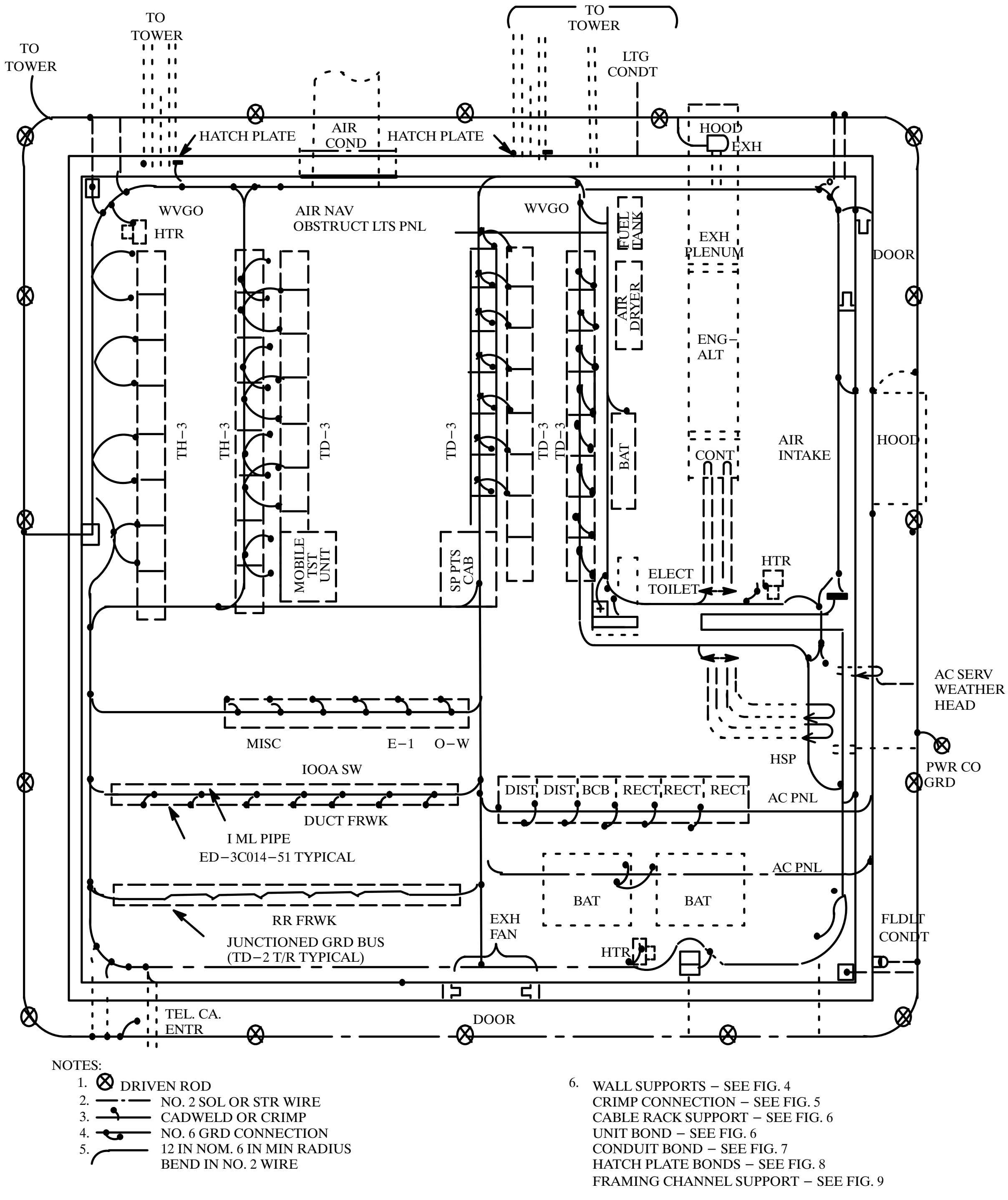


Figure 3 − Typical Ring Ground Installation In Microwave Station

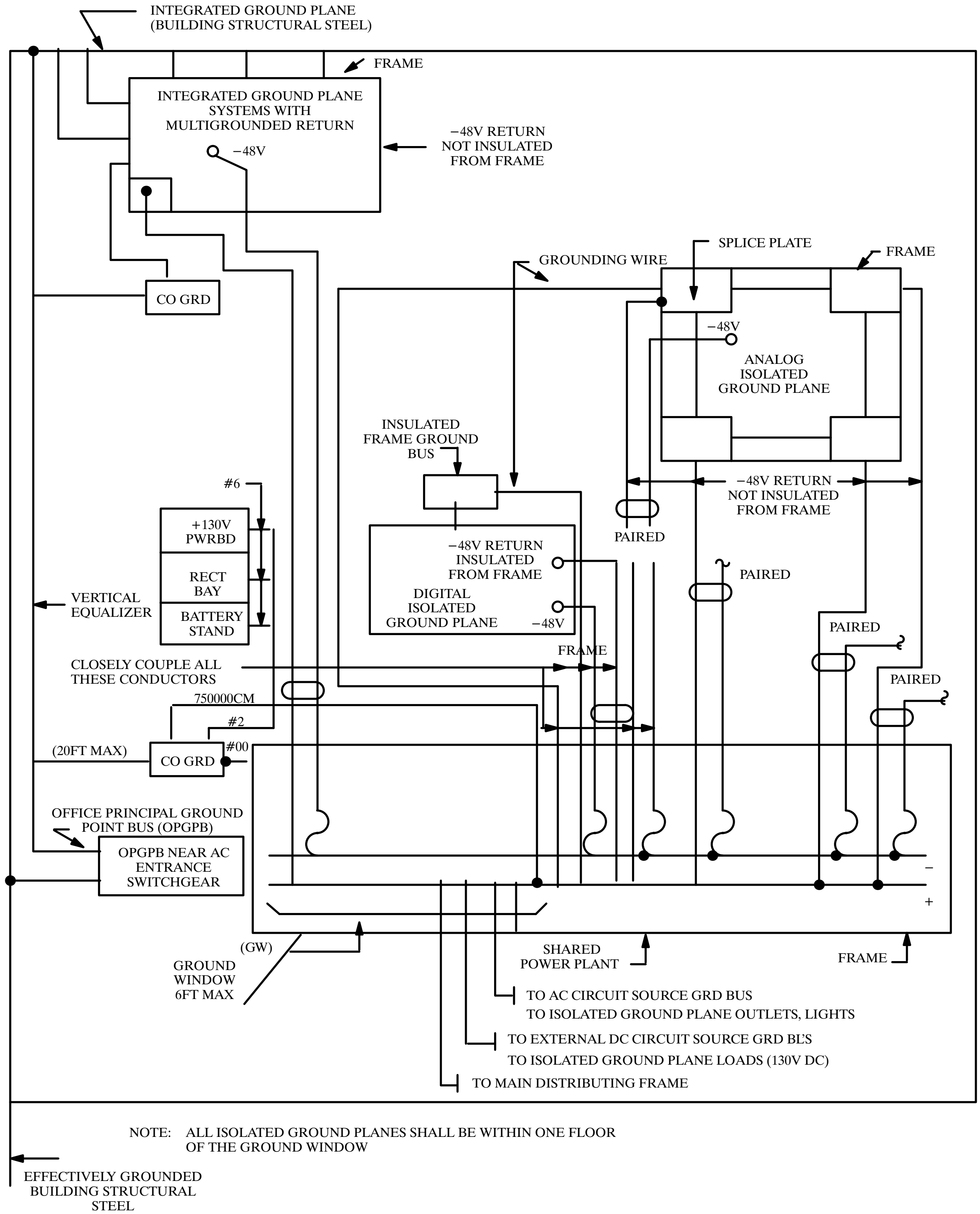
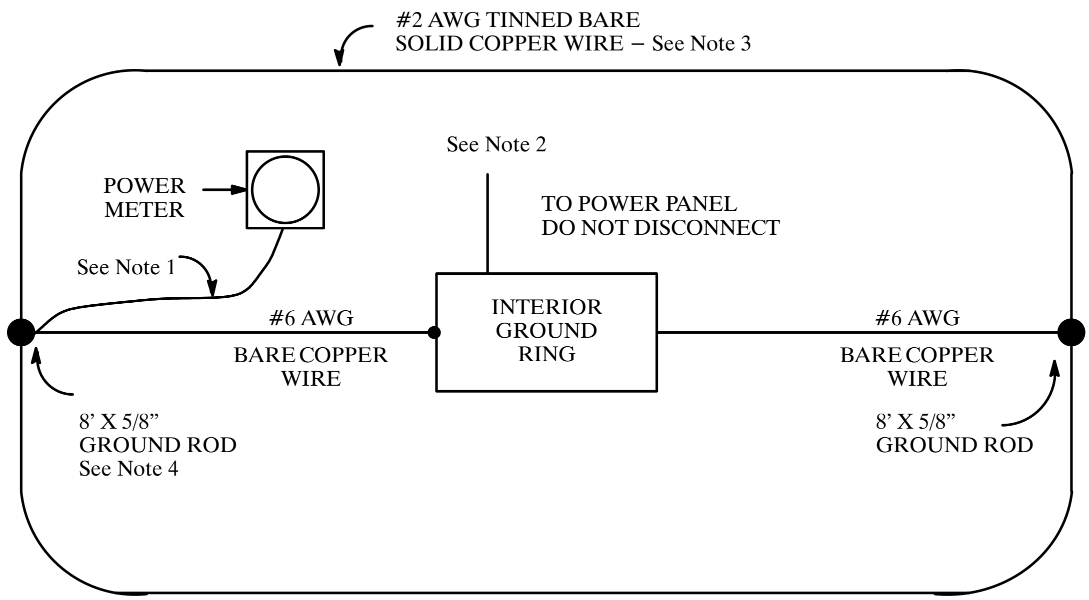


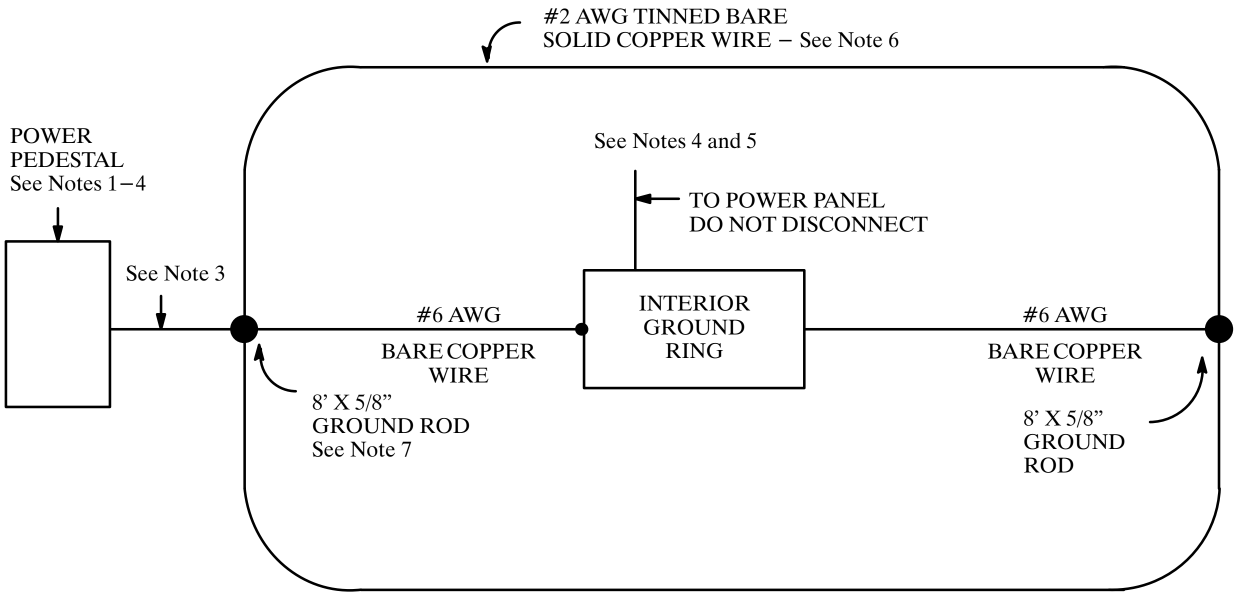
Figure 4 − Grounding For Integrated And Isolated Ground Powered From A Common Power Plant With Isolated Return Bar As Ground Window



NOTES:

1. **Power service grounding electrode conductor sized per NEC 250−94.**
2. **Bond power neutral bus to equipment ground bus at the power disconnect switch in the Hut, NEC 250−24.**
3. **Bury #2 AWG copper wire 6″ to 12″ deep within 2′ of Hut.**
4. **Ground rods to be covered with a DLC Flush Mount Ground Rod Closure per 629−010−901BT for inspection purposes.**

Figure 5 − External Ground Connections − Meter Attached To Structure − Mini Hut



NOTES:

1. **If the power pedestal is located within 8′ of the Mini Hut, only 2 ground rods are required to ground the Hut and meet the requirements of the NEC.**

2. **If the power pedestal is located more than 8 feet away from the Mini Hut, 2 − 8 foot ground rods, spaced 8 feet apart, are required to ground the power pedestal per NEC 250−83. These rods must be bonded together with a minimum #6 AWG bare copper wire. If the power service ground rods are located within 10 feet of the Hut ground rods or #2 AWG wire, the ground systems must be bonded together with #6 AWG bare copper wire. The bonding connections are to be made to the ground rods.**

3. **Power service grounding electrode conductor sized per NEC 250−94.**

4. **Bond power neutral bus to equipment ground bus in the power pedestal and at the disconnect switch in the Hut, NEC 250−24 (see note 5 if bonded in the Hut).**

5. **Place a power service grounding electrode conductor sized in accordance with NEC 250−94 direct from the disconnect switch to the ground rod.**

6. **Bury #2 AWG copper wire 6″ to 12″ deep within 2′ of Hut.**

7. **Ground rods to be covered with a DLC Flush Mount Ground Rod Closure per 629−010−901BT for inspection purposes.**

Figure 6 − External Ground Connections − External Power Pedestal − Mini Hut

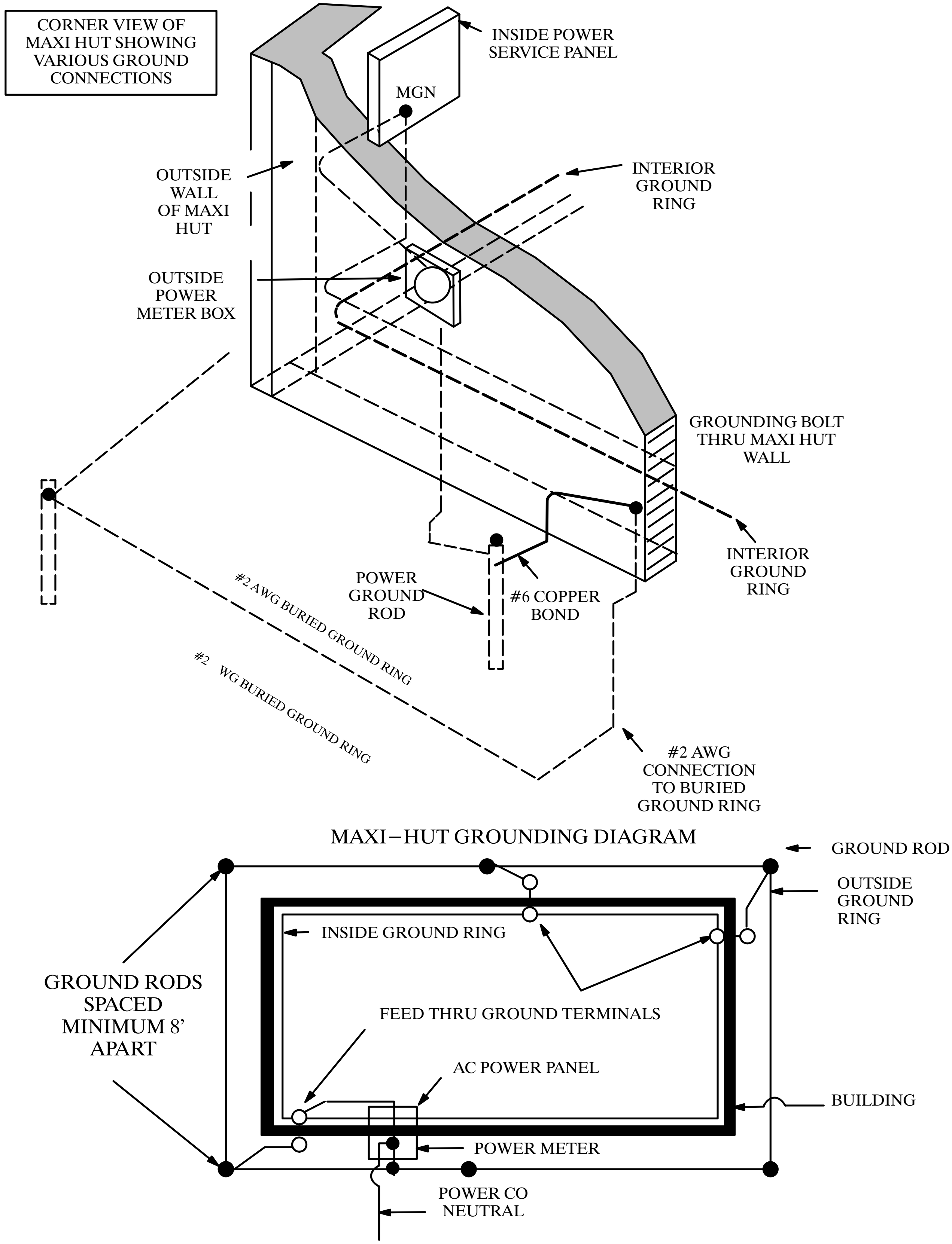


Figure 7 − Exterior Ground Connections − Maxi Hut

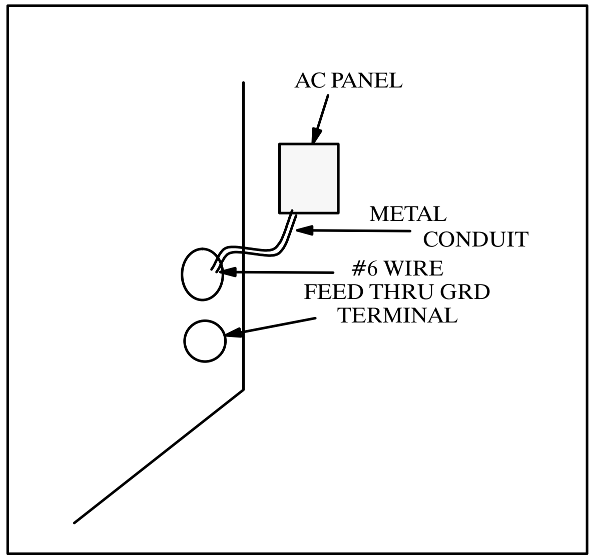


Figure 8 − Panel External Connections − Maxi Hut

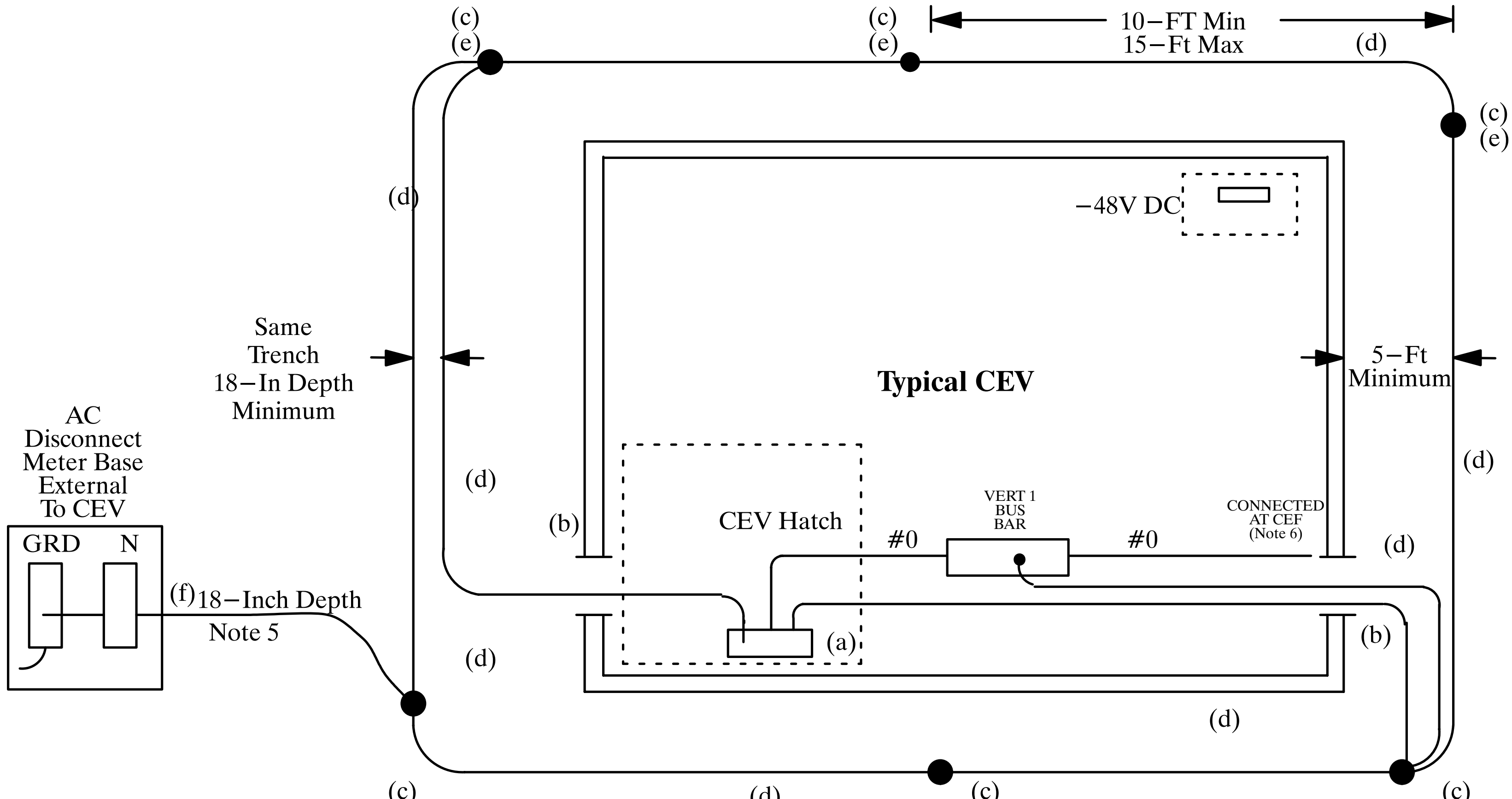


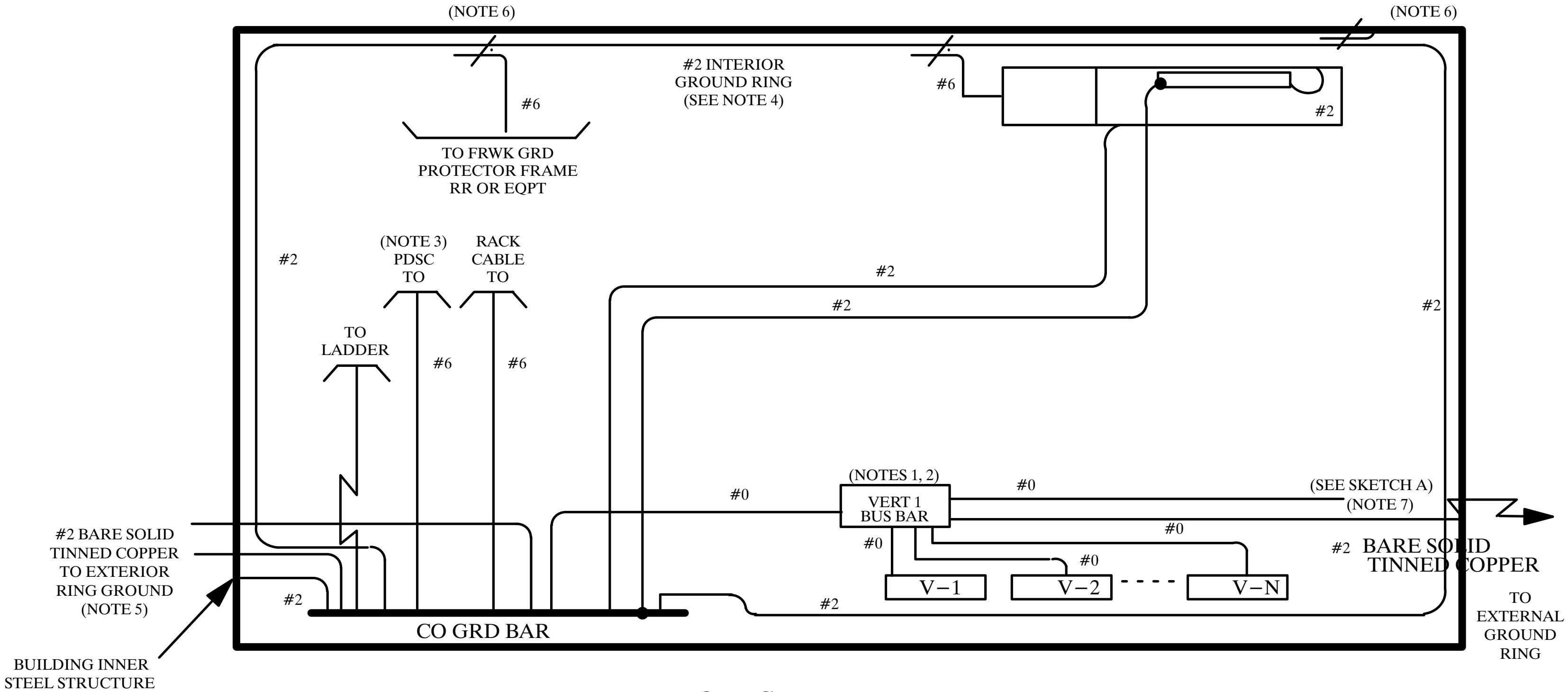
Figure 9 – CEV External Grounding

LEGEND:

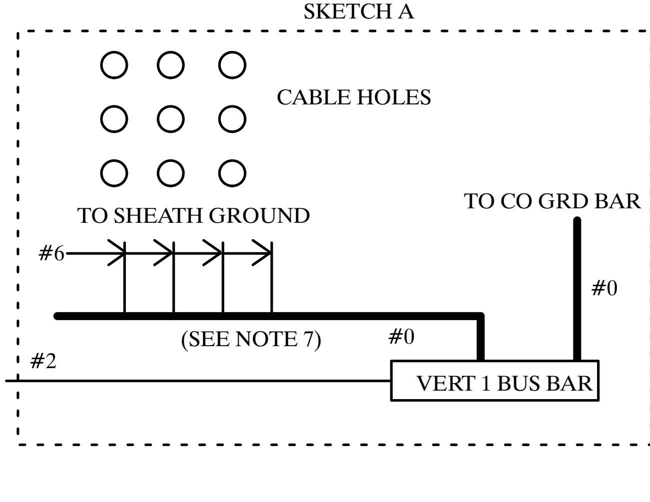
(a) CO Ground Bar
(b) PVC Conduit Thru Wall/Top Half of CEV, Encapsulant Sealed
(c) Exothermic Welded or Approved Connectors − Below Ground
(d) #2 AWG Bare Tinned Solid Copper Wire
(e) Six Stainless or Copperclad Steel 5/8−In Dia, 8−Ft long Rods Driven to a Depth of 18 Inches Minimum Below Grade
(f) Grounding Electrode Conductor

NOTES:

(1) Refer to BSP 802−001−191 For Additional Information
(2) Construct Exterior Ring Ground A Minimum of 5 Feet From Wall of CEV in Undisturbed Earth
(3) If Right−of−Way is not available, Exterior Ring Ground may be construct4ed 12 inches deep below the base of the CEV excavation.
In this case, the Exterior Ring Ground may be installed under the perimeter of the CEV, with the Ground Rods spaced approximately 10 feet apart.
(4) Exterior Ring Ground Shall Be Installed By An Electriction.
(5) If the power pedestal is located more than 8 feet from the grounding ring, 2−8 foot rods, spaced 8 feet apart are required per NEC 250−83.
These rods must be bonded together with a #6 AWG bare copper wire. If either of the power service ground rods are located within 10 feet of the ground ring, they should be bonded to the ground ring, at a ground rod location using approved grounding connectors, with #6 AWG bare copper wire.
(6) Same as Note 7 on Figure 10.



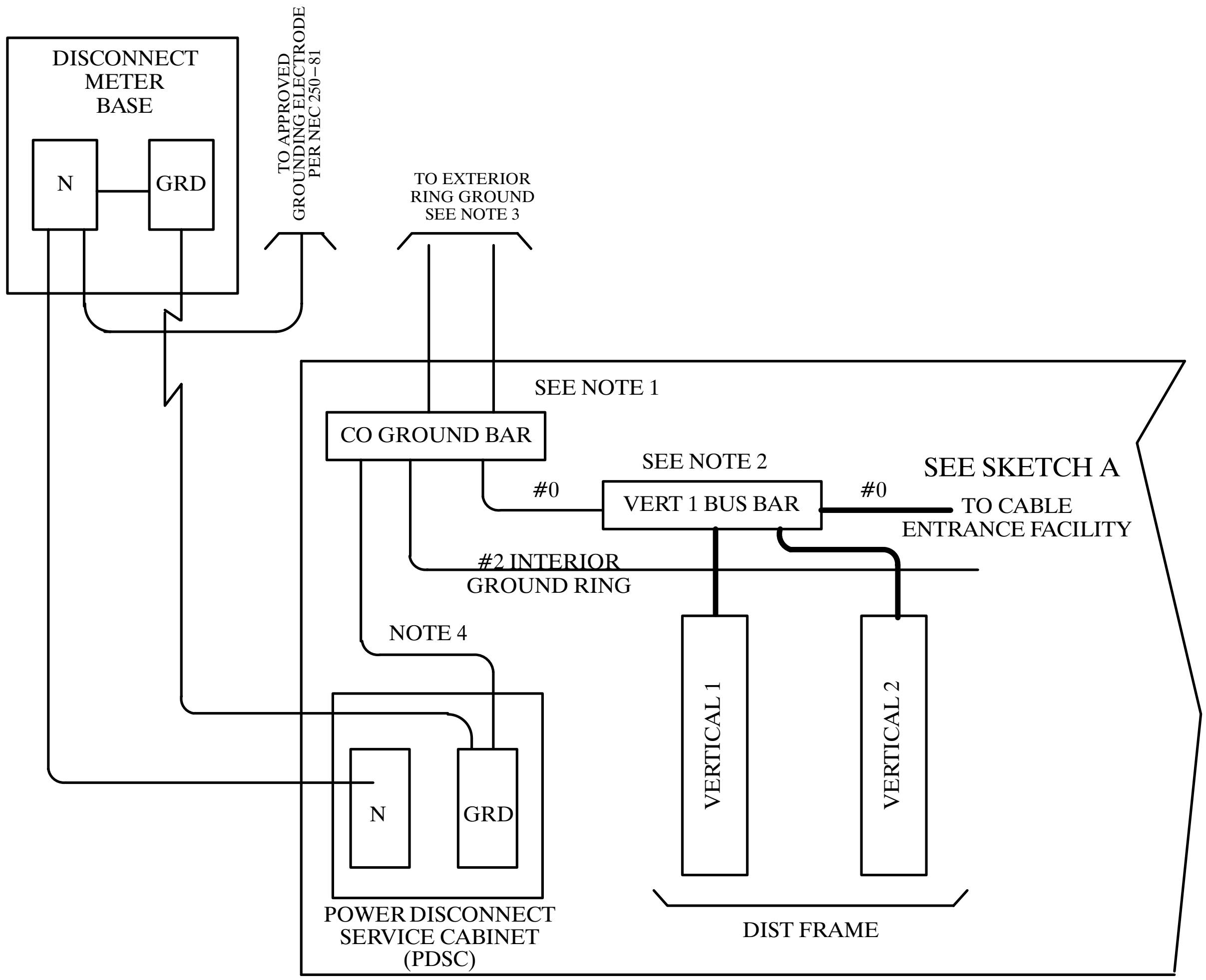
SKETCH A



NOTES:

1. EACH VERTICAL TIES TO VERT 1 BUS BAR WITH A SEPARATE #0 WIRE.
2. VERT 1 BUS BAR IS LOCATED ABOVE VERTICAL 1 (V−1) OF THE PROTECTOR FRAME.
3. #6 AWG FRAME GROUND REQUIRED FOR 100 AMP POWER DISTRIBUTION SERVICE CABINET (PDSC) #3 AWG FRWK GROUND REQUIRED FROR 200 AMP PDSC.
4. #2 AWG COPPER BARE STRANDED ATTACHED TO WALL HALFWAY BETWEEN CABLE RACK AND CEILING.
5. #2 AWG GROUND SHALL EXIT CEV THROUGH PVC IN WALL/TOP HALF OF CEV.
6. CONNECT CEV'S INNER STEEL STRUCTURE WITH #2 AWG AT ALL FOUR CORNER LOCATIONS ON TOP HALF OF CEV. (AT LEAST TWO OF THE FOUR BONDS MUST BE CONNECTED TO THE CO GROUND BAR.)
   ALSO, #2 AWG SHALL BE USED TO CONNECT THE CEV'S TOP HALF INNER STEEL TO THE CEV'S BOTTOM HALF INNER STEEL AT EACH CORNER.
7. THIS CONNECTION BETWEEN THE CEF AND EXTERNAL GROUND RING IS REQUIRED ON ALL CEV'S EXCEPT THE MINI−CEV.
8. THIS DRAWING IS TYPICAL OF THE EQUIPMENT LAYOUT IN A 16 FOOT CEV. THE EQUIP−MENT LAYOUT FOR OTHER CEV' MAY BE DIFFERENT. HOWEVER, THE BONDING AND GROUNDING WIRES WILL BE THE SAME SIZE.

Figure 10 – Typical 16 Foot CEV Internal Grounding



NOTES:

(1) CO Ground Bar Located Near Power Board Distribution (PBD)

(2) Vert 1 Bus Bar Located Above Vertical 1

(3) #2 Ground Wires Exit CEV Through PVC in Wall/Top Half of CEV

(4) #6 AWG REQUIRED FOR 100 AMP PDSC, #4 AWG REQUIRED FOR 200 AMP PDSC

(5) This Connection Between CEF and External Ground Ring is Required on All CEVs Except Mini−CEV

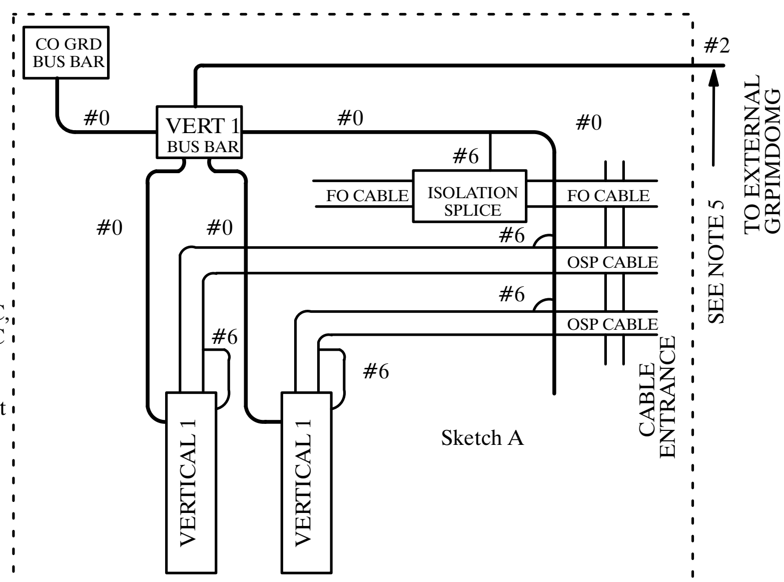


Figure 11 − Controlled Environmental Vault Cable Grounding

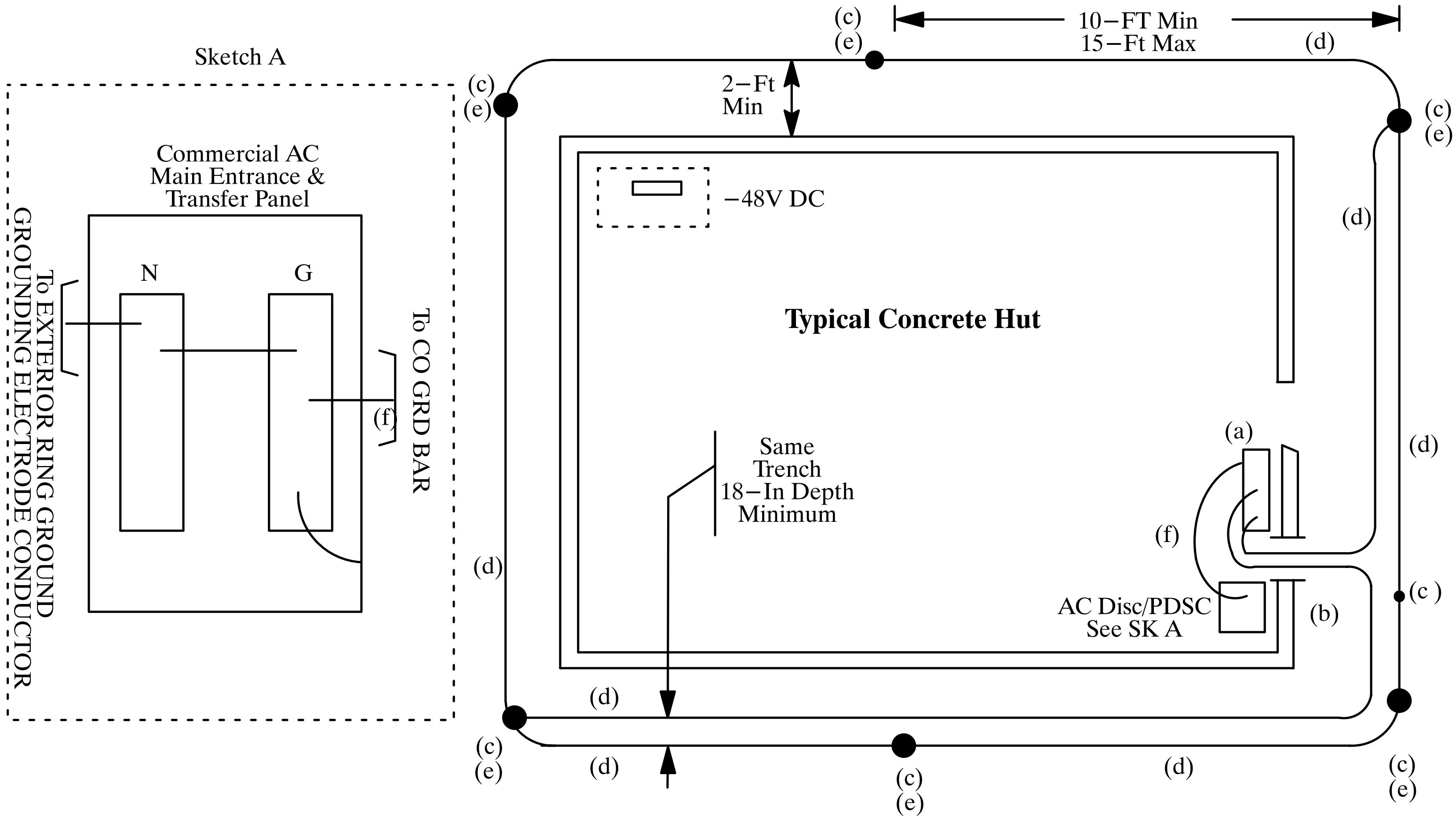


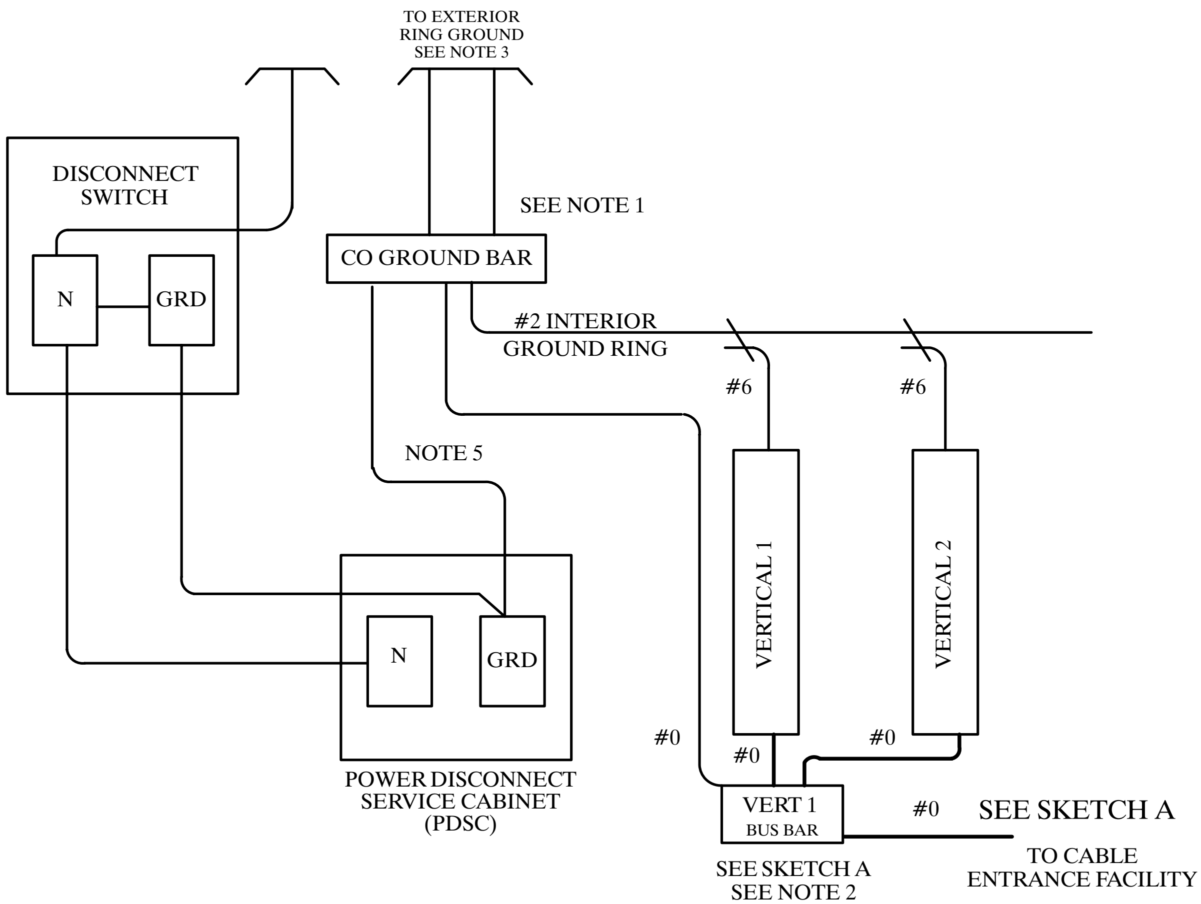
Figure 12 – Concrete Hut Exterior Ground Connections

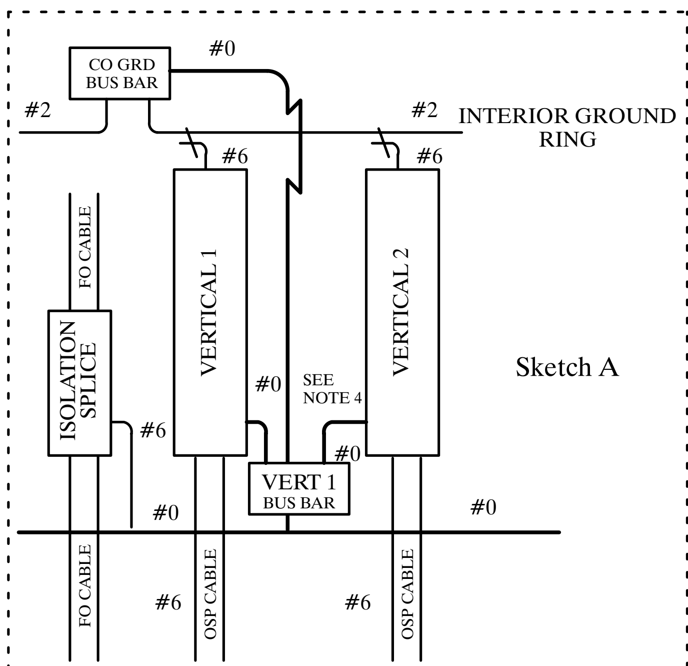
LEGEND:

(a) CO Ground Bar
(b) PVC Conduit Thru Floor
(c) Exothermic Welded or Approved Connectors − Below Ground
(d) #2 AWG Bare Tinned Solid Copper
(e) 5/8−In dia Stainless or Copperclad Steel 8−Ft Long Rod Driven to a Depth of 18 Inches Minimum Below Grade
(f) #6 AWG Insulated Stranded Copper Framework Ground For The 100 Amp or 200 Amp PDSC

NOTES:

(1) For Additional Information Refer to BSP 802−001−191 and Section 760−400−510SV
(2) Exterior Ring Ground Connections Shall Be Connected By An Electrician
(3) Exterior Ring Ground May Be Installed Under the Hut When Outside Space is Not Available. Ground Rods Should Be Spaced Approximately 10 Feet Apart

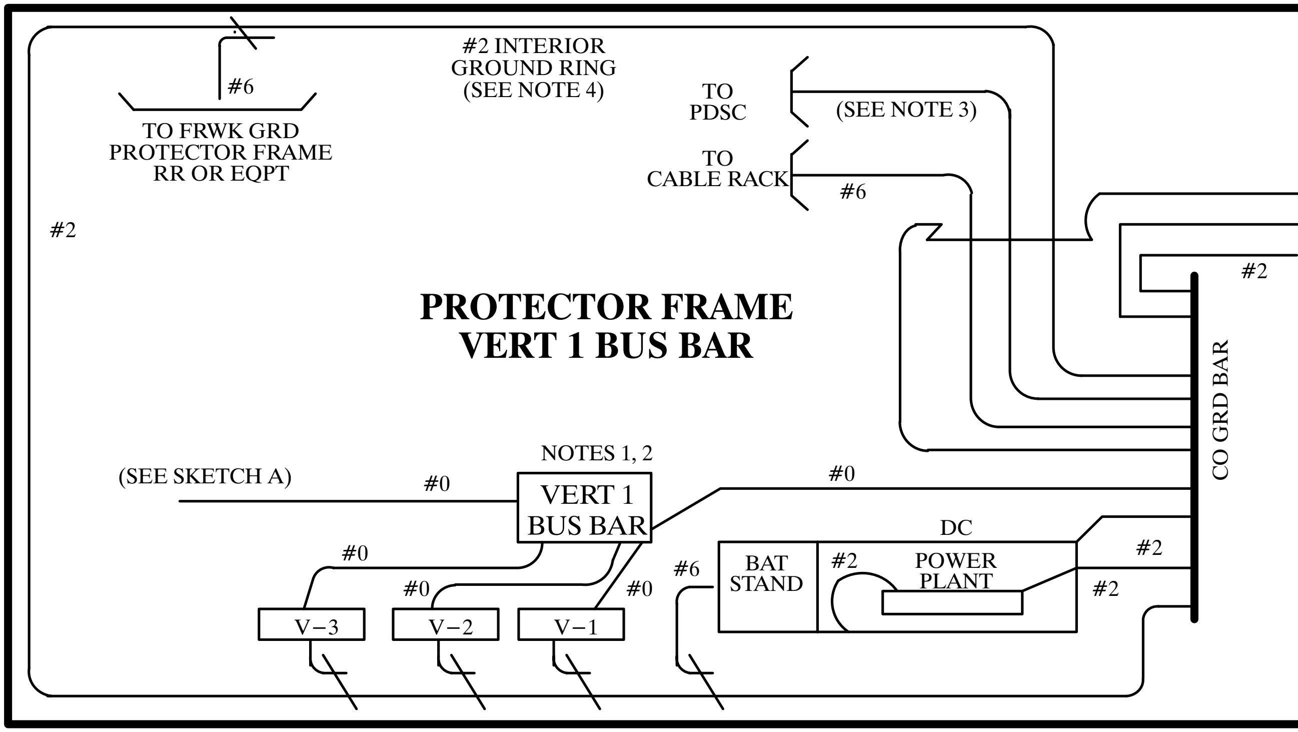


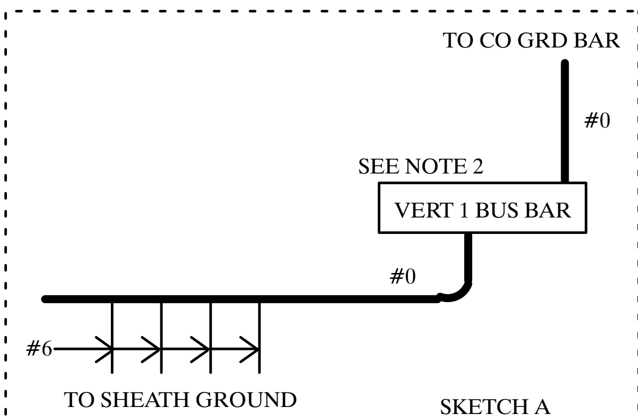


NOTES:

(1) CO Ground Bar Located Over The PDSC
(2) Vert 1 Bus Bar Located Under Vertical 1
(3) #2 Ground Wires Exit HUT Through PVC in Floor
(4) #0 Wire From Vert 1 Bus Var To Vertical 1, 2, etc.
(5) #6 AWG REQUIRED FOR 100 AMP PDSC,
#4 AWG REQUIRED FOR 200 AMP PDSC

Figure 13 − Concrete Hut Interior Grounding





NOTES:

1. EACH VERTICAL TIES TO VERT 1 BUS BAR WITH A SEPARATE #0 WIRE.
2. VERT 1 BUS BAR IS LOCATED BELOW VERTICAL 1 (V−1) OF THE PROTECTOR FRAME.
3. #6 AWG FRWK GROUND REQUIRED FOR 100 AMP POWER DISTRIBUTION SERVICE CABINET (PDSC) #4 AWG FRWK GROUND REQUIRED FOR 200 AMP PDSC.
4. #2 AWG COPPER BARE STRANDED WIRE FOR EXISTING APPLICATIONS ATTACHED TO WALL HALFWAY BETWEEN CABLE RACK AND CEILING. A #2 EQUIVALENT (SOLID, INSULATED, etc.) IS ACCEPTABLE FOR EXISTING APPLICATIONS.
5. #2 AWG GROUND SHALL EXIT CONCRETE HUT THROUGH PVC IN FLOOR. A #2 EQUIVALENT (STRANDED, INSULATED, etc..) IS ACCEPTABLE FOR EXISTING APPLICATIONS.

Figure 14 – Concrete Hut CO Ground Bar Terminations

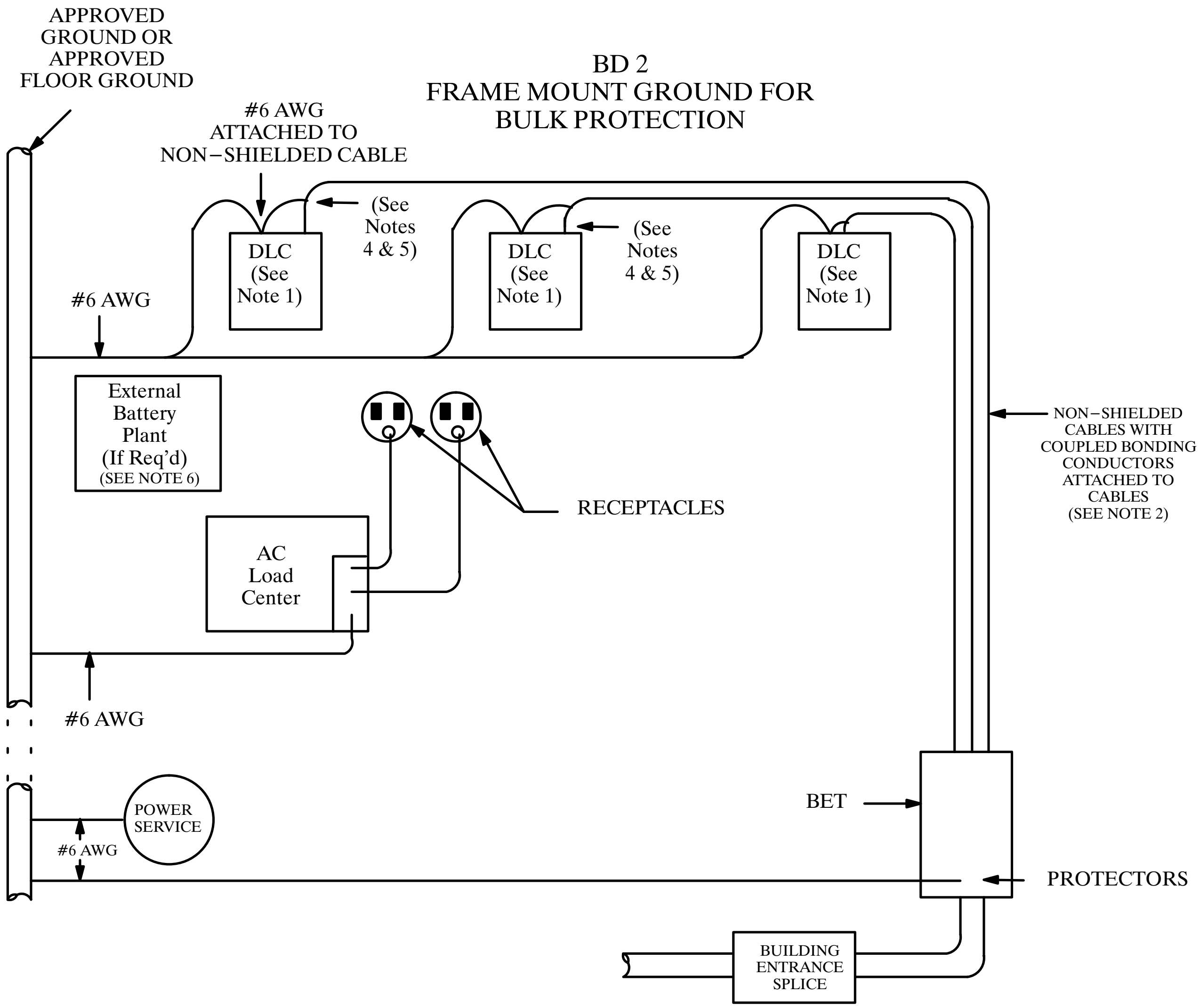


Figure 15 − Customer Premise

NOTES

1. **(Customers premises protectors equipped with gas tubes shall be located at the Building Entrance Terminal (BET)). Any protectors in the DLC channel banks, 1A power and jack panel or 8A power panel must be removed.**
2. **A Coupled Bonding Conductor is attached to the cables that are not shielded. The Conductor consists of #6 tie wrapped to cable & grounded at both ends. Coupled Bonding Conductor is a replacement for cable shields that are not present (e.g., House Cable).**
3. **If the Cross−Connect Field is located in a metal enclosure, the sides of the box should be used as the coupled bonding conductor bar.**
4. **The cable sheath or coupled bonding conductor should be grounded at the DLC frame as well as the BET.**
5. **Ground the cable shields at both ends on derived and feeder cables.**
6. **Power Plant and Grounding engineered and installed per established central office requirements. See Figure 1 for typical.**

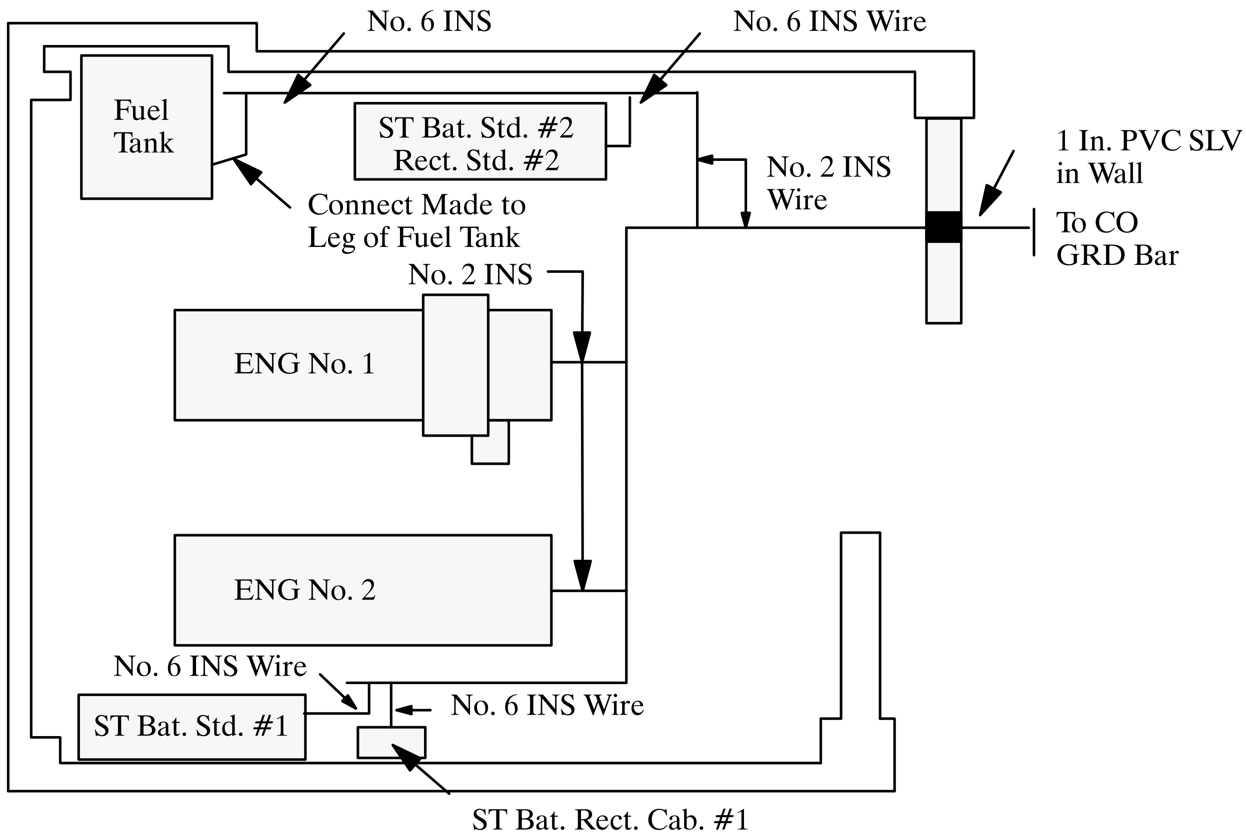


Figure 16 − Typical Method Of Grounding Engine Room

EQUIPMENT DESIGNATIONS − ENGINEERING PROCEDURES

CONTENTS

EQUIPMENT DESIGNATIONS − ENGINEERING PROCEDURES

1. General

1.1 This section describes the general engineering requirements for Frame Identification\Relay Rack codes for equipment installed in a Central Office Environment.

1.2 The requirements covered herein shall be followed except as modified by the manufacturer's equipment specifications and CO base drawings. In general, equipment drawings will show the designations, location, and size of designations to be stamped on an apparatus and mounting plates. CO base drawings (front equipment and/or wiring list) will provide circuit identification and specific group designation to distinguish one group of apparatus or equipment from another.

Power Frame Identification Code

1.3 Power distributing service fuse cabinets shall have the name and number of the cabinet, the voltage and the type of service stamped in abbreviated form on the trim above the door. If room is not available, as in the case of small cabinets, stamp on the door itself. The cabinet number shall consist of 3 or 4 digits. The first digit (or first two digits) represents the floor number, e.g., 0−basement, 1−first floor, etc. The last two digits represent the cabinet number, e.g., 01, 02, etc., on the floor.

Frame Identification/Relay Rack Code

1.4 The Frame Identification Code must be used in all documentation and records of BellSouth Telecommunications. This includes Office Record Drawings, Detailed Engineering Specifications, Invoices, Mechanized Data Bases, etc. See Figures 1 and 2 for examples of frame identification codes and where they are typically used.

1.5 The Frame Identification/Relay Rack code is a ten character field (two for Floor, five for the Line−up or Frame Function Code, two for the Bay Number and one for the Bay Designation).

PICS/DCPR (Plug−in Inventory Control System/Detailed Continuing Property Record) − The Data Field is eleven characters wide, right justified, blank filled, with the third character position blank in all cases. TIRKS − The data Field is ten characters wide left justified with no fillers.

NOTE FOR BST: **See BR 756−551−790 Field Format Directory, Relay Rack, for exceptions to this code structure.**

1.6 FLOOR − Character positions 1 & 2:

A floor is a continuous horizontal division of the structure housing the equipment. The code used to designate the floor is a two character mnemonic code that consists of certain combinations of alpha and numeric characters.

Examples:

FLOOR #	FLOOR CODE
1–99	01–99

FLOOR BELOW SURFACE	
1	00
2	0A
3	0B
4	0C
5	0D

1.7 LINE–UP or FRAME FUNCTION CODE – Character Positions 3 to 7:

Line Up:

A five character field. Four alpha numeric characters followed by a dot (.). This field is right justified, blank filled for PICS/DCPR and for TIRKS it is left justified with no fillers. A line–up represents a particular row of relay racks or equipment. It may be of one of the following types:

Transport equipment:

Line–Up: A particular row of equipment.

Examples:

Data	Frame Code
Line–up 3	– – –3.
Line–up 101	– 101.
Line–up 117A	117A.

Distributing Frame:

This includes Main Distributing, Intermediate Distributing, Toll Distributing, Local or Line Distributing, Protector, High Frequency Cabinets, frame locations. These frames carry a F(x) (x) type code.

For Cosmic Frames use the following:

(1) If the bays are adjacent to each other and arranged for inter–bay jumpers, only one code is required.

(2) Individual codes are required for all stand–alone bays, except transmit and receive bays that are in the same vicinity.

(3) Each Line−up of a COSMIC distributing frame requires a separate code.

Examples:

FRAME TYPE	FRAME CODE
Main. Dist. Frame	_F01.
Intermediate Dist. Frame	_F03.
Toll Main Dist. Frame	_F04.
COSMIC Frame	_FC3.

FRAME FUNCTION CODE:

A five character alphanumeric code is used for switching equipment. For Electronic switching system frames, the code has a maximum length of 3 characters. Bellcore Practice BR 751−410−501 contains a complete list of codes. Character position 7 is used as a Control Group Designator.

Control Group Designation by Manufacturer:

TYPE OF OFFICE or MANUFACTURER AT&T	CONTROL GROUP DESIGNATION
1/1A ESS	C
2 ESS	E
3 ESS or RSS	B
4 ESS	H
5 ESS	D
101 ESS	A
ETS	F
TSPS	R
AIS	V
Fujitsu	F
Northern Telecom	N
Siemens or Stromberg−Carlson	S
Ericsson	K

1.8 BAY NUMBER − Character position 8 & 9:

The Bay Number is a two character numeric that identifies individual bays within a line−up. For transport equipment this is the next available number in the line−up. For Switching equipment this is the next number in sequence for the type of frame being installed.

Examples:

DATA VALUE	BAY CODE
Bay 45	45
Bay 2	02
Bay 4	04
DTE 004	04
SM 001	01

1.9 BAY DESIGNATION − Character Position 10:

The bay designation is a one character mnemonic code. It is either alpha, numeric, or left blank. The Bay Designation can identify one of the following conditions:

(a) Front/back of a non−switching system.

(b) Left/right side if a non−switching system.

(c) Control Group of a switching system. (Not used by TIRKS)

(d) SONET Shelves in the same bay (Shelves 1 to 7)

DATA VALUE	BAY DSG CODE
Front	F
Back	B
Left	L
Right	R
Marker Group 0 to 9	0 to 9
SONET Shelves in same bay	A to D & F to H (E is not used)
Control Group 0 to 9	0 to 9

Control Group by Manufacturer:

TYPE OF OFFICE or MANUFACTURER	CONTROL GROUP NUMBER
AT&T	
1/1A ESS	0 to 9
2 ESS	0 to 4
3 ESS or RSS	0 to 9
4 ESS	0 to 3
5 ESS	0 to 4
101 ESS	0 to 4
ETS	0 to 1
TSPS	0 to 4
AIS	0 to 4
Northern Telecom	0 to 9
Siemens or Stromberg−Carlson	0 to 9
NEC America	0 to 1
Ericsson	0 to 1

Sonet Frame Identification Code

1.10 For SONET products the frame ID has a modifier in the Bay Designation field that denotes the shelf. This modifier is required by Network Monitoring and Analysis (NMA) to identify which Network Element is reporting a trouble condition.

1.11 Each shelf in a relay rack containing SONET equipment must be stenciled with a numeric designation beginning with "1" as the lower most shelf. The shelves must also be stenciled with the Alpha designation beginning with "A" as the lower most shelf. The alpha character, in parenthesis, should appear directly beneath the corresponding shelf number.

1.12 In those cases where SONET products have shelves that can be combined into a single shelf or operate independently in separate shelves the lowest numeric and alpha should be shown on the lowest shelf of the combined unit. This is the shelf designation that will be shown in TIRKS. The number and alpha should be omitted on the shelf above, which is combined into the single unit. This will cause a skip in the numbering sequence which will accommodate the un−combining of the shelves into independent shelves at a later date. The un−combining of the shelves will cause the relay rack to have to be re−stenciled with the new shelf number. This is illustrated in the example following paragraph 1.13.

1.13 Additionally SONET equipment of a different type or non−SONET equipment in the same relay rack will have their shelves numbered consecutively. Non−SONET equipment will not require the alpha designation. This is illustrated in the example below.

5 (F)	Product FS1 Single Shelf
4	Product ZZ1
3 (C)	Product FS2
	Product FS1 Combined Shelves
1 (A)	Product FS1 Combined Shelves

RR 101.01

5 (F)	Product FS1 Single Shelf
4	Product ZZ1
3 (C)	Product FS2
2 (B)	Product FS1 Single Shelf
1 (A)	Product FS1 Single Shelf

RR101.02

NOTE: The alpha "E" is not used to avoid confusion with the East, West direction convention

1.14 In the above example TIRKS would show the frame identification for the respective shelves in these relay racks located on the first floor as follows:

SHELF	FRAME ID	FRAME ID
1	01101.01A	01101.02A
2		01101.02B
3	01101.01C	01101.02C
4	01101.01	01101.02
5	01101.01F	01101.02F

Frame Identification for SONET equipment located in a non−BST territory should be shown as INDPNDT.

1.15 In developing the SONET frame identification for equipment located on customer premises the following conventions should be applied:

(a) Equipment installed in Relay Racks:

Follow the same convention as Central Office Equipment.

(b) Equipment installed in cabinets:

```
01CAB.01A
|  |  | |
|  |  | |
|  |  | |___ Multiplexer (A−Z)
|  |  |___ Customer Number (00−99)
|  |___ Cabinet
|___ Floor
```

(c) Equipment installed on walls:

```
01CUST.01A
|   |  | |
|   |  | |
|   |  | |___ Multiplexer (A−Z)
|   |  |___ Customer Number (00−99)
|   |___ Customer
|___ Floor
```

DOCUMENT	CHARACTER SET REQUIRED									
	FLOOR		LINE−UP or FRAME FUNCTION CODE					BAY NO.		BAY DSG.
	1	2	3	4	5	6	7	8	9	10
Office Record Drawings	NOTE 1		YES					YES		YES
Engineering Specifications	YES		YES					YES		YES
Stenciled on the Equipment	NO		YES					YES		YES
Order Acknowledgment	YES		YES					YES		YES
Mechanized Order Acknowledgment (MOA)	YES		YES					YES		YES
Invoice (Manual or Mechanized)	YES		YES					YES		YES
TIRKS® Records	YES		YES					YES		YES

NOTE 1: **The floor is indicated by the drawing on which the equipment is recorded.**

NOTE: **If equipment is located on a horizontal divison above the original division, the equipment located above will retain the floor code of the original division.**

Figure 1 − Examples Of Where Frame Identification Codes Are Used

Figure 2 – Examples Of Frame Identifications

	PICS/DCPR											TIRKS									
				Line–up or Frame					Bay		Bay			Line–up or Frame					Bay		Bay
	Floor			Function Code					No.		Dsg.	Floor		Function Code					No.		Dsg.
Description	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10
Second level below surface, Line–up 3, Bay 2	0	A					3	.	2			0	A	3	.	2					
Floor 2, Line–up 117A, Bay 45	0	2		1	1	7	A	.	4	5		0	2	1	1	7	A	.	4	5	
Floor 3, Line–up 118, Bay 12, Front	0	3			1	1	8	.	1	2	F	0	3	1	1	8	.	1	2	F	
Floor 1, Common Control System Cabinet No. 2, Control Group 1, Ericsson	0	1			C	C	S	K	0	2	1	0	1	C	C	S	K	0	2		
Floor 7, Switch Module 001, Control Group 3, 5ESS	0	7				S	M	D	0	1	3	0	7	S	M	.	0	0	1		
Floor 4, Digital Trunk equipment Frame 006, DTC 012, DTA 1, Control Group 2, DMS–100	0	4			D	T	E	N	0	6	2	0	4	0	1	2		1	0		
Floor 1, Digital Trunk Frame 03, Control Group 5, DCO	0	1			D	T	F	S	0	3	5	0	1	D	T	F	S	0	3		
Floor 1, Main Distributing Frame	0	1			F	0	1	.				0	1	F	0	1					

NOTE: PICS/DCPR Always leaves character position 3 blank

CROSS CONNECT SYSTEMS − ENGINEERING PROCEDURES

CONTENTS

CROSS CONNECT SYSTEMS − ENGINEERING PROCEDURES

1. General

1.1 This section covers the engineering considerations that should be taken into account with regard to the installation of telecommunication cross connect systems.

1.2 Cross−connect systems consist of distributing and interconnect frames. These systems are used for cross−connection, electrical protection, test access, temporary disconnection, and facility termination.

(a) DISTRIBUTING FRAMES: Frames that are not usually installed in lineups with equipment frames, such as the Main Distributing Frame (MDF) and the Protector Frame (PF).

(b) INTERCONNECT FRAMES: Frames that may be installed in lineups with equipment, or in separate lineups parallel or perpendicular to equipment frame lineups, such as the following:

- Intermediate Distributing Frame (IDF)
- Cosmic Frame (CF)
- Circuit Concentration Bay (CCB)
- Group Distributing Frame (GDF)
- Digital System Cross−connect (DSX)
- Quick Connect/Cross−connect (QCX)
- Trunk Distributing Frame (TDF)

1.3 Although no single standard floor plan is applicable for all distributing frame configurations, floor plans should be prepared for each type of distributing frame. These plans should reflect efficient use of building space and allow adequate aisle space for maintenance functions. Generally, distributing frames have 4 foot maintenance aisles, 2 foot, 6 inch wiring aisles, and 4 foot aisles between frames and walls and other building structures. Floor plan drawings contain essential frame identification information, cabling and physical data, aisle spacings, and pertinent notes and references.

1.4 BST will specify requirements for new cross−connect systems in the equipment order. This will usually occur when a new wire center or equipment area is specified.

1.5 Existing cross−connect equipment, such as distributing frames, will be engineered for expansion as directed by the Capacity Manager. In most cases, existing frames will be engineered for growth by the addition of similar terminal blocks and structural details.

1.6 All assignment of cross−connect frame cable terminations are controlled by the BST. As a result, the assignment of all terminations and added apparatus must be coordinated with the Capacity Manager.

Note: Common Systems Main Interconnect (COSMIC) Frame termination assignments will be identified on a Mechanized Engineering and Layout for Distributing Frame (MELD) document.

Distributing Frames

1.7 Termination units on conventional frames are referred to as verticals and horizontal bays, as illustrated in Figure 1.

Verticals − The vertical uprights on which facility cables are terminated are generally spaced on 8 inch vertical spacing. Since a frame starts and ends with a vertical, the total number of verticals is one more than the number used for computing frame capacity or lineup length.

Horizontal Bay − A bay is the apparatus mounting space (usually 8 inches) on a horizontal shelf between two verticals.

Numbering − Verticals are numbered consecutively (usually from left to right) starting with numeral 1. The first vertical, where growth is from left to right is ordinarily not furnished with jumper rings, and is not used for terminating facility cable pairs. Because of this, the first vertical of a frame is reserved for plugging−up and test line protectors.

Horizontal Shelves − Shelves are identified by letter designations starting with the letter A at the bottom, but omitting letters I and O. Horizontal bays on an individual shelf are identified by the associated letter designation followed by the vertical number. This number is normally stamped on the vertical, viewed from the horizontal side.

1.8 Distributing frames currently in use have been configured in several versions. Some of the configurations in use are Tall Conventional, Low Profile Conventional, Modular and Common System Main Interconnecting (COSMIC*).

Interconnect Frames

1.9 Interconnect frames use methods such as quick connect blocks or pin jacks to allow flexibility. These frames may be installed in lineups with equipment bays or in separate lineups in equipment areas.

1.10 A typical interconnect bay mounts in a standard dimension relay rack and consists of termination panels, wire troughs, and jumper wire. The number of termination panels varies with rack height. The number of terminals per panel varies with function.

Digital Signal Cross−connection Systems (DSX1 And DSX3)

1.11 DSX systems are specialized systems that have to be engineered and installed to meet transmission, jumper, and cabling requirements.

1.12 Bay locations and wiring assignments are predetermined to meet the above requirements and the BST plan for these systems shall be strictly adhered to. Deviations from the TEO shall only be allowed upon written approval of the Capacity Manager.

1.13 Space between the bays is critical when a waterfall configuration is not used. Sufficient space should be allowed for bays where cabling to the shelves enter from the side (between bays). This will depend upon the type of cabling, the number of terminations, and the height of the bay. For detailed engineering and installation instructions, the installation vendor should refer to the manufacturer's published documentation. If this is not available contact the Capacity Manager.

1.14 If the manufacture does not otherwise specify the following shall apply. The minimum spacing between bays should be 5 inches. As a result 2 1/2 inch spacers shall be placed on both sides of every bay.

Digital Cross−Connect Systems (DCS)

1.15 Digital Cross−Connect Systems electronically arrange and rearrange digital signal terminations, whereas Digital Signal Cross−Connect Systems(DSX) arranges\rearranges them by physical means. The DCS has the capability of electronically performing the testing and provisioning of circuits normally performed at the DSX.

1.16 Due to the high circuit density of DCSs, the engineering and installation of these systems has to be carefully planned and coordinated in order to meet transmission and jumper requirements, while also avoiding cable congestion and allowing for future growth. The location of these systems has to be planned carefully, especially those that are deeper than the standard 12 inches depth. If possible, group those systems with greater than normal depths together in a lineup. Do not mix equipment of different depths in the same lineup which would reduce the aisle space.

1.17 For detailed engineering and installation instructions, the services vendor should refer to the manufacturer's published documentation.

Fiber Distributing Frames (FDF)

1.18 Fiber Distributing Frames\Systems require detailed management of the systems by the FDF planner and engineer, and will follow a preconceived plan which shall incorporate a plan for a "FIBER PROTECTION SYSTEM". If a fiber protection system is not included on the order for the FDF, DO NOT engineer or install a FDF until there is a coordinating order for the installation of a fiber protection system. (See **Sections 8 and 25** for information regarding Fiber Optic Pathways.)

1.19 Detail engineering and installation of these systems will follow the manufacturer's published instructions.

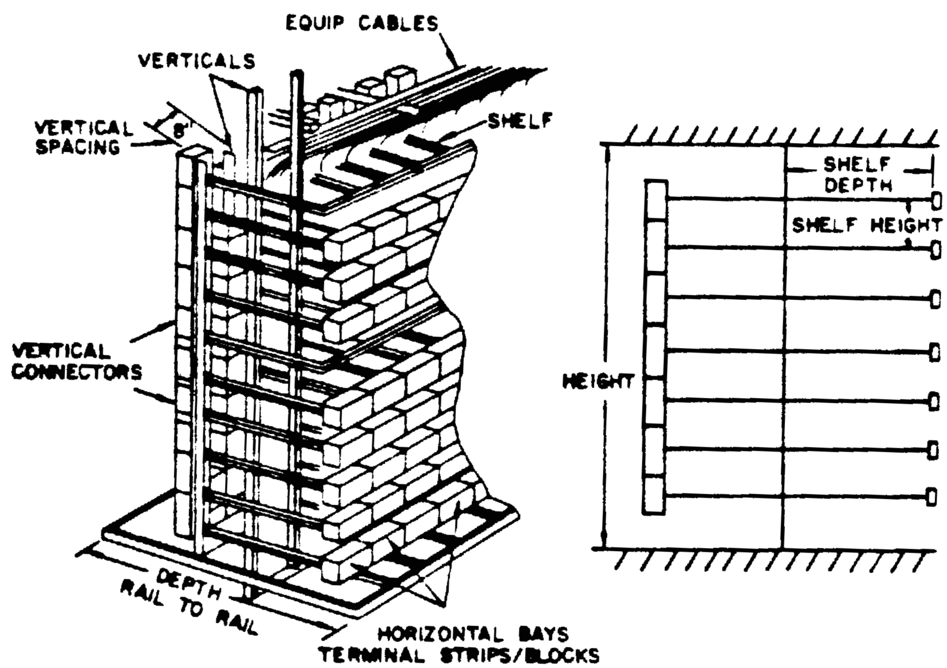


Figure 1 − Conventional Distributing Frame

EQUIPMENT INVENTORY UPDATE DATA DESCRIPTION TRUNKS INTEGRATED RECORD KEEPING SYSTEM (TIRKS)

CONTENTS

EQUIPMENT INVENTORY UPDATE DATA DESCRIPTION TRUNKS INTEGRATED RECORD KEEPING SYSTEM (TIRKS)

1. General

This section describes the data required to update the TIRKS equipment inventory (E1) data base file from a data input terminal. Definition of the specific data, extraction of the data from various source documents, and entry of the data are included in the description. This section is intended for use by BST or Vendor Detailed Engineers.

2. What Must Be Inventoried?

Equipment to be included in the TIRKS inventory must conform to two criteria:

(1) It must be circuit or carrier system assignable.

(2) It must be Common Language coded and orderable equipment. The criteria are explained in the following paragraphs. In addition, procedures to be used relative to some non−coded items are provided.

3. When Is E1 Updated?

The E1 data base is updated for TEO's that provide for additions, changes (relocations, modifications, recabling), retirements and removals of equipment. Also E1 is updated to reflect changes in equipment status.

4. Responsibilities

A. Capacity Manager:

(1) The BST Capacity Manager is responsible for the update of the E1 inventory. The Capacity Manager may prepare the necessary documents to update the inventory or may designate the documents be prepared by an agent, either BST or Vendor.

(2) All TEO's will be prepared in accordance with TR 73503 Section 5 and will contain:

(a) The 11 character Office CLLI code. (See 795−1XX−100)

(b) The 3 character (characters 9 through 11 of the office CLLI code) Frame termination location code.

(3) In all cases Capacity Manager is responsible for ensuring that the vendors provide the necessary CLEI/HECI code information and all features of the equipment necessary for the detail engineer to derive the correct code. Non inventory equipment does not need LEI codes. For products approved for use in BellSouth the requirements to have item CLEI/HECI coded is covered by

the product contract with that vendor. For non−approved products it is the responsibility of the engineer buying the product to ensure that CLEI/HECI codes are supplied by the vendor.

B. Detail Engineer:

(1) The detail engineer either BST or Vendor will complete the EIU form in accordance with this document. The detail engineer is responsible "for extracting" relevant data from the TEO and associated documents/drawings, and for entering the data on the EIU form.

(2) The detail engineer derives the CLEI/HECI code.

(3) The completed Detail Job Specification must include all relevant CLLI and CLEI/HECI codes. Section B of the Job Specification (i.e., Summary of Material and Cable Running List) are the primary source documents for preparation of the EIU form.

C. Vendor:

(1) When providing detailed engineering the vendor will complete the EIU form in accordance with this document.

(2) The company that supplies the equipment is responsible for obtaining the (CLEI/HECI code from Bellcore. Generally this is the equipment manufacture.

D. Equipment Order Control System (EOCS) Coordinator:

(1) The EOCS coordinator is responsible for updating the E1 inventory based on information supplied by the Detailed Engineer on the EIU form.

5. Preparation Of Equipment Inventory Update (EIU) Form

A. About The Form:

A standard Equipment Inventory Update (EIU) form has been designed to support collection of data and to facilitate data entry at the CRT terminal. Figure 12 is a reduced sample of the EIU form. Entries in the vertical fields on the form are to be made by the Detail Engineer as required.

The EIU form shall be supplied with the Telephone Equipment Order (TEO).

B. Determining What Is Entered:

The equipment may be single unit equipment, bay equipment, or assembly equipment. The major sets of information are the following:

(1) Specific equipment items

(2) Office, relay rack, and cross connect terminating frame locations of the equipment

(3) Equipment unit numbers

(4) Cross connect lead set identification

Entries are made on the EIU form by "equipment complement." An equipment complement is considered to be the entire quantity of an Equipment Catalog Item (ECI) for the given building, floor, and bay location. The following guidelines should be used in determining the items to be listed on the EIU form for one equipment complement:

(a) Must have the same CLEI/HECI equipment code.

(b) Must be limited to a maximum of 300 equipment units that are consecutively numbered and are located within one relay rack. If 300 units are exceeded, additional equipment complement item entries should be made on the EIU form. For example, consider that 500 2−way, 2−wire bridge equipment are located in bay X. Under the 300 equipment unit per complement entry limitation, this would be shown on the EIU form, as two equipment item complement entries: units 1 through 300 and 301 through 500. However, it is permissible to terminate only five equipment units at each terminal strip located on the cross connect distributing frame, and it is desired that each terminal strip location be shown in the data base. In this case, the terminal strip location becomes the primary limiting factor, requiring a total of 100 sets of equipment items (units 1 through 500 in increments of 5) to be entered on the EIU form for the total equipment complement.

(c) Must be limited to the equipment units terminated within a single terminal strip location on the cross connect distributing frame (see the notes below). It is important to be aware that this does not apply to the actual terminal strip block. In those instances where the engineer desires to define a complement as being limited to discrete blocks, the discrete block locations should be used as the basis for determining the number of EIU entry requirements.

Note 1: The "individual terminal strip location" concept is necessary to meet the requirements for short jumpers and, therefore, replaces the "first block location" concept for showing frame terminations.

Note 2: The individual terminal strip location could require several equipment complement entries to be made on the EIU form for any one equipment type. For example, equipment units 1 through 9O of the same CLEI/HECI code located in bay X and terminated at distributing frame location Al through A9 (ten equipment units per terminal strip location) could now require nine individual 10 unit entries on the EIU form instead of the one entry required under the first block location concept.

Note 3: The individual terminal strip location is not applicable to unitized Remote Test Access System (RTAS) complement entries.

C. Special Situations:

Special techniques must be used to enter data for the following types of equipment on the EIU form:

(1) Remote Test Access System (RTAS)

RTAS represents a collection of access points. An access point being a test location wired into a circuit. Access points may be provided in the following configurations.

(a) Built in on unitized facility terminals (analog, metallic or digital).

(b) Built in retrofit (unitized) but cross connected at a distributing frame.

(c) Located in tie pairs.

Stand alone terminated on a distributing frame block and cross connected as required, or hardwired into equipment assemblies of various types of non−facility terminal equipment.

Note: Stand alone as used in this section is not to be confused with the stand alone Remote Test System feature. Stand alone RTAS access points are inventoried as equipment units in TIRKS. This data is entered in the CLEI/HECI equipment inventory fields on the EIU form. For unitized RTAS (built in access points), two types of entries are made. First the equipment unit to which RTAS is assigned is entered in the CLEI/HECI inventory fields and additional entries are made in special fields designated for unitized RTAS. All of these data field entries are explained in Part 5F.

(2) Double and Multiple Bay Frame "J" Specifications

The EIU form should reference only the bay number upon which the inventoried unit is located.

(3) Equipped Only and Wired Only Conditions

Orders to install equipment in an equipped only or a wired only condition should be handled as pending additions. Orders to connect existing wired only or equipped only equipment, and orders to remove existing mountings and cabling and create equipped only or wired only conditions, should be handled as pending changes.

(a) Equipped Only: The cross connect fields for equipment that is physically in place, with internal wiring connected but without the cabling and power wiring in place, should be completed as described in Figure 18. An "Equipped Only" note must be added indicating this condition.

(b) Wired Only: When the cabling is physically in place but the mounting is not in place, the EIU should be prepared as though the mounting were in place and with the proper frame termination information. A "Wired Only" note must be added indicating this condition.

(4) Equipment Changes

An entry must be made on the EIU form for each contiguous unit count of equipment affected by removals and changes, such as relocations, modifications, and recabling. When an equipment location, CLEI/HECI code, relay rack, or from/to numbering is changed, TIRKS automatically generates a unit status of pending remove plus pending add. When a frame termination is changed, TIRKS automatically generates a unit status of pending change. The change entered on the EIU form should be made in accordance with the individual terminal strip location concept (paragraph 5B).

(5) Equipment Assemblies (Hard Cable Arrangements)

An equipment assembly is defined as two or more equipment items (ECI's) that are permanently cabled together and treated as a single unit for assignment purposes. Each assembly has a unit number. The items, components, that make up the assembly are inventoried in TIRKS and indicate the equipment assembly to which they are assigned. Each unique assembly type has an ECI and a CLEI/HECI code. Refer to 756−552−737 for a description of how to build assemblies.

The following guidelines are to be followed for the entry of equipment assembly data on the EIU form.

(a) A maximum of nine permanently connected, inventoried components can be included in a single equipment assembly. In some cases, 1 component equipment assemblies will be required.

(b) The components of equipment assemblies shall not be entered on the EIU form for non−TIRKS equipment hard cabled to non−TIRKS equipment.

(c) The components of equipment assemblies shall be entered on the EIU form for TIRKS equipment hard cabled to TIRKS equipment and non−TIRKS equipment. A Note must be added to cross reference the hard cabled arrangement.

(d) The components of equipment assemblies also shall be entered on the EIU form for TIRKS equipment hard cabled to non−coded equipment. In such cases, a note must be entered indicting the schematic diagram, unit numbering, and bay location of the non−coded item.

(e) An equipment assembly is not required when the Common Language code contains a supplementary unit incorporated as a part of the code. Direct cable lead sets for this type of equipment must be identified on the EIU form as lead sets requiring direct connections.

(6) Channel Banks

Individual terminal strip locations for the various types of channel banks are to be identified on the EIU form as follows:

(a) D4 Channel Banks: Individual terminal strip locations must be defined for the individual digroups.

(b) All Other Channel Banks: Individual terminal strip locations must be defined just for the bank.

(7) Channel Bank Assemblies

A channel bank assembly is defined as an inventoried carrier system terminal mounting where channels are permanently cabled to combinations of other toll terminal equipment. Each bank assembly has a unit number. The individual items (components) that make up the assembly are inventoried in TIRKS and indicate the bank assembly to which they permanently connected.

Other toll terminal equipment permanently connected to the channels of the carrier terminal should be entered on the EIU form and shown hard cabled to the terminal mounting. A note must be added if all of the channels of a terminal mounting are not interconnected identically.

(8) DCS/DSX Frame Cross Connects

For hardwired cross connections between a DCS frame and a DSX frame, the following must be identified:

(a) Cross connect bay/identification (ID)

(b) Cross connect location, using distributing frame ID and terminal location.

(c) Transmission line (TL) leads at the DSX frame and transmission drop (TD) leads at the DCS frame.

D. General Input Conventions:

The following general input conventions are applicable to preparation of the EIU form:

(1) Ditto marks should not be used on the form. However, the ladder (I) symbol may be used in the equipment code field to indicate consecutive identical entries. Vertical arrows may be used in other fields to indicate consecutive identical entries.

(2) A vertical arrow may be used when more than one distributing frame or terminal strip is associated with a particular item. A maximum of five distributing frames or terminal strips may he associated with a single item.

(3) All entries are to be left justified; that is, the first character entered in many field is to be written in the first column at the extreme left of the field. The exception to this rule is that leading zeros are to be entered to complete the item number field; for example, 002.

(4) It is suggested that a blank line be left between items.

(5) The following characters are to be entered as shown:

Character	Enter As
All alpha	Capital letters
Zero	0
One	1
Two	2
Alpha O	Ø
Alpha I	I
Alpha Z	Ƶ
Slash	/
Ampersand	&

E. Data Source Examples:

Figure 1, Example Face Sheet of Telephone Equipment Order
Figure 2, Example Pages From Job Specification
Figure 3, Example Page From CLEI/HECI Dictionary
Figure 4, Example Pages From Report of Equipment Items Inventoried in TIRKS
Figure 5, Example Front Equipment (Relay Rack) Drawing
Figure 6, Example Wiring List
Figure 7, Example Frame Drawing
Figure 8, Example Floor Plan Drawing
Figure 9, Example Office Record Index
Figure 10, Example Unitized RTAS Assignment Chart for Maintenance Connector Not Collocated With Equipment
Table A, Frame Types/Cross Connect Location Formats

F. Data Field Entries

The data fields described in (1) through (20) below follow the left justified entry convention. The descriptive format for each field includes the following:

(1) Name of field

(2) Definition of field

(3) Source of the data to be entered.

(4) Valid entry for the field

(5) Example of a valid entry

(1) INV AUTH CODE: (Inventory Authorization Code) BST use Only.

Definition: Specifies the group or area permitted to, and responsible for, making changes to the equipment inventory.

Data source: BST local procedures

Data entry: 2 alphanumeric

Example: SC

(2) LOCATION: (Location Code)

Definition: CLLI code for city or town, state, building, and, optionally, the entity office where equipment is located.

Data source: Job Specification Sections

Data entry: 8 or 11 alphanumeric

Example: CLMASCSN, CLMASCSNF01, CLMASCSNK41

(3) PENDING IN EFFECT ORDER DATA: (Group of Fields)

(a) BST ORDER NBR: (Telephone Order Number)

Definition: Identifies the additions, changes, retirements, or removals of equipment units. Make an entry on the EFRM screen only if the order is a pending change.

Data source: Job Specification

Data entry: 1 to 10 alphanumerics. The last 2 characters in the field may be used to identify supplements to the basic order.

Example: BHRA337000

(b) EXPECTED COMPLETION DATE:

Definition: Anticipated or scheduled completion date of the equipment item.

Data source: Job Specification

Data entry: 6 numerics, in format MM DD YY

Example: 05 22 95

SUPPLIER ORDER NBR:

Definition: It identifies the detailed specifications for additions, changes, retirements, or removals of equipment units.

Data source: Job Specification

Data entry: 1 to 10 alphanumerics

Example: 509077 NN

(4) ASGN AUTH CODE: (Assignment Authorization Code) BST Use Only

Definition: Code designating the area or group responsible for making assignments to equipment; it also represents a restriction as to who can post assignments.

Data source: BST local procedures

Data entry: 2 alpha

Example: MB

(5) MNTC RESP: (Maintenance Responsibility) BST Use Only

Definition: Code indicating the area or group responsible for maintaining equipment in a central office.

Data source: BST local procedures

Data entry: 1 alphanumeric

Example: B

(6) AUTH NBR: (Authorization Number) BST Use Only

Definition: Identifies the cost estimate under which the equipment was installed, rearranged, or modified.

Data source: TEO Face sheet

Data entry: 10 alphanumerics

Example: 274652

(7) TO BE COMPLETED BY DETAILED ENGINEER:

Definition: To be completed by the detail engineer.

(8) ITEM: (Equipment Item)

Definition: Abitrary number assigned to identify and track an equipment item within a given Job Specification.

Data source: Job Specification Section B

Data entry: 3 alphanumerics

Example: 002 or 02A

(9) ORDER TYPE:

Definition: Designates a pending activity.

Data source: Job Specification

Data entry: 1 alpha, as:

A = pending add

C = pending change (includes relocates, modifications, and recables)

X = pending retire in place

R = pending remove.

(10) EQUIP CODE: (Equipment Code)

Definition: CLEI/HECI code identifying the equipment.

Data source: Job Specification Section B.

Data entry: 10 alphanumerics

Example: LGSA31ARB

(11) RELAY RACK:

Definition: Designates the physical location of the equipment in a building. This entry includes the Floor, Lineup or Frame Function, Bay Number and Bay Designation. Details of this entry are covered in TR 73503, Section 12.

Data Source: Job Specification, Section B and C, Office Floor Plan and Wiring List.

Data entry: 5 to 10 alphanumerics

(12) FROM:

Definition: Identifies the first of a range of equipment units to be assigned; the lowest equipment unit number in the relay rack.

For DMS–10, 5ESS, DMS100, and DMS200 a dash must be included where the shelf ID precedes the dash and the location on the shelf follows the dash. For DTC racks for DMS100 and DMS200, the shelf ID is already indicated in the field "Relay Rack" and it is necessary to enter only the rack's location on the shelf.

Data source: Job Specification Sections B and C, Front Equipment (Relay Rack) Drawing.

Data Entry: 1–6 alphanumerics

NOTES:

(a) For all equipment except carrier and stand alone RTAS, use equipment unit numbering. Enter the first actual office number (physical stamping) of equipment units contained within this item. Must be numbered consecutively. Cannot exceed 300.

(b) The standard format for carrier equipment is terminal or channel bank numbering.

(c) For DSX bay/No.5 switch interface, use digital line trunk unit (DLTU) and slot numbering in the FROM/TO fields. For example FROM = 0−1; TO = 0−10.

(d) For DSX bay/DMS 10 & DMS 100 switch interfaces, use digital carrier mounting (DCM) shelf and unit on the DCM (line interface) numbering in the FROM/TO fields. For example FROM = 6−1; TO = 6−6. FROM = 000−0; TO = 000−4.

(e) For stand alone RTAS, use access point numbering within the connector group previously identified in the relay rack field. The quantity of access points entered in the FROM/TO fields cannot exceed 100 (00−99), which is the maximum available in a connector group.

(f) Whenever only one equipment unit is involved, enter that unit in both the FROM and To fields. For example: circuit 21, FROM 21 TO 21; or channel bank 1A, FROM 1A TO 1A.

(g) Consecutively numbered equipment items identified by even and/or odd designations should be prefaced with a "1" for odd equipment items and with a "2" for even equipment items. Example: B2 group connector (2−way) circuits 1−10 odd and even would be numbered 101−110 for odd connectors and 201−210 for even connectors.

(h) Phantom Equipment Units:

(1) A phantom (side one, side two, and phantom) is treated as a unit in TIRKS. The unit number is the group number. The HECI code that represents a phantom group of equipment will key the computer to mechanically generate an assignment record with three subdivisions, S1, S2, and PH.

(2) Side one and/or side two without the phantom circuit should be treated as individual units, since the HECI code representing this arrangement does not subdivide the unit.

(3) When an order is placed to establish a phantom unit, and thus create a phantom group, or when an order is placed to remove a phantom unit, a change operation is required indicating the existing and proposed arrangements.

(13) TO:

Definition: The last unit within the range of equipment units to be assigned. The highest equipment number on the relay rack.

Data source: Job Specification Sections B and C, Front Equipment (Relay Rack) Drawing.

Data entry: 1−6 alphanumerics

NOTE: The notes in FROM field are also applicable to the TO field.

(14) UNIT STATUS:

Definition: Current physical status of a piece of equipment.

Data source: Job Specification and/or TEO.

Data entry: 2 alpha, as:

IE = In effect (already installed) Operator input or system generated on completion of border PA Pending add (to be installed) Operator input The following are system generated and are included here as information only.

PA = Pending add (to be installed) operator input

PR = Pending remove (installed and to be removed)

PC = Pending change (installed and to be changed)

PX = Pending retirement (installed and to be retired)

PH = Hierarchy to be installed, assignable level only

RM = To be removed (coded for removal when spare)

RP = Retired.

(15) ASGN STATUS: (Assignment Status) BST Use Only

Definition: Availability of a piece of equipment for assignment. Use only when installing equipment; leave blank when removing equipment.

Data source: BST local procedures

Data entry: 1 alpha, as:

S = Spare
M = Plant maintenance spare
R = Reserved for bulk transfer
N = Not spare (circuit or pending activity posted)
X = Not assignable
C = Restricted for Computer System for Mainframe Operations (COSMOS)
T = Hierarchical
H = Hierarchical spare, automatic order processing

NOTE: S, H, T, M, R, X, and C may be entered with in effect equipment. R and N may be entered with pending add equipment. X may be entered from CCS for equipment that should be restricted for assignment to the bank on the same relay rack only.

(16) UNITIZED RTAS DATA: (Group of Fields)

(a) RTAS SYS: (RTAS System)

Definition: Identifies the particular unitized RTAS system.

Data entry: 3 numerics

Data source: Job Specification Sections B and C.

NOTE: Enter the unitized RTAS system number as the first number. Enter the number of the Remote Test System (RTS) with which the RTAS is associated, regardless of the type of RTS. If there is no RTS, the BST will furnish a number.

(b) CONNECTOR: (Maintenance Connector)

Definition: Identifies a specific set of 24 access points within the designated RTAS.

Data entry: 3 numerics as:

First numeric is 5, 6, 7, or 8

Last 2 numerics are 00−99

Valid entries are 500−899

Example 502

Data source: Job Specification, Sections B and C or RTAS Assignment Chart.

(c) FROM:

Definition: Identifies the first of a range of access points within the connector group. The FROM/TO count must equal the count for the equipment code data.

Data entry: 2 numerics

Example: 01

Data source: Job Specification, Sections B and C or RTAS Assignment Chart.

NOTE: For digital channel banks, enter the start number of the first access point in the FROM/TO fields (e.g., FROM 1 TO 1). The system derives the rest.

(d) TO:

Definition: Identifies the last of a range of access points within a connector group.

Data entry: 2 numerics

Example: 96

Data source: Job Specification Sections B and C or RTAS Assignment Chart.

(e) RELAY RACK:

Use only when the maintenance connector is not collocated with the equipment (retrofit). When used, see the previous RELAY RACK field description in (11) above.

(17) SW/FW (Software/Firmware) BST Use Only

Definition: Bellcore supplied Intelligent Network Element software and/or firmware code that describes a certain level of software and/or firmware with a controller.

Data source: BST local procedures

Data entry: 1−8 alphanumerics

Example: D50001

(18) FRAME TERMINATIONS: (Group of Fields)

(a) A: (Frame Association Code)

Definition: Indicates how the equipment is wired to the cross connect locations.

Data source: Job Specification, Section C for the wiring.

Data entry: 1 alpha as:

B = Bridged (lead set wired to more than one location)

S = Split (lead wired to different locations)

Blank = Wired in the normal manner

(b) TY: (Frame Type Indicator)

Definition: Value set identifying the structure of the distributing frame terminations referenced by the frame data, addresses 1−4.

Data entry: 1 alpha

Example: A

Data source: Table A

(c) FR: (Frame)

Definition: Identifies the specific distributing frame in a building on which equipment is terminated. The two character, 10th and 11th, of the Common Language Location Identification code.

Data source: Job Specification Section C, Office Record Index

Data entry: 2 alphanumerics

Example: 01

(d) ADDR1: (Address 1)

Definition: Data that identifies the bay, zone, terminal strip, etc, cross connect location of the equipment unit.

Data entry: 1−5 alphanumerics (See Figure 11 for the cross connect address formats to be used for each frame type.)

Example: Table A

Data source: Table A

(e) ADDR2: (Address 2)

Definition: Data that identifies the panel, terminal, etc, cross connect location of the equipment unit

Data entry: 1−5 alphanumerics (See Figure 11)

Example: Table A

Data source: Table A

(f) ADDR3: (Address 3)

Definition: Data that identifies the row, quadrant, etc, cross connect location of the equipment unit.

Data entry: 1−5 alphanumerics (See Figure 11)

Example: Table A

Data source: Table A

(g) ADDR4: (Address 4)

Definition: Data that identifies the terminal, column, etc, cross connect location of the equipment unit.

Data entry: 1−5 alphanumerics (See Figure 11)

Example: Table A

Data source: Table A

(19) LEADS: (Lead Set Indicators)

Definition: Specifies the presence or absence of the following leads on an equipment unit:

(a) Transmission drop

(b) Transmission line

(c) Signaling drop

(d) Signaling line

(e) Network leads

(f) Control leads

(g) Miscellaneous leads

Data Source: CLEI HECI dictionary, Report of Equipment Items inventoried in TIRKS or Job Specification Section C.

Data entry: 7 alphanumerics

NOTE: One character is entered for each of the seven possible lead sets listed above.

Y = Yes
N = No
D = Directly wired
M = Miscellaneous (7th position only)
Digits = The choice of any alternate lead condition shown in the CLEI HECI dictionary. For example, if the alternates T,R,T1,R1/T,R,A,B are shown for a TD lead. Enter 1 in the TD field to indicate T,R,T1,R1 or enter 2 to indicate T,R,A,B.

Example: YYNNNNM

Note 1: An entry must be made for all seven lead indicators, or all seven must be left blank.

Note 2: Lead set data is optional unless two or more lines of frame data (addresses 1−4) are entered.

Note 3: A single item may be terminated on a maximum of five distributing frames and/or terminal strips.

Note 4: For equipment assemblies that are directly cabled, TIRKS to TIRKS or TIRKS to non−TIRKS, enter D or N as applicable.

Note 5: **For equipped only conditioned, enter the character that most nearly identifies the anticipated future configuration of this equipment.**

Note 6: **For a DACS frame that cross connects to a DSX distributing frame, the only applicable leads are the TL and TD leads.**

Note 7: **For Common System Main Interconnect (COSMIC) frame cross connects, enter the terminal strip type (e.g., 78C1A−50, 78C1a−100, etc) in the NOTE field.**

(20) ITEM:

Definition: Cross reference to one or more item numbers previously identified in (8).

Data source: Previous ITEM field

Data entry: 7 alphanumerics. The 4th character can be a plus sign (+), a comma (,), or a through sign (−).

Example: 001+004; 001,004; 001−004

(21) USER DATA:

Definition: Free form field available for codes or comments to aid in selection of equipment. Remember to identify the item(s) to which the user data pertains.

Data source: BST defined

Data entry: 1−10 alphanumerics

Example: NWTN07O1

(22) NOTE:

Definition: Free form field available for comments concerning the equipment complement. Remember to identify the item(s) to which the note pertains.

Data source: BST defined.

Data entry: 1−70 alphanumerics:

Examples: The following are some specific instances when notes should be added:

NOTES:

(a) Stand−Alone RTAS: For stand alone RTAS equipment, the first 10 characters in this field could contain relay rack information.

(b) Equipped Only: Enter equipped only for equipment that is in place physically, with internal wiring connected by cabling, but power wiring is not in place.

(c) Wired Only: Enter wired only for equipment when cabling is in place physically but the mounting is not in place.

(d) Equipment Assemblies:

(1) Add a note to cross reference a hard cable arrangement for TIRKS equipment assemblies to both TIRKS and non−TIRKS equipment.

(2) Add a note regarding 1 component equipment assembly used for TIRKS equipment item hard cabled to non−coded equipment item. Include SD, equipment unit numbering, and bay location of non−coded item.

(e) Preassigned Equipment Hardwired to TSPS Hardware: Add a note indicating the condition, e.g., that the leads are hardwired to universal trunks and are for traffic administration use only.

(f) COSMIC Frames: Add a note identifying the terminal strip type for cross connects.

(g) Any other information pertaining to the equipment and/or which may be helpful to the BST may be entered here.

EXAMPLES OF EIU's FOR CERTAIN EQUIPMENT:

Figure 13, Example Pending Add
Figure 14, Example Pending Remove
Figure 15, Example Pending Retire in Place
Figure 16, Example Pending Change of Bay Location, Equipment Code, and Frame Terminations
Figure 17, Example Pending Add of Split Loads
Figure 18, Example Pending All of Equipped Only
Figure 19, Example Pending All of Equipment Assemblies
Figure 20, Example Pending Add of D4 Channel Banks With Unitized RTAS
Figure 21, Example Pending Add of Miscellaneous Maintenance Connector (Stand Alone RTAS)
Figure 22, Example Pending Add of DSX1 Bay/No. 5 ESS Switch Interface
Figure 23, Example Pending Add of DSX1 Bay/DMS−10 Switch Interface
Figure 24, Example Pending Add of DSX1 Bay/DMS−100 Switch Interface
Figure 25, Example Pending Add for DACS/DSX Frames Cross Connect

SUPPLIER ORDER #

BST ORDER #

CLLI CODE

DATE

ORDER TYPE

```
| VENDOR'S ORDER #: 50907NA     BELLSOUTH TELECOMMUNICATIONS                          |
| DATE:                         TELEPHONE EQUIPMENT ORDER              PAGE   OF     |
|                                                                                   |
| BST ORDER #: BHBA345678    APPX:       | TYPE ORDER E[ ] F[ ] I[ ]                |
|                                                                                   |
| THIS ORDER PLACED ON:                  | JOB LOCATION:                            |
|  COMPANY:                              |  CLLI:CLMASCSN733   EARTH QUAKE ZONE:    |
|  CITY:                                 |  BASE# & Serial #     EIU: YES[ ] NO[ ]  |
|  STATE:           ZIP:                 |  CITY:                COUNTY:            |
|  ATTN:                                 |  STATE:               ZIP:               |
|                                                                                   |
| SHIPPING INFORMATION:                  |  SCHEDULE INFORMATION:                   |
|  SHIP AS AVAILABLE [ ]                 |  ORDER DUE:             SHIP:            |
|  SHIP CONSOLIDATED [ ]                 |  BLDG READY:            ON JOB:          |
|  SHIP VIA:                             | COMPLETE: 08-26-93     ADV.COMP:         |
|  SPECIAL SHIPMENT AUTHORIZED [ ]       | ADV COMP DETAILS:                        |
|  MARK PACKAGES:                        |                                          |
|                                                                                   |
| SEND SHIPMENTS TO:                     | SEND SCHEDULE INFORMATION TO:            |
|                                                                                   |
| MAIL INSTALLATION PAPERS TO:           | MAIL BILLING INFORMATION TO:             |
|                                                                                   |
| ASSOCIATED PROJECTS:                   | REFER ENGINEERING QUESTIONS TO:          |
|                                        |  BST ENGINEER:                           |
|                                        |  PHONE NUMBER:                           |
|                                                                                   |
|                              JOB DESCRIPTION                                      |
|                                                                                   |
| Add D4 Channel Banks                                                              |
|                                                                                   |
|ITEM|QTY.|                             |                                           |
|NO. |    |  MATERIAL IDENTIFIER        |  MATERIAL DESCRIPTION                     |
|____|____|_____________________________|___________________________________________|
|                                                                                   |
|                TO BE COMPLETED BY SUPPLIER (AS APPROPRIATE)                       |
| SHIP:             START:                   ADV COMP:            COMPL:            |
|                                                                                   |
|***************************** FOR BST USE ONLY *********************************|
|                                                                                   |
| EQUIPMENT TYPE:      SWITCH [ ],  TRANSPORT [ ], POWER [ ], LOOP [ ]              |
| ACCOUNTING CLASSIFICATION:      AREA #:          AUTHORIZATION #:                 |
| BST ORDER APPROVAL:                                     DATE:                     |
|___________________________________________________________________________________|
```

Figure 1 − Example Face Sheet Of Telephone Equipment Order

VENDOR ORDER #   CLLI CODE   BST ORDER #

TITLE PAGE   PAGE 1

ORDER NO.: 25096 LT
SPEC. NO. 186
ORDER TYPE: ENGR,FURN,INSTALL

SPECIFICATION

THIS SPEC COVERS FRWK,ASSEM AND EQPT FOR
METALLIC FACILITY TERMINAL RAYS AND
ASSOCIATED EQUIPMEIUT FOR CODED ORDERING

DATE RECEIVED: 08/23/92
SHIP DATE: 09/15/92
ON JOB DATE– 09/22/92
START DATE: 09/24/92
PREPARED BY:
CW BROWN
TEL. NO.: 4045551234
REFER ENGR. QUES. TO:
CW BROWN
TEL. NO.: 40455512345
APPROVED BY– RJW
SECTION OF SPEC. /APPX.:
GENERAL A
DRAWING A
MATERIAL B

CUST. NAME: BELLSOUTH TELECOM
OFFICE SMYRGAPFTO1
TOWN – MARIETTA
STATE– GA
BST ORDER #: BHRA337700
BST ENGR: ME MILLER
TEL. NO.: 5025551234

STATUS OF SPEC   COMPLETE

Figure 2 − Example Pages From Job Specification
Page 1 of 3

```
    HECI
    EQUIP    BAY RELAY
    CODE    CODE RACK                                                   FROM/TO
                                 SECTION B

                   BST ORDER #: BHRA337700
                   ORDER & SPEC.-   25096 LT  186    PAGE    4

                SUMMARY. OF MATERIAL NOTES
ITEM     NOTE          DESCRIPTION....................

 1       ST           MATERIAL DESIGNATED -ST- SHALL BE
                      STAMPED BY THE INSTALLER AS FOLLOWS
                      STAMP THE SEVEN, EIGHT OR TEN
                      CHARACTER CLEO CODES ON SPECIFIED
                      EQUIPMENT IN ACCORDANCE WITH NOTE
                      STC AND LOCAL INSTRUCTION
                      SECTION 35-SO LAD 4.01 HANDBOOK 39.
                      REFER TO SPECIFICATION
                      092 AND INSTALLERS NOTE A FOR
                      SPECIFIC REQUIREMENTS

         C            DESIGNATES A FORMATTED LINE OF
                      INFORMATION.

         STC          EQUIPMEIUT AND/OR MATERIAL SO
                      DESIGNATED SHALL BE STAMPED BY THE
                      INSTALLER PER TR 73503.

                      SUMMARY OF MATERIAL
MAIN PT  NOTE  QTY.   IDENTIFICATION....DESCRIPTION...ISS
 1       ST         2 J 99386H 1        L-1            36
                      MFT BAY
         C            RR0120.17 CKT 1 TO 96

           C            RR0120.21 CKT 1 TO 96
         STC          MTB0S60
                      E/W
 1 A                2 L-5
         STC          MTM1H208
 1 B                2 L-C
 1 C                2 L-E
 1 D                2 L-G
 2      1 ST        1 J 99386H 1       L-1             36
        2             MFT BAY
        3 C           RR0121.22/CKT 1 TO 96
        4 STC         MTBOS60
        5             E/W
 2 A    1           1 L-5
 2 STC                MTM1H200
 2 B    1           1 L-C
 2 C    1           1 L-E
 2 D    1           1 L-G
```

Figure 2 − Example Pages From Job Specification
Page 2 of 3

INSTALLER’S CABLE RUNNING LIST SECTION C

FROM/TO LEADS MTG CODE FRAME **TERMINAL STRIP** **RELAY RACK**

```
|                         INSTALLER’S CABLE RUNNING LIST              SECTION A |
|ORDER NO.     | SPEC | APPX | REFER ENG QUES TO|                        | PAGE |
|     (1)      | (2)  | (3)  |       (4)        |                        |  (5) |
|    |    |      |  |         |        |          FROM        |    TO     |      |
|RUN |CKT.|AMOUNT|NO|         |CKT. NBG| RR or    |CA  |EQPT| RR or  |Eqpt|      |
|NO  |REF.|IN FT.|CA|  CODE   |or CA NO| FRAME    |DES.|LOC.| FRAME  |Loc.| ROUTE|
| (6)| (7)| (8)  |9 |  (10)   |  (11)  |  (12)    |(13)|(14)|  (15)  |(16)| (17) |
|    |    |      |  |T7C018-49 FIG. 28 MTM1H2O8   |    |    |        |    |      |
|    |    |      |  | (X3 FORMED PER ED-1C865-21 G56 QTY 1)|        |    |      |
|    |    | 100  |1 | 287A    |        | HTMDF F10  TS2310            RR0120.17 FC |
|1X17,1AK |      |  |         |        |          |    |    |        |    |      |
|    |    |      |  |         | T,R    |          |    |    |        |    |      |
|    |    |      |  |         |SIDE A  |          |    |    |        |    |      |
|    |    |      |  |         | 1 TO 96|          |    |    |        |    |      |
| 1  |    |      |  |T7C510-31 FIG. 1 SNMAGB34RA |    |    |        |    |      |
|    |    |      |  |(4-24883-0590)              |    |    |        |    |      |
|    |    |      |  |(X3 FORMED PER ED8C724-20 G-301 QTY 6)|        |    |      |
| 1.1|    | 115  |1 |613C     |SHLF 1, |RR110.08  |    | FB |RR125.13|FB  |1K,12,1P|
|    |    |      |  |         |MULD A, |          |    |    |        |    |      |
|    |    |      |  |         |IN      |          |    |    |        |    |      |
| 1.2|    | 115  |1 |613C     |SHLF 1, |RR110.08  |    | FB |RR125.13|FB  |1K,12,1P|
|    |    |      |  |         |MULD A, |          |    |    |        |    |      |
|    |    |      |  |         |OUT     |          |    |    |        |    |      |
|____|____|______|__|_________|________|__________|____|____|________|____|______|
```

FIgure 2 − Example Pages From Job Specification
Page 3 of 3

LEAD
DESIGNATIONS

```
BST TEST NAME FOR DEPT R98425           TIRKS:  EQUIPMENT REFERENCE DATA SYSTEM  PAGE
NUMBER:           2
  PGN ID: RRDL83 DICTIONARY OF HECI (ECI) DATA FOR JOB SPECIFICATIONS UNIT EQUIPMENT
J-DRAWING SEQUENCE DATE:  10/24/74 08:16

  COMPLETE RUN                            ISSUE  NUMBER 033              SPINOFF DATE
10/01/74
J98615AP-1 - J DRAWING NO. (BASIC) - ORD STAT - MD OFF STLG - V4 APP J96615AP-1L1   ECI
NO. 004152 HECI    VRMM300AAA
------------------------------------------------------------AS-
SEMBLY------------------------------------------------------------
                   LIST OR GRP-1***
-------------------------------------------------------------
WIRING-------------------------------------------------------------
   T-99740-30 - T DRAWING NO. (BASIC)
T-88740-90 - I DRAWING NO.
       FIGS/OPT  6*N**                                                              CA
FIGS 4(1,2)F
----------------------------------------------------LEAD GROUP
INFORMATION-----------------------------------------------------------
        TRMS LEADS D/S       TRMS LEADS L/F       SIG LEADS D/S         SIG LEADS L/T
NETWORKS LEADS  CONTROL LEADS  MISC LEADS
        T,R,T1,R1/T,R,A,B       T,R

J98615AP-1  -  J  DRAWING  NO.  (BASIC)  -  ORD  STAT  -  MD  OFF  STLG  -  V4  APP  4006  NET
ECI NO. 000703   HECI  VRMM200AAA
-----------------------------------------------------------AS-
SEMBLY-------------------------------------------------------------
                   LIST OR GRP-1***
----------------------------------------------------LEAD GROUP
INFORMATION-----------------------------------------------------------
                      T-99740-30       -       T       DRAWING       NO.       (BASIC)
      T-99740-30 - T DRAWING NO.
                                                          FIGS/OPT                  5***
        CA FIGS
4(5)F/21(5)F/3(5)D,2(5)T/3(5)D
----------------------------------------------------LEAD GROUP
INFORMATION-----------------------------------------------------------
       TRNS LEADS D/S     TRMS LEADS L/F    SIG LEADS D/S     SIG LEADS L/T     NETWORKS
LEADS  CONTROL LEADS  MISC LEADS

                                                T.R.T.R

J98615AP-1  -  J  DRAWING  NO.  (BASIC)  -  ORD  STAT  -  MD,  OFF  STLG  -  V4  APP  648  FLT
ECI NO. 000701   HECI  VRMM300AAC
----------------------------------------------------------AS-
SEMBLY--------------------------------------------------------------
                 LIST OR GRP-1***
-----------------------------------------------------------WIR-
ING-----------------------------------------------------------------
                      T-99740-30       -       T       DRAWING       NO.       (BASIC)
       T-997490-30 - T DRAWING NO.
                                                                FIGS/OPT            5***
         CA FIGS
4(1,2)F/20(1,2)F
----------------------------------------------------LEAD GROUP
INFORMATION-----------------------------------------------------------
          TRMS LEADS D/S   TRMS LEADS L/F    SIG LEADS D/S     SIG LEADS L/T    NETWORKS
LEADS  CONTROL LEADS  MISC LEADS
          T,R                                T,R
```

HECI
CODE

Figure 3 − Example: Page From HECI Dictionary

HECI
CODE

PAGE 76 EQUIPMENT REFERENCE DATA – REPORT OF EQUIPMENT ITEMS INVENTORIED IN TIRKS
TIME 11. 4.49 LISTING OF MOUNTING ITEMS (UNIT TYPE M) BY HECI CODE

HECI	P / C	DW–NUM	DW–TYPE	DW–STAT	DW–IND		DATA
HECI	020590	T−1C359−32	T	ST	1	F	15,38
		T−1C359−39	T	ST	B	F	4W HBA HB
MTM2410AR0	028322	SD−1C359−01	S	ST	B	F	FS6,CAD9,200 48V−TLK.Y
		J99343A−2	J	ST	B	L	1
		T−1C359−39	T	ST	B	F	4W HAA, HA
		T−1C359−49	T	ST	1	F	1,H6
MTM2411ARA	017606	J89343A−2	J	ST	B	L	1
		SD−1C359−01	S	ST	B	F	FS6,AP5.6.CAD9.16,20.210 48V−TLK,B,D,Y,ZB
		T−10359−32	T	ST	1	F	15,37,38, 39W ZB
		T−1C359−39	T	ST	B	F	4,AW HBA HB
MTM2411ARD	020592	J99343A−2	J	ST	B	1	
		SD−1C359−01	S	ST	B	F	FS6,AP5,6,CAD9,16,20.210 48V−TLK,B,Y,D,ZB
		T−1C359−32	T	ST	1	F	15,37,38,39W ZB
		T−1C359−39	T	ST	B	F	4W HAA HA

HECI
CODE

PAGE 85 EQUIPMENT REFERENCE DATA – REPORT OF EQUIPMENT ITEMS INVENTORIED IN TIRKS
TIME 11.44.49 LISTING OF MOUNTING ITEMS (UNIT TYPE M) BY SD– AND T– DRAWING NUMBER

DW–NUM	HECI	P / C	DW–TYPE	DW–STAT	DW–IND		DATA
T−97047−33	HECI	022368	T	ST	B	F	6
	VRM2A44ARA	012380	T	ST	B	F	4
	VRM2A12ARD	011195	T	ST	B	F	2W HA,HEA HA
	VRM2A12ARK	900147	T	ST	B	F	1W HC
	VRM2A12ARF	012226	T	ST	B	F	3
	VRM2A14ARJ	022401	T	ST	B	F	5W A
	VRM2A22ARE	012402	T	ST	B	F	3
	VRINVL07RA	012251	T	ST	B	F	4
T−97047−34	VRINVL15RD	021448	T	OR	B	F	1,B,SA,SB
	VRIN/L15RC	021447	T	OR	B	F	4W S,X
	VRINVL01S0	002862	T	OR	1	F	1

Figure 4 − Example Pages From Report Of Equipment Items Inventoried In TIRKS

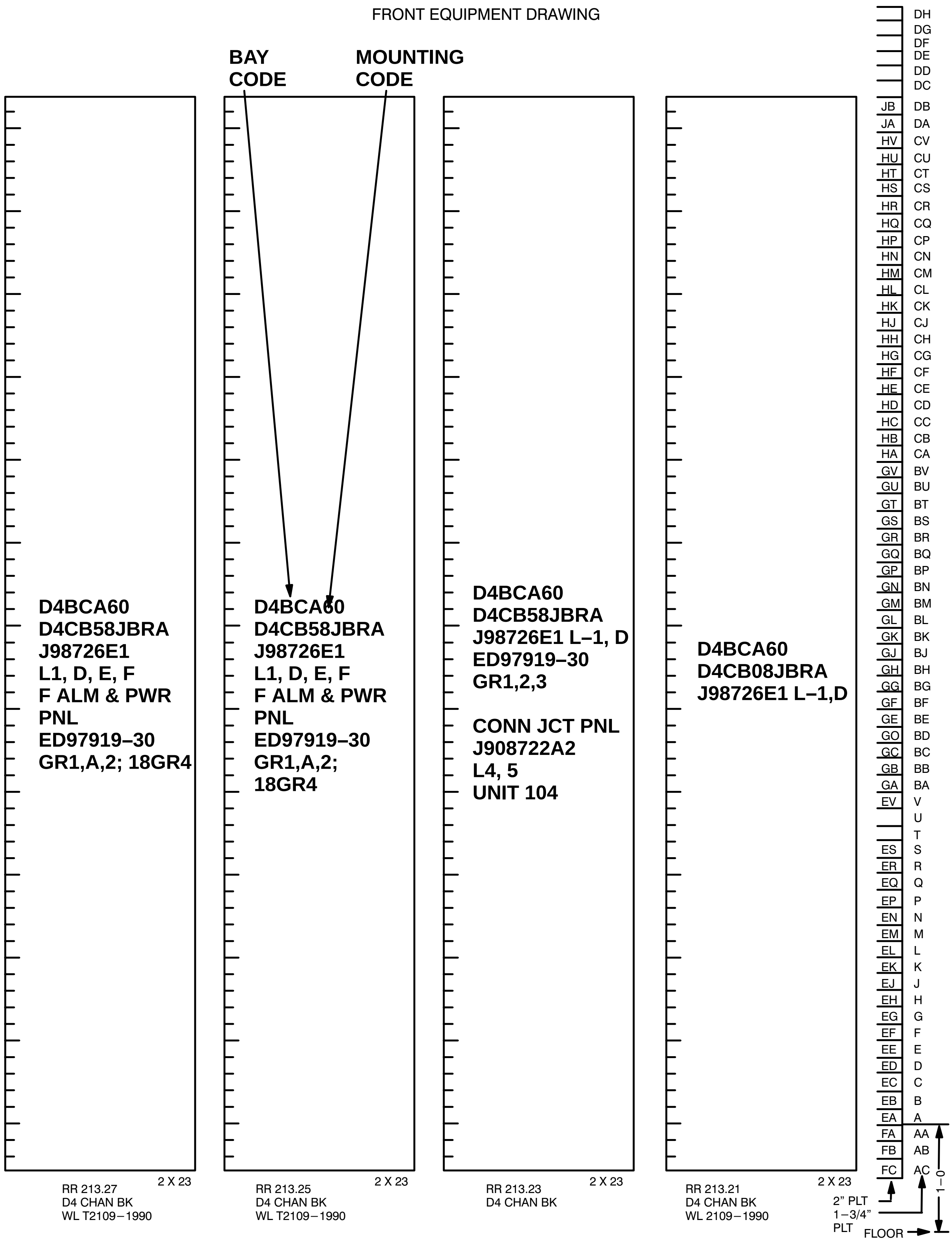


Figure 5 − Example Front Equipment (Relay Rack) Drawing

WIRING LIST

BAY CODE

MOUNTING CODE

LINE	NAME OF CKT	SCHEMATIC NUMBER	EQUIPPED FIG.	EQUIPPED OPTION	NUMBER
1	MFT MTB0R00	SD/C018−01			T7C018−15
	UNIT MTM2750BRA		–		–40
			–		–40
			–		–40
5			–		–40
	UNIT MTM1Z50BRA		–		–42
			–		–42
			–		–42
			–		–42
10			–		–42
			–		–42
	INTCONN		–		–49
			–		–49
					–49
15			–		–49
			–		–49
					–49
			–		–49
			–		–49
20			–		
			–		
	PWR DIST	SD7C007−01	2, 3, 4,		T7C007−33
			5, 6, 7,		
			8, 9, 10,		

Figure 6 − Example Wiring List

FRAME DRAWING

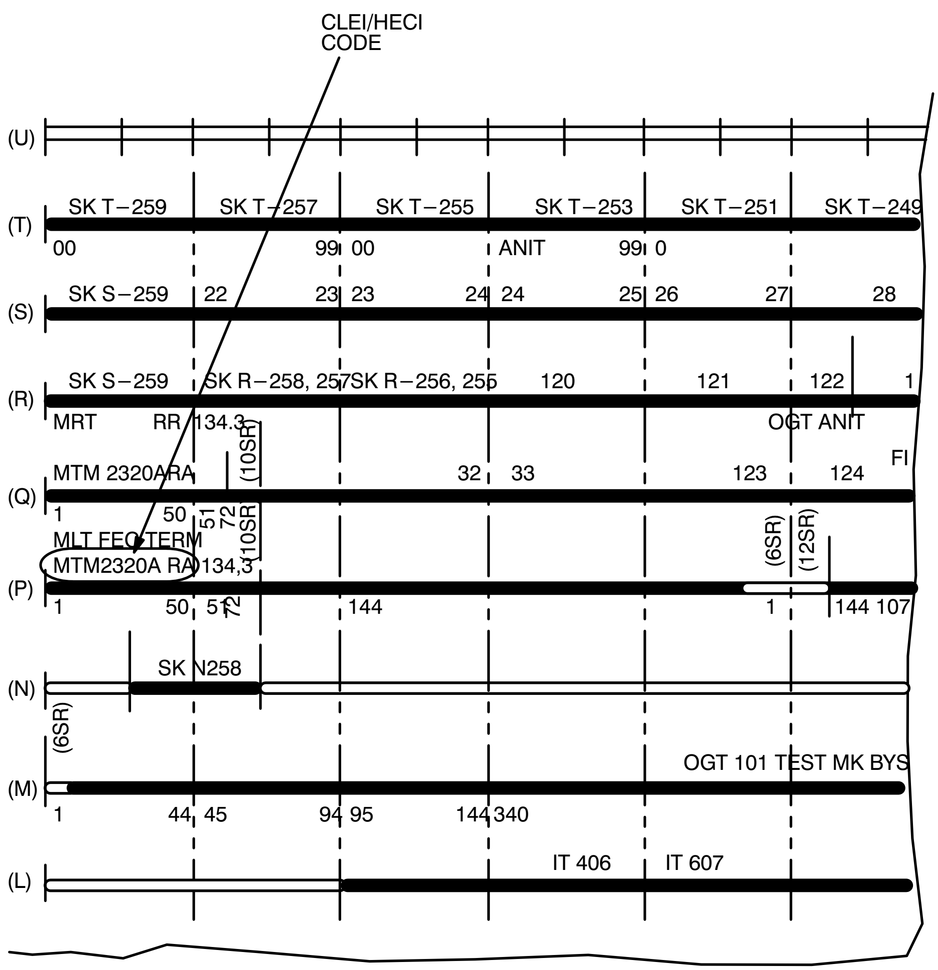


Figure 7 − Example Frame Drawing

FLOOR PLAN DRAWING

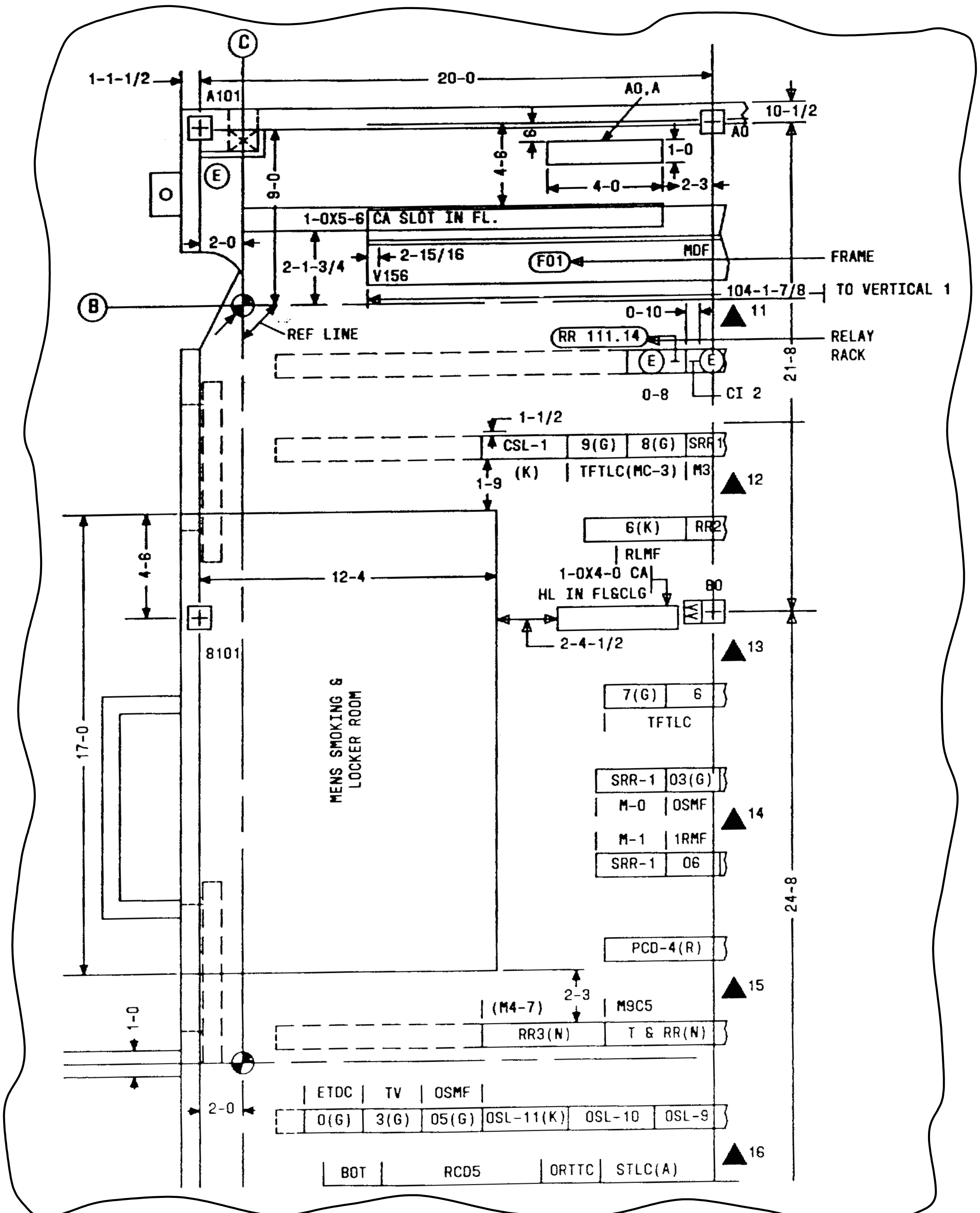


Figure 8 − Example Floor Plan Drawing

CLLI CODE

OFFICE RECORD INDEX – OFFICE INFORMATION

EQPT LOCATION ADDRESS	TOWN	STATE	ZIP	BLDG ID	SVC CTR	SVC CTR NO.
139 STATE ST	AUGUSTA	ME	04330		BOSTON	315

TELCO	TELCO AREA	TELCO DIVISION	ORBIT	INST AREA	INST DIV	TELCO ACCT CODE
	NO STATES	ME	0002	BOSTON ME	03109NK	671

OFFICE NAME	CLLI CODE	SYS	FLOOR
AGST 00 TOLL	CLMASCSN	TOLL	

SECTION	I/A	SYMBOL	Y/B	GENERAL OFFICE INFORMATION

ISS NBR	ISSUE NOTE

```
002 01 RAY PASQUALE 148570  55240    42473
003 01  G CRESPI    14850    5966    /0/7
004 01  G CRESPI    14850    5966    /2/7
005 01  F R MCBEE   14850    5894    /1/7
006 01  L MADRA     14850    5893    /1/7
007 01  F F MCBEE   14850    5893    /1/7
008 01 J J GARDNER  14257056  998  000082973NNN
009 01 EE MCDONALD  14257057 048ET  130112773NNN
010 01 T O CONNOR   14257057 046EH  130010274NNN
011 01 D MACKLING   14257053  806  092042374NNN
012 01 J P ELIFF    151540   56703NN191020976NNN
013 01 J P ELIFF    151540   56700NN191020976NNN
014 01 J P ELIFF    151540   56704NN191020976NNN
015 01 W C BARNES   151530   58240NF717060776NNC
016 01 L J ANDERSEN 151530   58309KF092091376NNN
017 01 W C BARNES   151530   51498NF096011777NNN
021 01   53294NT 270 151540 ET   122377
022 01   52681NT 092 A15154 ORV  122377
023 01   38661NT 216 122950 FSG  013078
024 01   53475NL 092 012295 OPA  122377
025 01   55372NT 092 055340 RR   041379
026 01   50339NT 092 155340 AAD 061579
027 01   00001EA 092 100000 ERS 061579
028 01   50697NT 092 155340 IF  012580
030 01   57254NT 224 122340 IF  070381
```

GENERAL CHARACTERISTICS

SECTION	I/A	SYMBOL	Y/B		
01		DA		01	TOLL
		EB		01	SERVICE OBSER, DESK IN SAME OFFICE
		LC		01	BROADBAND SYSTEM S N1W N2W N3W ON N1 CARR
		ZZ		01	43A1 CARR TLG EQPT
				02	NO 7 SO DSK
				03	1A TRK CONC FOR AIS
10		A		01	ARRANGED FOR VNL
20		C		01	MW SUPPLY 204.16 204.2
43		A		01	201.1
		D		01	201.1
44		A		01	201.1
		F		01	201.1

PAGE 1

Figure 9 − Example Office Record Index
Page 1 of 2

FRAME ID

OFFICE RECORD INDEX – OFFICE INFORMATION																													PAGE
			DRAWING NO.						ASSOC WL				TITLE					DISTRIBUTION CODES											
													REMARKS																
FL	LINE OR ROW	SOURCE	SC	DASH	ALPHA	EXDASH	ISSUE	NI	SC	DASH	EXDASH	DOC TYPE	EQUIPMENT DESCRIPTION	LOCATION OR SEQUENCE	OWNER	NOTE	STATUS	CODE	N	P	CODE	N	P	CODE	N	P	CODE	N	P
		C		081		00	030	1				OR	OFFICE RECORD INDEX		A			960	1		380	1		381		1	966	1	
																		971	1		976	1		977	1				
02	180			116			031			1150		MS	DUE TO.REMOVAL OF EQPT				V	960	1		380	1							
													VOID DATE----- 123178																
													3CL SWBD FRT EQPT 100L																
02	204			133			048			1330		RR	RR EQPT 204 LINE TT BD					960	1		380	1							
02	210			134			010			1340		RR	RR 212.1 TO 9	212.1 TO 9	A			960	1		380	1							
01				138			018			1380		MS	VOID DUE TO REMOVAL OF EQPT				V	960	1		380	1							
													VOID DATE----- 042279																
													FE 7 SQ SWBD																
02				150		00	002					DF	EQPT LOW PROF COMB DIST FR-021	BAYS 1 TO 25 F01	A			960	1		380	1							
02				150		01	002					DF	EQPT LOW PROF COMB DIST FR-021	BAYS 26 TO 50 F01	A			960	1		380	1							
02				150		02	002					DF	LOW PRFL COMB DIST FR-021	BAYS 51 TO 75 F01	A			960	1		380	1							
02				150		03	018					DF	EQPT LOW PROF COMB DIST FR-021	BAYS 76 TO 100 F01	A			960	1		380	1							
02				150		04	018					DF	EQPT LOW PROF COMB DIST FR-021	BAYS 101 TO 125 F01	A			960	1		380	1							
02	207			170			056	2		1151		RR	RR EQPT RR 201.2 TO .4	RR201.2 TO .4	A			960	1		380	1							
01										1150																			
										1912																			
02	201			171			034	1		1790		RR	RR 201L KP SDR & LK & MISC					960	1		380	1							
													TOLL RR																
02	202			172			025	1		1152		RR	REMOVAL OF EQUIPMENT				V	960	1		380	1							
										1151			VOID DATE----- 101782																
													RR EQPT 202L TOLL RR BAYS .2																
													TO 9																
02	202			173			054	1		1151		RR	RR EQPT RR 202.10 & UP					960	1		380	1							
										1893																			
02	203			174			019	1		1152		RR	REMOVAL OF EQUIPMENT				V	960	1		380	1							
										1151			VOID DATE----- 101782																
													RR 203.2 TO 203.11																
02	204			175			022			1890		RR	RR EQPT 204L N1 & ON CARR					960	1		380	1							
										1894			BAYS .20 TO 29																
02	202			176			025	1		1894		RR	RR EQPT RR 202.20 & UP					960	1		380	1							
02	204			178			020			1878		RR	RR EQPT 6W PTCH BAY 204.16					960	1		380	1							
													TO .19																
02	203			179			050	1		1152		RR	RR EQPT 203 LINE MISC TOLL &					960	1		380	1							
										1892			43A1 CARR																
02	203			180			027	1				RR	RR EQPT BAYS 203.22 TO.25 MISC					960	1		380	1							
													TOLL & 43A1 CARR																
02	217			181			007	1		1152		RR	RR EQPT 217L					960	1		380	1							
										1154																			
02	201			182			031	1		1151		RR	RR WL 201.11 & UP					960	1		380	1							
										1150																			
02	204			183			013			1891		RR	X1 CARR RR EQPT BAYS 204.12 &					960	1		380	1							
										1890			TT RR 204.13 TO .16																
02	215			184			001			1840		RR	RR EQPT WLEL 9001 SW LORAIN	RR215.3A 4A	A			960	1		380	1							
													CONV																
02	204			185			023	1		1850		RR	RR EQPT RR 206.2-206.6	RR 206.2 TO 5				960	1		380	1							
02	207			186			019	1		1860		RR	RR EQ RR 207.1-207.6					960	1		380	1							
										1152																			
																													PAGE 3

Figure 9 − Example Office Record Index
Page 2 of 2

UNITIZED SMAS DATA — RELAY RACK, CONNECTOR, FROM, TO

HECI DATA — FROM/TO, EQUIP CODE, RELAY RACK

STAGE 1 DISTRIBUTION NETWORK PANEL	DISTRIBUTUION NETWORK PANEL	J98622BL2	J98622BT1	MAINTENANCE CONNECTOR LOCATION	MTCE CONN NO.	LTP ACC NO. CKT 1 RTAS NO.	LTP ACC NO. CKT 24 RTAS NO.	MAINTENANCE CONNECTOR ASSIGNED TO: CIRCUIT ASSIGNMENT	MAINTENANCE CONNECTOR ASSIGNED TO: TYPE EQUIP-MENT	MAINTENANCE CONNECTOR ASSIGNED TO: LOCATION
J1P033AD1 L–1, 2 S1DP50ZA RR 526.3	J1P033AB1 DN500A RR 526.1			526.1	500A	50001	50024	1–24	D4CBJ84RA	501.2
					501A	50101	50124			
					502A	50201	50224			
					503A	50301	50324			
					504A	50401	50424			
	J1P033AB1 DN501A RR 526.1				505A	50501	50524			
					506A	50601	50624			
					507A	50701	50724			
					508A	50801	50824			
					509A	50901	50924			
	J1P033AB1 DN510A RR 526.1				510A	51001	51024			
					511A	51101	51124			
					512A	51201	51224			
					513A	51301	51324			
					514A	51401	51424			
	J1P033AB1 DN511A RR 526.1				515A	51501	51524			
					516A	51601	51624			
					517A	51701	51724			
					518A	51801	51824			
					519A	51901	51924			

NOTE:
Remember that this is to be used as a data source document; it is not a TIRKS input document.

Figure 10 − Example Unitized RTAS Assignment Chart For Maintenance Connector Not Collocated With Equipment

FRAME TERMINATION CROSS CONNECT LOCATION FORMATS

TERM	DEFINITION
BAY	A first order subcomponent of a frame, usually a relay rack.
BLOCK	See TERMINAL STRIP.
COLUMN	A row of cross connect terminals. The column number and row number are used to form a matrix that uniquely identifies a terminal on − a COSMIC frame.
DIGROUP CIRCUIT	Electronic equivalent of digital carrier bank.
FRAME	A unit dedicated to interconnection of assignable equipment in a central office or in a telephone equipment room at a customers location. A frame may consist of a bay mounted panel, a complete bay, or a group of bays. Cross connections can be made from any terminal (lug) on a frame to any other terminal (lug) without using an interframe tie cable. Each lineup of a COSMIC main distributing frame is a separate frame. In, those cases where the transmit and receive sides of a carrier frame are separated, a transmit frame and its receive counterpart are considered to be one frame even though they may be in different lineups.
MODULE	A subcomponent of a frame. ESS switch and COSMIC frames are subdivided into modules.
PANEL	A first order subcomponent of a bay; usually, a unit mounted directly on a relay rack.
QUADRANT	An area of a panel; a subzone of a frame.
ROW	A horizontal or vertical arrangement of cross connect terminals or lugs on a cross connect panel.
TERMINAL	A lug or jack where the physical cross connect is made.
TERMINAL STRIP	A block of terminals mounted on a cross connect frame, usually a conventional frame.
TIME SLOT	Electronic equivalent of channel unit within a digroup circuit.
U or L	Upper or lower. The direction from which the jumper wire enters a block.
VERTICAL	A row of terminals on an ESS switch modular frame.
ZONE	An area of a frame. Frames are divided into zones to allow equipment assignments that will assure the shortest possible jumper wire path.

Figure 11 − Frame Termination Cross Connect Location Formats
Page 1 of 4

TABLE A

FRAME TYPES/CROSS CONNECT LOCATION FORMATS

FRAME TERMINATIONS FORMAT DEFINITIONS		FRAME TERMINATION FIELD USE				FRAME TERMINATION SYNTX (NOTE 1)					
FORMAT	FRAME TYPES	ADDR1	ADDR2	ADDR3	ADDR4	FORMAT	FRAME (TY)	ADDR1	ADDR2	ADDR3	ADDR4
A	GDF2, SGDF1, & 2 DSX0	Bay	Panel	Row, Terminal L or D	-	A	FXX	XNN	NN	ANNND ANNNL (Note 2)	-
Example: Bay 6, Panel 3, Row A, Terminal 10, Line Side						A	F01	6	3	A10L	
B	MGDF, GDF Type 1	Bay	Panel	Terminal L or D	-	B	FXX	NN	NN	NNND NNNL (Note 2)	-
Example: Bay 1, Panel 16, Terminal 5, Drop Side						B	F02	1	16	5D	
C	DSX1, DSX1C DSX2, DSX3/4 Mod. NDC-A33A	Bay	Panel	Terminal	-	C	FXX	XNN	NNX	NN	-
Example: Bay 11, Panel 12B, Terminal 21						C	F21	11	12B	21	
D	Type B (Zoned)	Zone	Terminal Strip	-	-	D	FXX	XX	ANNN (Horiz) NNNA (Vert)	-	-
Example: Zone 12, Terminal Strip C121						D	F03	12	C121		
E	Type B (Non-Zoned)	Terminal Strip	-	-	-	E	FXX	ANNN (Horiz) NNNA (Vert)	-	-	-
Example: Terminal Strip C101B						E	F01	C101			
G	COSMIC	Module	Shelf, U or L, Block	Row	Column	G	FXX	NN	NNUNN NNLNN (Note 3)	N	NN
Example: Module 11, Shelf 11, Upper, Block 12, Row 3, Column 13						G	F02	11	11U12	3	13
H	Miscellaneous Location	-	-	-	-	H	FXX	-	-	-	-
Use only when NO cross connect data is available						H	F02				
J	DSX3, DSX4	Bay	Panel	Row	Terminal	J	FXX	NN	RLNN SLNN (Note 4)	NN	NN
Example: Bay 3, Panel RL5, Row 4, Terminal 6						J	F02	3	RL5	4	6
K	ESS Switch Modular	Vertical R or L	-	-	-	K	FXX	NNNR NNNL (Note 5)	-	-	-
Example: Vertical 36, Right Half of Vertical						K	F01	36R			

Note 1: Syntax code key: A = Alphabetic: N = Numeric: X = Alphanumeric & Bold = Literal Character.
Note 2: L = Line, D = Drop
Note 3: U = Upper, L = Lower
Note 4: RL – Regular Lines, SL = Standby Lines. Both are followed by a number.
Note 5: L – Left, R – Right

Figure 11 – Frame Termination Cross Connect Location Formats
Page 2 of 4

TABLE A, Continued

FRAME TYPES/CROSS CONNECT LOCATION FORMATS

FRAME TERMINATIONS FORMAT DEFINITIONS: FORMAT	FRAME TYPES	FRAME TERMINATION FIELD USE: ADDR1	ADDR2	ADDR3	ADDR4	FRAME TERMINATION SYNTX (NOTE 1): FORMAT	FRAME (TY)	ADDR1	ADDR2	ADDR3	ADDR4
L	N1 Cabinet (With Typical Stamping, Note 6)	Bay	Terminal L or D	-	-	L	FXX	NN	NNND NNNL (Note 2)	-	-
Example: Bay 18, Terminal 139, Line Side						L	F02	18	139L		
M	N2 Cabinet	Bay	Panel	Row	Terminal L or D	M	FXX	NN	A	N	NND NNL (Note 2)
Example: Bay 2, Panel R, Row 6, Terminal 10, Line Side						M	F01	2	R	6	10L
N	QCX Bays HOMAC, Inc.	Bay Front or Back	Panel Vertical	-	-	N	FXX	NNF NNB	AX	-	-
Example: Bay 13, Panel K						N	F02	13	K		
P	CCB Bays	Bay	Panel	Quadrant	-	P	FXX	NN	XX	N	-
Example: Bay 21, Panel G, Quadrant 4						P	F01	21	G	4	
R	MDB Bays	Bay	Panel	-	-	R	FXX	NN	NN	-	-
Example: Bay 12, Panel 11						R	F03	12	11		
S	Span Term. Assembly Misc Relay Rack Loc.	Bay	Panel	-	-	S	FXX	NN	XX	-	-
Example: Bay 17, Panel A1						S	F04	17	A1		
T	LCIE	Bay	Panel	Field	Terminal	T	FXX	NN	PN or SN (Note 7)	A	NN
	or										
	LCIE	Bay	Panel/ Subpanel	Vert./ Horiz.		T	FXX	NN	XXX	XXXX	-
Example: Bay 1, Primary Panel 1, Row C, Terminal 12						T	F02	1	P1	C	12
U	Any Other Frame Not Previously Specified (Note 8)	X-Conn	X-Conn	X-Conn	X-Conn	U	FXX	XXXXX	XXXXX	XXXXX	XXXXX
Example: Punching 121, Bay 101.12						U	F04	121	101.12		
V	DACS TITAN 5500	Bay	Di-Grp ID	Time Slot	-	V	FXX	NN	XXXXA	XXA (Note 9)	-
Example: Bay 12, DC 121						V		12	121		

Note 1: Syntax code key: A = Alphabetic, N = Numeric, X = Alphanumeric, and Bold = Literal Character.
Note 2: L = Line, D = Drop
Note 6: When N carrier cabinets cannot be coded using this structure because of nonstandard arrangements, the cabinets may be identified using the code for the frame, and no cross connect data will be provided in this code set. In such cases, use Format H. If cross connect data can be defined, but it does not agree with Format L, Format U may be used.
Note 7: P = Primary Panel, S = Supplementary Panels.
Note 8: This format is used for cross connect data that cannot be Identified using one of the other formats, and does not represent a standard cross connect entity, for which a new format should be developed. Any character except position 1 may contain either an alpha, numeric, or special character. This code may be up to 15 characters, but in no case should it include more than 4 elements (addresses) separated by delimiters.
Note 9: Leave Time Slot ID Blank.

Figure 11 − Frame Termination Cross Connect Location Formats
Page 3 of 4

TABLE A, Continued

FRAME TYPES/CROSS CONNECT LOCATION FORMATS

FORMAT	FRAME TYPES	ADDR1	ADDR2	ADDR3	ADDR4	FORMAT	FRAME (TY)	ADDR1	ADDR2	ADDR3	ADDR4
W	ESS Nodular Single-Sided IDF	Vertical ID	Block ID	-	-	W	FXX	AA	XX	-	-
Example:											
X	AT&T 800 Series DSX	Bay	Panel	Block	Terminal	X	FXX	NN	NN	N	NN
Example:											
Y	AT&T LCIT CSIT LSCIM LGX	Bay	Unit	Terminal	-	Y	FXX	NNN	NN	ANN	-
Example:											
Z	AT&T	Bay	Panel		-	Z	FXX	NNN	NXA	-	-
Example:											
AA	NEC America	Bay	Panel	Position	Terminal	AA	FXX	NN	NO or NW	NN	NL or ND (Note 2)
Example:											
AB	AT&T DACSIII, DACSIV	Bay/Unit	Slot	Port	-	AB	FXX	NN	NN	NN	-
Example:											
AC	Tellabs 5332 Subrate MUX	Frame	Slot	MUX	Channel	AC	FXX	NN	NNNNN	N	NN
Example:											

Note 1: Syntax code key: A = Alphabetic: N = Numeric: X = Alphanumeric & Bold = Literal Character.
Note 2: L = Line, D = Drop

Figure 11 − Frame Termination Cross Connect Location Formats
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EQUIPMENT INVENTORY UPDATE (EIU) FORM

INV AUTH	LOCATION	PENDING/IN EFFECT DATA			ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	TO BE COMPLETED BY THE DETAIL ENGINEER
		TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO				SHEET____ OF____ PREPARED BY______________ DATE__________ DEPARTMENT________ TELEPHONE NUMBER______________ APPROVED BY__________ DATE________

ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	UNITIZED RTAS DATA					SW/FW	FRAME TERMINATIONS							LEADS						
								RTA SYS	SGN CONN	SGN FROM	TO	RELAY RACK		A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	TD	TL	SD	SL	N	C	M

ITEM	USER DATA	NOTES/TRAD DATA

Figure 12 – EIU Form

EQUIPMENT INVENTORY UPDATE (EIU) FORM

INV AUTH	LOCATION	PENDING/IN EFFECT DATA: TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO.	ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	TO BE COMPLETED BY THE DETAIL ENGINEER
								PREPARED BY______ SHEET____ OF____
								DATE______ DEPARTMENT ______
								TELEPHONE NUMBER______
								APPROVED BY______ DATE ______
SC	CLMASCSNF11	BH12345678	122592	L12345	BA	M	S1234	

ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	UNITIZED RTAS DATA: RTA SYS	CONN	FROM	TO	RELAY RACK	SW/FW	FRAME TERMINATIONS: A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	LEADS: TD	TL	SD	SL	N	C	M
001	A	MTM1H20BRA	01120.17	01	96	PA	N								E	10	J086				Y	Y	Y	Y	N	N	N
002	A	4TM0410AAA	01100.05	61	140	PA	N								D	12	12	012A			Y	Y	Y	Y	N	N	N

Figure 13 – Pending Add

001	R	DXS01200DD	02201.01	01	120										D	21	10	K120			Y	Y	Y	Y	N	N	Y

Figure 14 – Pending Removed

001	X	VRM4A11ARA	01101.06	01	132										D	11	12	165A			Y	N	Y	N	N	N	Y

Figure 15 – Pending Retire In Place

EQUIPMENT INVENTORY UPDATE (EIU) FORM

INV AUTH	LOCATION	PENDING/IN EFFECT DATA TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO.	ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	TO BE COMPLETED BY THE DETAIL ENGINEER
								PREPARED BY_____ SHEET____ OF____ DATE_____ DEPARTMENT_____ TELEPHONE NUMBER_____ APPROVED BY_____ DATE_____
SC	CLMASCSNF11	BH12345678	122592	L12345	BA	M	S1234	

ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	UNITIZED RTAS DATA RTA SYS	CONN	FROM	TO	RELAY RACK	SW/FW	FRAME TERMINATIONS A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	LEADS TD	TL	SD	SL	N	C	M
001	C	RC12K21HAB	02100.5	01	60										E	11	210A				Y	Y	Y	Y	N	N	N
		RC12K21HAB	02100.3	01	60										E	11	210A				Y	Y	Y	Y	N	N	N
002	C	RC12L10HAB	02102.3	01	60										E	08	100B				Y	Y	Y	Y	N	N	N
		RC12L08HAB	02102.3	01	60										E	08	100B				Y	Y	Y	Y	N	N	N
003	C	RC12K01HAB	01110.6	01	60										E	08	100B				Y	Y	Y	N	N	N	N
		RC12K01HAB	01110.6	01	60										E	08	100B				Y	Y	Y	Y	N	N	N

ITEM	USER DATA	NOTES/TRAD DATA
001		Change Bay Location

NOTE 1: TIRKS automatically returns a PR/PA unit status for items 001 and 002, and a PC for item 003.

Figure 16 – Pending Change Of Bay Location, Equipment Code, And Frame Terminations

EQUIPMENT INVENTORY UPDATE (EIU) FORM

INV AUTH	LOCATION	PENDING/IN EFFECT DATA			ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	TO BE COMPLETED BY THE DETAIL ENGINEER
		TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO				PREPARED BY____ SHEET____ OF____ DATE____ DEPARTMENT____ TELEPHONE NUMBER____ APPROVED BY____ DATE____
SC	CLMASCSNF11	BH12345678	122592	L12345	BA	M	S1234	

ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	UNITIZED RTAS DATA					SW/FW	FRAME TERMINATIONS							LEADS						
								RTA SYS	CONN	FROM	TO	RELAY RACK		A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	TD	TL	SD	SL	N	C	M
001	A	4TMO310AAC	09902.10	01	296	PA	N							S	D	91	12	A249			Y	N	Y	N	Y	N	N

Figure 17 − Split Leads

002	A	VRM4A11ARF	09904.01	126	140	PA	N														Y	Y	Y	Y	N	N	N

ITEM	USER DATA	NOTES/TRAD DATA
002		EQUIPPED ONLY

Figure 18 − Equipped Only

EQUIPMENT INVENTORY UPDATE (EIU) FORM

		PENDING/IN EFFECT DATA						TO BE COMPLETED BY THE DETAIL ENGINEER
INV AUTH	LOCATION	TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO.	ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	SHEET____ OF____ PREPARED BY____________________ DATE__________ DEPARTMENT________ TELEPHONE NUMBER________________ APPROVED BY__________ DATE_______
SC	CLMASCSNF11	BH12345678	122592	L12345	BA	M	S1234	

								UNITIZED RTAS DATA						FRAME TERMINATIONS							LEADS						
ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	RTA SYS	CONN	FROM	TO	RELAY RACK	SW/FW	A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	TD	TL	SD	SL	N	C	M
003	A	SFMOV00DRD	09301.10	01	48	PA	M														Y	D	Y	Y	N	N	N
004	A	SFMOV00DRD	09201.19	01	48	PA	M														D	Y	Y	Y	N	N	N

ITEM	USER DATA	NOTES/TRAD DATA
003		TL HARDWIRED TO N2B0 1–4 RR301.20
004		TD HARDWIRED TO SD97188–01 1–2 RR202.20

Figure 19 – Equipment Assemblies

EQUIPMENT INVENTORY UPDATE (EIU) FORM

INV AUTH	LOCATION	PENDING/IN EFFECT DATA: TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO.	ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	TO BE COMPLETED BY THE DETAIL ENGINEER
								PREPARED BY________ SHEET____ OF____ DATE________ DEPARTMENT________ TELEPHONE NUMBER________ APPROVED BY________ DATE________
SC	CLMASCSNF11	BH12345678	122592	L12345	BA	M	S1234	

ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	UNITIZED RTAS DATA: RTA SYS	CONN	FROM	TO	RELAY RACK	SW/FW	FRAME TERMINATIONS: A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	LEADS: TD	TL	SD	SL	N	C	M
001	A	D4CBGACBRA	01101.02	1A	1A	PA	N	50	590	01	24			S	E	91	A049				Y	N	Y	N	N	N	N
		D4CBGACBRA	01101.02			PA	N							S	E	10	M193				N	N	N	N	N	Y	N
		D4CBGACBRA	01101.02			PA	N							S	E	10	L011				N	N	N	N	N	Y	N
		D4CBGACBRA	01101.02			PA	N							S	E		10	BF			N	Y	N	N	N	N	N
		D4CBGACBRA	01101.02	1B	1B	PA	N	50	591	01	24			S	E	91	A048				Y	N	Y	N	N	N	N
		D4CBGACBRA	01101.02			PA	N							S	E	10	N193				N	N	N	N	N	Y	N
		D4CBGACBRA	01101.02			PA	N							S	E	10	L011				N	N	N	N	N	Y	N
		D4CBGACBRA	01101.02			PA	N							S	E		10	BF			N	Y	N	N	N	N	N
		D4CBGACBRA	01101.02	2A	2A	PA	N	50	592	01	24			S	E	91	A047				Y	N	Y	N	N	N	N
		D4CBGACBRA	01101.02			PA	N							S	E	10	N195				N	N	N	N	N	Y	N
		D4CBGACBRA	01101.02			PA	N							S	E	10	L011				N	N	N	N	N	Y	N
		D4CBGACBRA	01101.02			PA	N							S	S		10	BF			N	Y	N	N	N	N	N

Figure 20 – Example Pending Add Of D4 Channel Banks With Unitized RTAS

EQUIPMENT INVENTORY UPDATE (EIU) FORM

INV AUTH	LOCATION	PENDING/IN EFFECT DATA: TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO.	ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	TO BE COMPLETED BY THE DETAIL ENGINEER
SC	CLMASCSNF11	BH12345678	122592	L12345	BA	M	S1234	

TO BE COMPLETED BY THE DETAIL ENGINEER

PREPARED BY__________ SHEET____ OF____

DATE__________ DEPARTMENT__________

TELEPHONE NUMBER__________

APPROVED BY__________ DATE__________

ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	UNITIZED RTAS DATA: RTA SYS	CONN	FROM	TO	RELAY RACK	SW/FW	FRAME TERMINATIONS: A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	LEADS: TD	TL	SD	SL	N	C	M
001	A	SMCMSN2ERD	50CG570	01	24	PA	N							S	E	91	043A				Y	N	N	N	N	N	N
		SMCMSN2ERD												S	E	91	041A				N	Y	N	N	N	N	N
002	A	SMCMSN2ERD	50CG510	25	48	PA	N							S	E	91	044A				Y	N	N	N	N	N	N
		SMCMSN2ERD												S	E	91	042C				N	Y	N	N	N	N	N

Figure 21 – Example Pending Add Of Miscellaneous Maintenance Connector (Stand Alone RTAS)

EQUIPMENT INVENTORY UPDATE (EIU) FORM

INV AUTH	LOCATION	PENDING/IN EFFECT DATA: TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO.	ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	TO BE COMPLETED BY THE DETAIL ENGINEER
								PREPARED BY______ SHEET___ OF___ DATE______ DEPARTMENT ______ TELEPHONE NUMBER______ APPROVED BY______ DATE______
SC	CLMASCSNF11	BH12345678	122592	L12345	BA	M	S1234	

								UNITIZED RTAS DATA						FRAME TERMINATIONS							LEADS						
ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	RTA SYS	CONN	FROM	TO	RELAY RACK	SW/FW	A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	TD	TL	SD	SL	N	C	M
001	A	E5MD100ARA	01IM.002	0–1	0–10	PA	N								C	15	08	11	12		Y	Y	N	N	N	Y	N

Figure 22 – Pending Add Of DSX1 Bay/No. 5ESS Switch Interface

001	A	ENMCN201RA	01PE.02	6–1	6–6	PA	N								C	14	07	13	15		N	Y	N	N	N	N	N

Figure 23 – Pending Add Of DSX1 Bay/DMS 10 Switch Interface

EQUIPMENT INVENTORY UPDATE (EIU) FORM

INV AUTH	LOCATION	PENDING/IN EFFECT DATA: TELCO ORDER NO.	COMP. DATE	SUPPLIER ORDER NO.	ASGN AUTH	MTCE RESP	AUTHORITY NUMBER	TO BE COMPLETED BY THE DETAIL ENGINEER
								PREPARED BY______ SHEET____ OF____ DATE______ DEPARTMENT______ TELEPHONE NUMBER______ APPROVED BY______ DATE______
SC	CLMASCSNF11	BH12345678	122592	L12345	BA	M	S1234	

ITEM	ORDER TYPE	EQUIPMENT CODE	RELAY RACK	FROM	TO	UNIT STAT	ASGN STAT	UNITIZED RTAS DATA: RTA SYS	CONN	FROM	TO	RELAY RACK	SW/FW	FRAME TERMINATIONS: A	TY	FR	ADDR1	ADDR2	ADDR3	ADDR4	LEADS: TD	TL	SD	SL	N	C	M
001	A	ENMCN101RA	01EDCA.001	000–0	000–4	PA	N								C	14	06	12	21		N	Y	N	N	N	Y	N

Figure 24 − Pending Add Of DSX1 Bay/DMS 100 Switch Interface

001	A	TIMA200ARD	03DCT.19	33	64	PA	N								V	17	01/12	01/14	15		Y	N	N	N	N	N	N
002	A	T1MA300ARJ	05DCT.09	01	32	PA	N								C	09	11/12	08/21	15		N	Y	N	N	N	N	N

Figure 25 − Pending Add Of DACS/DSX Frames Cross Connect

(Reserved for Future Use)

(Reserved for Future Use)

SECTION 17	Effective Date January 4, 1999	Page 1 of 1

★★

CHANGE:	DATE	REVISION LEVEL
Add Paragraph 3.1 (b) and 3.1 (c) Change Paragraph 1.3, 1.5, 3.1 (a), 3.4, 5.1, 5.3, 6, 6.1, 6.2, 6.8, and 6.14	10/01/97	G
Change Paragraph 4.9 and 4.10	1/4/99	G

ADMINISTRATIVE INFORMATION − INSTALLATION PROCEDURES

CONTENTS

ADMINISTRATIVE INFORMATION – INSTALLATION PROCEDURES

1. General Information

1.1 This section provides the BellSouth Telecommunications Inc. (BST) policy and procedures for the installation, removal, rearrangement and modification of central office equipment.

1.2 This section provides minimum installation requirements to ensure equipment is installed properly, safely and complies with the TEO, specific installation instructions, general purchase agreement, and manufacturer's documentation (equipment drawings/manuals) that the installation supplier shall adhere to.

1.3 The installation supplier shall issue a schedule confirming the requested start, advance complete (when required) and final complete dates which shall be submitted to the Capacity Manager, if the schedule differs from the dates on the TEO. (See Exhibit 1) The installation supplier shall not establish Advance Completion dates without explicit instructions in writing from the Capacity Manager. For removal projects, the installation supplier shall provide a copy of any schedule revision to the BST Reuse Specialist and the Capacity Manager.

1.4 Possible schedule changes to the order must be reported immediately to the Capacity Manager for negotiation as soon as the change is known. Schedule changes may be caused by changes in material, equipment availability, software, processes, procedures or installation personnel. This may cause a deferment of the project and schedule. A revised schedule shall be issued to the Capacity Manager confirming the negotiated date changes. For removal projects, the installation supplier shall provide a copy of any schedule revision to the BST Reuse Specialist and the Capacity Manager.

NOTE: Although deferments may not affect a scheduled completion date, the vendor should notify the Capacity Manager of the deferment shown on the firm schedule or equivalent form in the event of a planned or unexpected partial Completion (Advanced Service) requirement.

1.5 The Installation Supplier is responsible for protecting the integrity of all BST supplied material.

- The Installation Supplier is responsible for all material received at the vendor specified material staging location.
- Material shipped from the vendor's staging location to the site of installation must remain in BST approved protective packaging.
- The installation supplier shall make a visual inspection and inventory all material, equipment or apparatus shipped to the job site.
- Material furnished by BST, used or reused, shall also be inspected to ensure they require no repair, adjustment or test effort.
- All materials provided by BST must be inspected by the installation supplier within five (5) business days of job start to determine if any repair, adjustment or test effort is required.

1.6 The installation supplier shall contact the detail engineer if there is a conflict between the requirements in the job documentation and in TR 73503. The detail engineer shall contact the Capacity Manager for resolution of the conflicting requirements. All materials provided by BST must be inspected by the installation supplier within five (5) business days of job start to ensure no repair, adjustment or test effort is required.

1.7 The installation supplier shall not deviate from the manufacturer documentation or TR73503 without prior written approval from the Capacity Manager.

2. Documentation Distribution

The installation supplier shall turn over all applicable documentation to the Network Operations Representative at job completion. The Network Operations Representative will verify this information and accept by signing an installation supplier acceptance form. This would include, but not be limited to, the following:

(a) Original and any marked office base drawings
(b) Technical and installation manuals
(c) Test summaries and records
(d) Battery operations and charge records
(e) Operating and maintenance instructions
(f) Detail Engineer Specification
(g) Alarm Test Records
(h) Coaxial Cable Test Results Form

NOTE: See TR 73508 for Emergency Engine required documentation.

The installation supplier shall include a statement, with the Confirmation of Job Completion form, that the job has been verified, tested and cleared of all defects. Any exception items must be discussed and noted.

3. Central Office Drawings/Records Update

3.1 The installer shall follow the listed procedures in TR 73564 and TR 73519 when updating central office drawings and records.

(a) Once the installer receives the marked drawings or sketches from the detail engineer, he must review them, discuss with the detail engineer any changes, make any changes, if necessary, and return one copy to the detail engineer and retain one copy in the central office for reference. The installer should use the color scheme as indicated below. The detail engineer will ensure that the changes are provided to the Central Office Drawing Maintenance Vendor (CODMV).

(b) Once the installer receives the BellSouth Database Assignment Records such as DSX–OD, FOX–OD, BTAS, etc. from the Detail Engineer, he must review them and discuss with the detail engineer any changes, if necessary, and return one copy to BST Capacity Manager. The installer should use the color scheme as indicated below.

(c) Changes in equipment location shall be reported to BST PPRM by revision of the MOAs. The installation supplier will verify this by contacting their detail engineer.

3.2 To ensure the accuracy of the marked drawing(s), the installer shall use the following color scheme when changes are required. As reference, the color scheme information should be included in the general notes of the detail specification.

(a) RED − All equipment additions, assignment changes, that represent equipment which is being added, reconfigured, reassigned or modified shall be shown in red.

(b) YELLOW − All equipment being removed or relocated to another location shall be shown in yellow.

(c) GREEN − All changes which do not reflect equipment being added or removed, and represent new information that affect existing records shall be referred to as record only changes and shall be shown in green.

3.3 The installer shall identify marked prints using a label or stamp similar as shown. The minimum information required by BST is provided on this label. Copies of the installer marked prints must be completed before job completion.

INSTALLERS MARKED PRINT

BST Order No.	Drawing Issue No.
Vendor Order No.	Marked Print Changes Yes No Eng. Copy Job Copy
Installer's Name	Date

3.4 Under no circumstance is an installer to take a new ERMA assignment without prior approval from the detail engineer. ERMA assignments are fuse positions on Battery Distribution Fuse Boards (BDFBs) Miscellaneous Fuse Bays (MFBs), Miscellaneous Fuse Panels, Power Ring and Tone Distribution Frames and Tone Distribution Frames (PRTD).

3.5 The requirement for the installer to mark the central office drawings is not limited to just the drawings which were provided in the engineer's specific installation instructions (TEO). If the approved changes affected other central office record drawings, or the detail engineer failed to provide the drawings, the installer is responsible for obtaining and marking any additional drawings. The installer should contact the detail engineer for the additional drawings.

4. Job Completion Notice

4.1 This section provides the BellSouth Telecommunications Inc. (BST) policy and procedures for the job completion process for those providing installation, removal, rearrangement, modification, material, and/or software, in a central office environment including huts, CEVs and Customer Premise.

4.2 The installation supplier must submit a Confirmation of Job Completion to the BST Network Operations and Capacity Manager no later than the Monday following the completion date. (See Exhibit 2)

4.3 The installation supplier shall report the completion of a job to BST on the Confirmation of Job Completion form. Advanced or partial completion of a portion of the job will also be reported on this form.

NOTE: For all switch projects, a Confirmation of Job Completion Notice shall be issued at turnover with the turnover date in the advanced completion date field. Place a comment in the job description field to indicate that all physical installation have been completed and the switch turned over to BellSouth. The installation and drawings are subject to Quality Assurance Review after this date. A final Confirmation of Job Completion Notice shall be issued at project completion.

4.4 The installation supplier shall forward two copies of the Confirmation of Job Completion form to BST. One copy will be delivered, FAX'd or mailed to Network Operations and one copy to the Capacity Manager.

4.5 Once Network Operations accepts or rejects the job, the Capacity Manager must be notified by the Network Operations Representative either by telephone or the completed Confirmation of Job Completion form.

4.6 Minor exception items that were not completed by the job completion date may be listed on the Confirmation of Job Completion form with the approval of the Capacity Manager.

4.7 These minor exception items must be completed by the installation supplier within the 30 days after the completion date. Once the minor exception items have been completed, the original completed Confirmation of Job Completion form must be re−submitted noting the date and the installation supplier representative's signature under the Exceptions to Project category.

4.8 If the scheduled advance or main job completion date cannot be met or the Capacity Manager rejects the job, the installation supplier must contact the Capacity Manager to negotiate a new completion date(s). The installation supplier must obtain BST approval to extend job completion dates.

4.9 During the course of the installation and no later than 75% of the installation interval, if the installation supplier is concerned there could be a possibility of not meeting the completion date, the installation supplier is responsible for notifying the Capacity Manager.

4.10 If the installation supplier determines that the completion date will not be met, a revised completion date must be negotiated with the Capacity Manager. The installation supplier will issue a Notification of Revised Completion Date form. (See Exhibit 3)

4.11 The installation supplier, after consultation with and agreement from BST, will show the reason and the responsible organization causing the revised dates on the Notice of Revised Completion Date form.

```
FIRM SCHEDULE                                   REVISED:

REPORT DATE:_____________          TYPE ORDER  E( ) F( ) I( )  ISSUE NO.______

BELLSOUTH TELECOMMUNICATIONS
BST ADDRESS:                            SHIP TO ADDRESS:
________________________________        ___________________________________
________________________________        ___________________________________
________________________________        ___________________________________
________________________________        ___________________________________
TELEPHONE NUMBER:________________

                          ORDER DATE INFORMATION

DATE ORDER RECEIVED_____________

BELLSOUTH REQUESTED DATES:              ENGI/INSTALL SUPPLIER SCHEDULE DATES:
_________________________________       ___________________________________
SHIP_____________________________       SHIP_______________________________
ON JOB___________________________       ON JOB_____________________________
COMPLETE_________________________       COMPLETE___________________________
ADV COMPLETE_____________________       ADV COMPLETE_______________________

                              CONTACT NAMES

BELLSOUTH REPRESENTATIVE:               ENGI/INSTALL SUPPLIER:

NAME_____________________________       NAME_______________________________
PHONE NUMBER_____________________       PHONE NUMBER_______________________

                       REASON FOR CHANGE IN SCHEDULE
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

                           WHEN TO USE THIS PAGE
```

Firm schedules are required for all orders placed with an Engineering/Installation Supplier if the commitment dates vary from those originally requested on the TEO. Upon receipt of the TEO suppliers will verify that the information contained on the face sheet is complete per contract agreements.

The Engineering/Installation Supplier will issue a firm schedule in a time frame specified by the contract. From the time the TEO is received until the issuance of the firm schedule, the Engineering/Installation Supplier is responsible for securing from their engineering, manufacturing, and installation organizations, commitments that are compatible with the required BST schedule as agreed to in contractual negotiations. If the requested completion date cannot be met, the Engineering/Installation Supplier should discuss alternatives with the Capacity Manager prior to issuing the firm schedule. If BST changes dates on the original TEO, the Engineering/Installation Supplier must issue a revised firm schedule if they are not in agreement with the dates.

The supplier of software will provide shipping schedules for software. The software schedule will be issued at the same time the hardware firm schedule is issued if both are provided by the same supplier. Some dates that are dependent on parameter configurations will not appear on the first issue of the firm schedule for growth jobs. However, all software schedule dates will be furnished on subsequent firm schedules to be issued at a specified time after receipt of order.

EXHIBIT 1 − FIRM SCHEDULE

CONFIRMATION OF JOB COMPLETION

The Installation Supplier must complete and submit the Confirmation of Job Completion form upon project completion. All items must be addressed and documented where applicable. Attach additional sheets where necessary. The Confirmation of Job Completion form must be submitted by the Installation Supplier no later than the Monday following the job completion date.

Date _________________ Page 1 of ___
BST/TEO NO: _________________ Installation Supplier ID/Order NO:___________

INSTALLATION SUPPLIER'S ADDRESS: ____
CLLI / PROJECT ADDRESS: ____
JOB DESCRIPTION: ____

____

____

TEO REQUESTED ACTIVITY: ______________ _______________ ________________

START DATE ADVANCE COMPLETE COMPLETE DATE

SUPPLIER ACTUAL ACTIVITY:_____________ ______________ _______________

START DATE ADVANCE COMPLETE COMPLETE DATE

JOB ACCEPTANCE

( ) OPERATIONAL/PERFORMANCE TEST PERFORMED JOINTLY?

( ) YES NO ( ) WHY?

( ) APPLICABLE DOCUMENTATION RECEIVED BY Capacity Manager?

( ) YES NO ( ) WHY?

( ) DISPOSITION OF SCRAP/UNUSED MATERIALS OR EQUIPMENT?

( ) LOCAL ALARMS TESTED?
( ) YES NO ( ) WHY?

( ) REMOTE ALARMS TESTED?

( ) YES NO ( ) WHY?

PROJECT ACTIVITY COMPLETED AND SUBMITTED BY:

INSTALLATION SUPPLIER REPRESENTATIVE: __________________________ / ___________
DATE

PROJECT ACCEPTED ( ) REJECTED ( ). BY:

NETWORK OPERATIONS: _____________________________ / ___________
DATE

PROJECT ACCEPTED AND COMPLETED. APPROVED BY:

CAPACITY MANAGER: _____________________________ / ___________
DATE

EXHIBIT 2 − CONFIRMATION OF JOB COMPLETION
Page 1 of 2

Page 2 of ____

CONFIRMATION OF JOB COMPLETION

DATE __________

EXCEPTIONS TO PROJECT

ARE THERE ANY EXCEPTION ITEMS? ( ) * YES (LIST BELOW) ( ) NO

EXCEPTION ITEMS DESCRIPTION: ____

____

____

*** ALL MINOR EXCEPTION ITEMS MUST BE COMPLETED WITHIN 30 DAYS AFTER JOB COMPLETION.**

(ATTACH ADDITIONAL SHEET IF NECESSARY)

EXCEPTION ITEMS NEGOTIATED AND AGREED TO BY:

– NETWORK OPERATIONS ____/______________

DATE

– INSTALLATION SUPPLIER _____________________________________/ ______________

DATE

EXCEPTION ITEMS CLEARED: _____________ / _____________________________________

DATE INSTALLATION SUPPLIER SIGNATURE

EXHIBIT 2 – CONFIRMATION OF JOB COMPLETION
Page 2 of 2

NOTIFICATION OF REVISED COMPLETION DATE

The Installation Supplier must complete and submit the Notification of Revised Completion Date form as soon as the condition is known that the original completion date will not be met. All items must be addressed and documented where applicable. The Notification of Revised Completion Date must be approved by the BellSouth Representative.

Date ________________

BST/TEO NO: ____________ Installation Supplier ID/Order NO:__________

INSTALLATION SUPPLIERS ADDRESS: ____

CLLI / PROJECT ADDRESS: ____
JOB DESCRIPTION: ____

____

____

SCHEDULED ACTIVITY: ______________ ______________ ______________

START DATE ADVANCE COMPLETE COMPLETE DATE

REQUESTED ACTIVITY:______________ ______________ ______________

START DATE ADVANCE COMPLETE COMPLETE DATE

REASON FOR REVISION REQUEST: ____

____

____

REVISION CAUSED BY ( ) BST ( ) VENDOR ( ) OTHER

REVISION REQUESTED NEGOTIATED AND AGREED TO BY:

− NETWORK OPERATIONS REPRESENTATIVE __________________________/_____________

DATE

− CAPACITY MANAGER _________________________________/ ______________

DATE

− INSTALLATION SUPPLIER _________________________________/ ______________

DATE

EXHIBIT 3 − NOTIFICATION OF REVISED COMPLETION DATE

5. Job Acceptance

5.1 At the end of a project or at the Method of Procedure approval meeting, Network Operations may request that operational/performance tests be performed jointly.

5.2 The installation supplier shall maintain a test record summary indicating for each test performed the following: employee performing test, date of test, equipment tested, troubles found, troubles cleared, date cleared, and by whom. A copy of this test record summary shall be forwarded to Network Operations Supervisor at job completion.

5.3 Network Operations requires a 48 hour notification of joint operational/performance test.

6. Job Information Memorandum/Change Notices

6.1 This Job Information Memorandum/Change Notice provides BellSouth Telecommunications Inc. (BST) regional policy and procedures to be followed on central office equipment projects.

6.2 The installation supplier must submit a written JIM or similar type document to the Capacity Manager as a formal method for information exchange. (See Exhibit 4) When the JIM involves BST provided equipment, the installation supplier will also provide a copy of the document to the BST Reuse Specialist.

6.3 The JIM routine is used to seek authority for additional work effort or additional billable material necessary to complete the job that is being installed.

6.4 The preferred method of adding to or modifying an open job is to issue a new TEO.

6.5 The Capacity Manager is responsible for ensuring that the added or modified work is appropriate and supplemental authorization, if required, is obtained prior to the start of the work.

6.6 Changes to a job must be approved by the Capacity Manager. Billing for work that was not properly authorized will not be processed for payment.

6.7 The JIM is issued by the installation supplier. JIM's should be issued for the following conditions:

(a) Report various job conditions such as material shortages

(b) Obtain additional engineering, installation or drawing information

(c) Report additions, changes and conditions that require additional billing or credit

(d) Forward information (i.e., damaged material, condition of BST furnished equipment, etc.)

(e) Obtain approval for premium labor charges such as night work bonus and overtime allowance

6.8 The installation supplier shall route all JIMs requiring BST approval to the Capacity Manager for additional labor charges or billable material required to complete the job and contract exclusions. BST approval can be obtained by a telephone call in situations where the time frame for material procurement or installation is critical. The confirming JIM should make a specific reference to this telephone call, date, time and the job conditions that required such action. In those instances when the JIM describes a problem with BST provided equipment, the installation supplier will deliver an information copy of the JIM to the BST Reuse Specialist.

6.9 A complete description is required in all cases of the installation effort involved when a JIM is forwarded to BST for approval. All JIMs issued without a complete description of the installation conditions being reported will be rejected and returned to the installation supplier.

6.10 This detailed description should include drawing numbers, figures and options when applicable. The accountable work operations should be entered on the JIM with the quantity of equipment.

6.11 The installation supplier shall enter the approximate dollar value as "Approximate Cost $________ for the premium labor associated with: (enter BST request or job condition)". This statement is required on all JIMs when BST makes a request of the installation supplier or imposes a condition which will require the use of premium labor. The installation supplier shall not start any work requiring premium labor prior to receiving the approval of the JIM for premium labor.

The installation supplier shall attach the ordering documents (installer's requisition, etc.) to the JIM when additional billable material is required for the BST order. This additional billable material will be ordered by the installation supplier to complete the TEO and contract exclusions.

6.12 An estimate of the cost, to perform the described work operations and any additional billable material, must be shown on the front of the JIM when conditions reported will require additional BST expenditures. The installation supplier shall enter the approximate dollar value as "Approximate Cost $________" before sending the JIM to BST for approval.

6.13 The installation supplier shall issue a credit JIM for labor authorized but not performed. The labor credit will be associated with material considered BST owned surplus.

6.14 Two copies of all JIMs should be submitted to the Capacity Manager for approval or information. One copy (information) shall also be provided to the BST Reuse Specialist when BST provided material is involved.

6.15 JIMs for additional work effort or additional billable material require BST approval.

6.16 The approved JIM is the basis for the installation supplier to issue a supplementary contract proposal to reflect anticipated charges to BST for the authorized work activity and billable material.

6.17 The approved JIM and associated supplemental contract proposal is the authorization for the installation supplier to proceed with the work described in the JIM.

6.18 The JIM should be answered promptly to avoid delays which could affect the completion of the order. If the answer will be delayed, the appropriate installation supplier should be advised when the answer will be furnished.

6.19 If a JIM is to be rejected, the JIM should be returned with a letter outlining the reasons for the rejection. JIMs that do not follow the outlined procedures will be returned to the installation supplier.

JOB INFORMATION MEMORANDUM

DATE____________

TO____________________________________ FROM ______________________________________

ADDR__________________________________ ADDR ______________________________________

CITY__________________________________ CITY ______________________________________

TELE__________________________________ TELE ______________________________________

TEO # ____________________ CLLI _______________________ COMPLETION DATE ___________

LOC. ADDR ______________________________ CITY _____________________________________

JOB DESCRIPTION ____

____

SUBJECT:

____

____

DETAILS: ____

____

____

____

____

INSTALLATION SUPPLIER ____

SIGNATURE __________________________ TITLE ________________________ DATE___________

BST RESPONSE / APPROVAL ____

____

SIGNATURE __________________________ TITLE ________________________ DATE __________

EXHIBIT 4 − JOB INFORMATION MEMORANDUM

GENERAL INFORMATION − INSTALLATION PROCEDURES

CONTENTS

GENERAL INFORMATION − INSTALLATION PROCEDURES

1. General

1.1 The following information provides Installation Suppliers with the general requirements concerning laws, ordinances and codes. Items addressed may require joint Capacity Manager and Installation Supplier review and coordination prior to, during and after the actual installation activity.

2. Laws And Ordinances

2.1 The Installation Supplier shall adhere to all laws and ordinances while performing work for BST.

2.2 The Installation Supplier shall conduct business in a manner that will not cause discredit to BST in the community where the work is being performed.

3. Codes

3.1 The Installation Supplier shall follow all applicable national and local building, electrical and fire codes when performing work on BST premises.

3.2 The local electrical requirements issued as a city/county ordinance or state law that vary from the standard National Electrical Code (NEC) must be adhered to by the installation supplier. All material, such as electrical cabinets, junction boxes, conduit, fittings, wire, etc., must meet the requirements of the NEC.

4. Occupational Safety And Health Administration (OSHA)

4.1 It is imperative and a BST requirement that all installation suppliers are personally committed to job safety. Federal, state, and local codes and statutes covering safety will be observed while on BST premises. Compliance with the Occupational Safety and Health Administration (OSHA) Act, and rules of the Environmental Protection Agency (EPA) must be adhered to.

4.2 The Installation Supplier shall insure its employee adhere to the Federal and State OSHA and BST regulations and requirements governing personal safety while on BST property.

4.3 The Installation Supplier shall immediately notify the Capacity Manager in writing of any OSHA inspections, visits or OSHA Citations while on BST premises.

5. Environmental Regulations

5.1 The Installation Supplier shall strictly comply with all applicable local, state, and federal environmental statues and regulations while performing work for BST and while on BST premises.

5.2 The Installation Supplier shall immediately notify the Capacity Manager in writing of any environmental regulatory agency inspections, visits or any environmental regulatory agency citation issued while on BST premises.

6. Electro−Static Conditions

6.1 Electronic Components in the Central Office are subject to Electrostatic Discharge (ESD). It is important that static control measures be used with any electronic system plug−in equipment. Manufacturer's documentation/procedures shall be followed at all times when handling Electronic Components. (plug−ins, circuits packs etc.)

6.2 The terms "plug−in unit" or "plug−in" are used to refer to any circuit pack, printed wiring board, card, device, or other unit which contains solid state electronic components.

6.3 To maintain Electrostatic Discharge control measures, consideration should be made of the following:

- Receipt of Plug−ins. Plug−ins may be received at various locations such as a warehouse, field stocking location, Intermediate Distribution Center or a central office. The installation supplier must ensure that the plugs−ins are in protective packaging.
- Storing Circuit Packs. All plug−ins must be stored in approved antistatic packaging and storage bins, cabinets or shelves until placed in service. These storage components must be metal and grounded according to the grounding standards in Section 11.
- Handling of Circuit Packs. Plug−ins must not be handled unnecessarily. Manufacturer's instructions must be followed at all times.

6.4 Manufacturer's recommendations of Electrostatic Discharge control measures are provided with plug−ins and circuits. This information is available upon request if needed.

7. Pre−Existing Conditions

7.1 At the start of a job, conditions may exist on equipment that is involved with the current project that violate the BellSouth technical standards. Those pre−existing conditions should be referred to the Capacity Manager to determine if they should be corrected on the current installation project or remain as they are. The installation supplier should document or attain documentation from the Capacity Manager regarding the referral and the final decision. Some examples of pre−existing conditions are:

- grounding violations on a bay before the start of additional equipment to the bay
- improperly installed bay that will affect the current project
- drawing information that is incorrect

8. Alarms

8.1 The installation supplier when performing any alarm installation activity in the central office must follow the BellSouth DTS Alarm Plan Job Aid, Switch Manufacturer instructions, Power Alarms systems instructions along with any Capacity Manager request.

8.2 During installation activity in attended and unattended offices or where the alarms are extended to a distant control office, the installer shall contact the surveillance center and report all alarms due to installation activity. This will eliminate unnecessary dispatching of BST maintenance personnel. Where alarms are not extended to a remote location, BST shall instruct the installer how and where to report alarms.

8.3 To facilitate the unnecessary dispatching of BST personnel, it is mandatory that the installation supplier perform joint acceptance test of alarms with Network Operations and/or the remote location monitoring the central office alarms for proper operation. The joint acceptance test of the alarms should be done at the beginning of the job and at the end of the project. All alarm test records and alarm documentation shall be turned over to the Network Operations Representative.

8.4 If during the course of the installation the Installation Supplier generates an alarm, the Installation supplier must report the alarm to the surveillance center for verification. The alarm that was generated or disconnected must be reconnected and monitored by the Installation Supplier during the installation with the surveillance center for proper operation and integrity.

8.5 The installer, when departing from an office, will ensure that the alarm system is in the proper position and has complied with local BST instructions for leaving an office in normal attended and unattended operation.

8.6 For equipment removals and rearrangements, it is imperative that alarms be verified before and after the job to maintain alarm integrity of the equipment/bays that remain in service. Any alarms which have been inadvertently disconnected should at that time be identified, reported to the surveillance center and reterminated.

8.7 Environmental alarms will remain operational at all times during any installation activity associated with equipment additions, modifications and removals. The installer is responsible for the proper operation of alarms associated with the existing equipment that could be affected by the installation activity on the job. It is therefore recommended that the method for maintaining alarm continuity be included in the Method of Procedure.

9. Surplus Material/Equipment

9.1 Material ordered for and remaining on hand after completion of an installation and/or removal job is considered surplus. It may be owned by BST or supplier owned. In general, BST owns the material which it has ordered, and/or for which it has paid. Installer shall complete a Request for Disposition of Surplus Material Form, RF 6330 (see Exhibit 8), or similar. The installer must complete columns A through C and forward to the Capacity Manager for review and disposition instructions.

9.2 This unapplied material is subject to the following disposition instructions resulting from an installation and/or removal:

(a) Return to the supplier for credit.

(b) Transfer material to another job for reuse.

(c) Transfer material to BST warehouse for future use.

(d) Ship to Material Distribution Center (MDC) as high value scrap.

(e) Junk locally.

10. Removal Administration

10.1 Form RF 8010, Transfer Report, (Exhibit 1), provides the installation supplier with a detailed summary of equipment to be removed and preserved for future use by BST. The Transfer Report is used to communicate what frames, bays and subassemblies are to be removed and saved for re−application.

10.2 All items of material listed on the Form RF 8010 − Transfer Report should be physically inspected by the installation supplier to ensure the equipment is complete, operable and free from physical defects. Any defects should be documented and reported immediately to the BST Reuse Specialist. Once inspected, the installation supplier will pack all items specified on the Transfer Report in a manner that will protect the components and keep them free from damage while in transit and in storage. No BST equipment saved for reapplication shall be removed from a protected environment or transported without protective packaging. Exceptions to this requirement will not be granted without prior written authorization from BST.

10.3 The installer shall comply with requested dates entered on the Form RF 8010, Transfer Report associated with "Date Required" at "Ship To" location. Conflicts with the dates shall be brought to the immediate attention of the responsible Capacity Manager.

10.4 A copy of the Transfer Report will be included with each shipment of equipment.

10.5 The following forms provide the Installation Supplier with the procedures needed to process scrap material.

(1) RF−5433 COE Scrap Return Authorization − Exhibit 2

(2) RF−1020−B Scrap Disposition Record − Exhibit 3

(3) RF−1800 SCB/SB Straight Bill Of Lading − Exhibit 4

10.6 Depending on the amount of scrap involved, the installer may be referred to Materials Services for coordinating the on−site removal, sale and shipment procedures, including the removal of hazardous material. Scrap not sold directly to a contracted reclamation center shall be shipped to a Material Disposition Center (MDC).

10.7 Equipment withdrawn from service by the installer will be reported to the Capacity Manager on Form RF 5338, Notification Of Central Office Equipment Removal, Exhibit 5.

11. Building Access And Security

11.1 The following information provides the installer with the general requirements affecting building facilities and their care. When conditions deviate from the guidelines prescribed in this section, they shall be negotiated locally between the BST and the installer.

11.2 BST will allow the installer access to the premises and facilities as stated in the TEO or as agreed upon with Network Operations. When required, hours of access will be agreed upon in writing via the MOP (see Section 19) prior to the start of installation.

11.3 The Installation Supplier shall be responsible for the actions of their employees or representatives while they are on BST premises. Employees of the Installation Supplier may be denied access to BST premises if it is determined that it is in the best interest of BST.

11.4 The Installation Supplier's employees or representatives must wear an identification badge (I.D.) at all times while on BST premises. The identification badge (I.D.) must contain the following items: company name, employee name, and photo of employee.

11.5 If the Installation Supplier employee is new or temporary and does not have a photo I. D., a temporary I. D. shall be issued by the Installation Supplier. The temporary I. D. must contain the employee's name, employee's drivers license number or number from a DMV identification card so it can be matched, on request, with the photo on the employee's drivers license or DMV identification card.

11.6 The installer shall provide the local Network Operations representative or security guard with proper identification credentials requiring building access. Various procedures exist in BellSouth that provide for access to company facilities. As such, this may require that the installer obtain non−employee identification cards from the BST.

11.7 The Installation Supplier must guard against and take the necessary steps to prevent unauthorized visitors from entering that portion of the BST premises for which the Supplier is responsible. Exterior openings (e.g., doors, windows, etc.) or interior security openings shall not be left open and unattended.

11.8 When the Installation Supplier is responsible for work activities in unattended buildings, the Installation Supplier shall insure the premises are kept secured at all times. The Installation Supplier shall adhere to all access requirements specified by the BST organization responsible for the building's security.

11.9 BST shall not be responsible for the security of the Installation Supplier's tools, equipment, or personal possessions.

11.10 The installer shall not have any unauthorized visitors on the BST premises while performing installation services.

11.11 In unattended buildings at remote locations a key may be furnished for the installer's use. The decision for the issuance of this key will be determined by Network Operations. When the installer is responsible for work activities in unattended buildings, the premises shall be locked at all times.

11.12 All security devices such as doors, gates, windows etc., shall be in place at all times, except when temporary removal is required to permit material to enter or leave the BST premises. These devices shall be replaced immediately after completion of the activity, and no later then the end of each work day.

11.13 No photography is allowed in telephone equipment buildings without the prior approval of the BST.

12. Housekeeping

12.1 The following information provides the Installation Supplier with general requirements concerning housekeeping in the Central Office, CEVs and HUTS. Housekeeping is defined as cleaning and keeping area(s)of installation activity free of unused materials, debris, and non−

related installation items. In addition to these items, the Installation Supplier shall adhere to TR73503. OSHA and EPA standards should be adhered to at all times.

12.2 Items addressed will require joint Network Operations and the Installation Supplier review and coordination during and after the actual installation activities.

12.3 The Installation Supplier shall adhere to the following.

(a) All equipment, prior to being brought into an equipment area, shall be free of dust and foreign substances. All specific or unique housekeeping or equipment cleaning procedures or requirements shall be detailed in the MOP.

(b) All building openings used for material / equipment entry or removal must be closed properly after the entry activity.

(c) Dirt, loose piece parts, scraps or waste material shall be cleaned up immediately. Poor housekeeping is a potential safety hazard and should be avoided at all times. All other non–hazard material should be removed daily.

(d) All combustible material shall be removed from the building as soon as possible to prevent a fire hazard.

(e) Areas of installation activity shall be checked thoroughly after installation for installation supplier tools, equipment and personal possessions. These items must be removed.

(f) After the completion of a job, the installation supplier shall remove all debris, wasted material and equipment from the work area.

(g) Disposal of all unused material must be in accordance with instructions from the Network Operations Representative or Central Office Coordinator.

13. Personal Safety

13.1 The installer must be aware of any areas that contain asbestos before the start of any installation activity. The installer shall contact the Capacity Manager to confirm that a survey was conducted on the building for the presence of asbestos containing material.

13.2 Physical, electrical, and chemical conditions can exist in the design of equipment that affect personal safety. The installer shall maintain a safety check list of potential hazards applicable to telecommunications products.

13.3 Since the possibilities of hazardous conditions are so numerous in COE installations/removals, the installer shall maintain a check list as a guide in satisfying safety standards, such as the use of safety glasses, hard hats, proper clothing, availability of first aid supplies, etc. Enforcement of safety considerations and the incorporation into the design of environmental requirements should ensure personal safety.

13.4 Any AC/DC circuits not essential for maintenance of service should never be worked on while energized. When it is unavoidably necessary to work on live power circuits or adjacent to these circuits, the installer shall take adequate precautions. These precautions shall include insulated tools, fiber sheets or rubber blankets and/or extra personnel. Service protection is discussed in detail in Section 27.

13.5 When the electrical potential is removed from operating circuits, each circuit shall be identified with a "Warning − Man Working On Circuit" tag at the fuse clip or switch. This tag shall only be removed by the person responsible for the work being performed. The installer shall identify these circuits using a tag similar to Form RF−5470.

RF−5470
(1−87)

WARNING
Man Working On Circuit
Do Not Insert Fuse
Or Close Switch
This tag shall be removed only by the person responsible for the work operation.

Installer's Name ______________________

13.6 When there is servicing or maintenance activities required on energized equipment where unexpected energization, start up or release of stored energy may cause injury, the installation supplier should use the following procedure:

- LOCKOUT/TAGOUT Safety rules and regulations as prescribed by OSHA must be adhered to.
- Locate and identify all isolating devices to be certain which switch, value(s) or other energy isolating devices apply to the equipment to be locked out or tagged out.
- Notify all affected personnel of the lockout or tagout system being utilized and the reason.
- If machine or equipment is operating, perform shutdown procedures as prescribed by the manufacturer standards and BST requirements and the MOP.
- Operate the switch, valve, or other energy isolating device(s) so that the equipment is isolated from its energy source(s). Stored energy must be dissipated or restrained.
- Install Lockout or Tagout energy isolating device or similar as shown in Exhibits 6 and 7.
- If more than one supplier is required to lockout or tagout, equipment, each shall place a lockout or tagout device on the energy isolating device.
- After service or maintenance is complete or equipment is ready for operations, check area around machine and equipment to ensure that no personnel is exposed to any moving part.
- Remove all tools, clear area of personnel, remove lockout or tagout device. Operate the energy isolating device(s) to restore energy to machine or equipment.

13.7 Specific safety instructions pertaining to particular installation activities are included in other sections throughout this publication. Safety instructions associated with work on AC\DC circuits are included in Section 27.

14. Fire Safety

14.1 No smoking shall be permitted in BST buildings. The use of spray paint is prohibited on BST premises.

14.2 Trash removal from BST premises and property is the responsibility of the installer. Where large trash receptacles are available on the BST property, the installer may use these with prior permission from Network Operations. Disposal of trash by burning on or near the premises shall not be permitted.

14.3 All flammable materials/combustible items shall be removed from the Central Office environment by the Installation Supplier on a daily basis. If any accumulation of such materials/items creates a potential fire hazard, it must be removed more frequently. Flammable materials/ combustible items are (not limited to) waste paper, foam plastic, cloth bags, packing boxes, packing material, wood crates and wood cable reels. All exits, corridors, and stairways shall be kept free of storage materials. Equipment, debris, or other obstructions that could restrict or block normal exiting shall be avoided at all times. Storage of flammable liquids used in COE installation/removals shall be kept in approved metal storage cabinets and will be dispensed from approved containers. These cabinets shall be conspicuously lettered “FLAMMABLE − KEEP FIRE AWAY”.

14.4 Fire detection systems shall be maintained in full operation at all times. Under no condition shall any component, such as detection heads, pull stations, annunciator panels, or alarm circuity be made inoperable. The only exception shall be those intervals where outages may be required for the extension and/or modification of existing systems. During such operations, the outage time shall be kept to an absolute minimum. Outages shall not extend beyond the normal work day and shall be coordinated and approved by BST.

14.5 Access to a fire extinguisher shall be maintained at all times. Neither the extinguisher(s) nor their location markings shall be obscured from view by equipment, materials, etc. Fire fighting apparatus shall not be removed or relocated unless needed for fire fighting purposes or authorization is obtained from the on−site Capacity Manager. If fire fighting apparatus is used, the installation supplier shall immediately notify Network Operations.

14.6 When an installer is engaged in any activity that presents a fire risk, the installation supplier shall provide additional fire fighting equipment in addition to the existing apparatus. This equipment and its location shall be defined in the MOP. Examples of activities that may require additional fire fighting equipment are:

- Engine alternator work, including fuel lines, exhaust systems, etc.
- Cutting, termination, or relocation of live power cable.
- Any other activity that may be considered a fire risk.

14.7 Care shall be taken to ensure that the storage of combustible packing is not in contact with heat−producing telephone or building equipment such as soldering irons, heat exchangers, transformers, rectifiers, etc.

14.8 The installation of temporary electrical and/or telephone cables shall be such that the cables will not be in contact with or in close proximity to heaters, furnaces, or heat−producing equipment.

14.9 The installer shall be responsible for opening and closing cable holes, slots, and sleeves between floors and walls on a daily basis. Cable holes shall remain closed when cable work is not in progress. This is discussed in detail in Firestopping Requirements for Floor and Wall Openings.

15. Building And Equipment Protection

15.1 All building construction or alterations within areas requiring installer occupancy shall be completed before the scheduled start of the installation activity unless otherwise specified and agreed to by all parties.

15.2 BellSouth shall provide electric power for all necessary purposes, with suitable outlets, in areas where work will be performed. Heat and general illumination, of a permanent,temporary, or emergency nature, in rooms wherein work will be performed or material stored, will also be provided by BellSouth.

15.3 No adjustments to controls, thermostats, or venting of the heating or cooling system shall be made by the installer. Any necessary adjustments should be requested of the local Capacity Manager.

15.4 Space for administration, storage of material, unpacking, lunch room, toilet facilities, and other purposes and its location will be a matter of agreement between the installer and BST prior to the start of the installation.

15.5 BST will not be responsible for providing parking facilities, or for the loss of personal possessions such as tools, jewelry, etc. Telephone service for conducting installation business should be addressed at or prior to job start to determine if phone service will be provided by BST or the installer. Unless agreed to in writing by BST, the cost will be borne by the installer. When telephone services are to be used for equipment testing purposes, BST shall arrange for the necessary services, as needed.

15.6 The Installation Supplier shall provide adequate protection for the building and all equipment as referenced in the job documentation, MOP, this technical reference document, and any additional BST instructions. Adequate protection shall be used to protect floors, columns and walls from damage. If the installer causes damage to BST property, the installer shall be responsible for all necessary repairs.

15.7 All material shall be stored in such a manner so as not to exceed the safe floor load of the building or cause a safety hazard. Material shall not be unpacked in rooms having working equipment without prior approval of Network Operations.

15.8 When the installer is responsible for handling and hoisting equipment, it is the installer's responsibility to see that the hauling and hoisting contractor uses care to protect the building and equipment.

15.9 Equipment or devices such as cameras, radio receivers/transmitters, or metal ladders are not allowed in BST buildings without the expressed, written permission of BST.

15.10 Specific questions on building/equipment protection or the suitability of specific materials to be used for protection should be directed to the Capacity Manager(s).

15.11 At job completion all job related equipment/building protection shall be removed, and all access devices returned to BST.

15.12 Precautions to be taken when working on power equipment are detailed in Sections 27.

15.13 The cutting of ferrous material shall be strictly controlled. Filings, chips, etc. can be extremely harmful and damaging to telecommunications equipment. Wherever possible, equipment protection precautions shall be maintained, and cutting must be done outside of equipment areas.

15.14 Prevention of service interruption or degradation is the joint responsibility of BST and the Installation Supplier.

15.15 The following items will help reduce the possibility of service interruption during job activities. This list is not intended to be all inclusive, more items may be necessary to effectively reduce the possibility of service interruption.

(a) Full cooperation, between the Installation Supplier and BST, prior to and during job activities.

(b) Complete discussion and understanding of job activities.

(c) Identification of BST and Installation Supplier responsibilities.

(d) Utilization of a job plan and approved detailed MOPs.

(e) Identification and approval (in the MOPs) of the tools and processes to be used during job activities.

(f) Identification and marking of critical live equipment, cables, or cable loops that may be within the work area.

(g) Protection of working equipment.

(h) Change in working hours as required for high risk work operations.

(i) Identification or marking of equipment to be removed and saved for reuse by BST.

(j) Identification of when and how working equipment may be taken out of service.

(k) Identification of who will be taking working equipment out of service.

(l) Cable shall not be cut on the cable rack.

16. Waterproof Floors

16.1 Many Central Offices have equipment located in areas that are subject to water intrusion. Floors and walls in these areas are waterproofed to prevent water penetration into the building.

16.2 The installer shall contact the Capacity Manager before drilling into any basement floor or wall. The Capacity Manager will determine whether an area has been waterproofed and if there is a requirement for special precautions and procedures.

16.3 Where a waterproofing condition exists, the Capacity Manager will determine the specific method of securing equipment to the walls or floor. If the waterproofing cannot be broken to accept anchors the “Poured Concrete Block” method could be considered.

NOTE: Frames equipped with pullout units, that will result in a significant amount of weight shift, cannot use this method.

16.4 In the absence of waterproofing, normal installation procedures shall be followed.

BellSouth Services
A BELLSOUTH Company

RF 8010
(11−86)

Transfer Report − Engineering

BSP 790−100−530SV

1 4

☐ South Central Bell
☐ Southern Bell

Transfer Report No. | Page ___ pf ___

Purpose Of Transfer (Place X In Appropriate Box) | Reference Doc.

☐ RCOE Stock ☐ Equipment For Use On TEO _______________ ☐ Adj. Accounts
☐ SMMS Stock ☐ Sale (Comptrollers To Bill) ☐ Other _______________

Ship/Transfer From (Credit)			Ship/Transfer From (Debit)		
Location		State	Location		State
Geo. Loc.	Auth. No.	RCO	5 Geo. Loc. 9	10 Auth. No. 16	17 RCO 25
RCC	Func. Code	Field Code	26 RCC 34	35 Func. Code 40	Field Code
Telco Order Number	Vendor Order Number		Telco Order Number	Vendor Order Number	

Transportation Instructions		Shipping Information		Engineering Contact	
☐ Prepaid ☐ Third Party	Req'd. Ship Date	Ship To:		Engineer	
Bill To:				Tel. No.	
				Prepared By	
				Tel. No.	
Geo. Loc.	Auth. No.	Packed/Shipped By	Date Shipped	Date	RCOE Concurrence
Field Code	Telco Order	Shipped VIA		Remarks	
Mark Pkgs.		No. Of Pkgs.	Bill Of Lading #		

Inst.	Engineering							
Pkg. No.	Slash No.	Equipment Description	Cond.	Qty.	Price	Per	Yr. Pl. 41 42	43 Amount To Be Transferred 51

To Comptrollers _____________19_____

Shipment Verified _____________19_____
Quantity Of, And Package Numbers Correct Except As Shown On Reverse Side.

Signed:(Eng. Representative)

For Comptrollers Dept. Use Only													
FA Source	EXTC Code	Account						Geo. Dist.	Spec. Edit	FA Mode	I−C Use	Pack No.
		Bill Ind	Main	SUB	LTR	SUF	Appl. Type					
52	53 57	58	59 62	63 66	67 68	69 70	71	72	73	74	75	

*Condition: N = New, G = Good, J = Junk

Exhibit 1 − Material Transfer Report

RF−5433
(4−87)
Front

COE Scrap Return Authorization

☐ South Central Bell ☐ Southern Bell

BSP 790−100−530SV

To:	Disposition To: ☐ MDC ☐ On−Site To Vendors ☐ Other: ______	Telco Order No.
		Vendor Order No.
	From: (Off./Addr.)	Date
		Page _______ Of _______
Removal Performed By:		

Engineering Contact	Accounting Classifications		
Engineer:	Classifications	COE Scrap Credit	
		Prorate transportation costs and scrap credit as follows:	
Address:	Estimate/Job Auth. No.	Acct. (FRC/FC)	Percent
	Geo. Loc. Code:	_____ X	_______
Tel. No.:	State Code:	_____ X	_______
RCOE Concurrence	RCO:	_____ X	_______
Approved:	RCC:	_______ Total	_______ 100%

Engineering Use		Installer's Use	
Description	Qty.	RF−1020−B No.	Shipped VIA

Installer's Use	
Disposition Completed By:	Date Of Last Shipment:

Exhibit 2 − COE Scrap Return Authorization
Page 1 of 2

RF−5433
(4−87)
Reverse

Instructions For Completing Form RF−5433, COE Scrap Return Authorization

BSP 790−100−560SV

Form RF−5433 is designed to convey disposition authority, for COE scrap shipments, to the installation/removal vendor or Materials

Management (MM) disposition agent acting on behalf of the Engineer. Disposition is specified by the Engineer except in cases where Materials Management is responsible for the final disposition of COE scrap shipments. Scrap credits resulting from scrap shipments authorized by this form will credit Account 171, Depreciation Reserve. This form will not be used to secure credit for the return of equipment to a manufacturer supplier.

Engineering:

Form RF−5433 is initiated by engineering. Form RF−5433 is sent to the installation/removal vendor and/or MM disposition agent designated to process scrap shipments to the Material Disposition Center (MDC) or reclamation vendor.

The form and fields on the form are self−explanatory and should be completed as indicated providing all accounting classifications necessary to properly classify scrap salvage credits to the authorization.

The proration of scrap credit and transportation charges for scrap shipments should be based on the inplace cost, by field reporting code (FRC), of the equipment to be processed by the RF−5433 form. Space exists for up to five FRC/percent prorations on each RF−5433.

The RCOE Coordinator or representative shall concur in the scrap disposition of COE. Equipment listings on Form RF−5433 will be in descriptive terms like bays, frames, shelves, etc. (by type), along with quantity of each (see 790−100−560SV).

Form RF−5433, COE Scrap Return Authorization shall be processed as follows:

Copies 1 and 2 − Forward to the installation/removal vendor and/or MM disposition agent.
Copy 3 − Forward to Comptroller−Cost Office.
Copy 4 − Forward to Engineering File.

Installation Vendor/MM Disposition Agent:

Removal and disposition can begin when Operations forces indicate that all working/wired circuits have been disconnected and the equipment defused. All scrap shipments must be pre−paid or sent by Company truck.

The installation/removal vendor or MM disposition agent shall prepare Form RF−1020−B SCRAP DISPOSITION RECORD (BSP 748−300−002SV), for each shipment of COE scrap, using the accounting classifications and other information provided by this document.

The installation/removal vendor or MM disposition agent shall complete the information on this form, indicating the RF−1020−B SCRAP DISPOSITION RECORD numbers associated with the equipment listed and return this form to the engineer after disposition is completed.

Transportation will be via company truck or common carrier. When Common Carrier is utilized the installation or removal vendor will document the shipment on the STRAIGHT BILL OF LADING−SHORT FORM, Form RF−1800 SB or RF−1800 SCB (or equivalent), in accordance with BSP 744−200−001SV. Shipments must be marked PREPAID.

Form RF−5433, COE Scrap Return Authorization shall be processed as follows:

Copy 1 − Return to the Engineer
Copy 2 − Retain

Exhibit 2 − COE Scrap Return Authorization
Page 2 of 2

BellSouth Services
A BELLSOUTH Company

RF−1020−B
(8−85)

Scrap Disposition Record

A. Shipped To	B. Shipped From	103612
MDC Or Vendor	Street Address	C. Telco Order No. ____ Vendor Order No. ____ State Code ___ ___ ___ ___
Street Address	City And State	
City and State	Form Prepared By ( ) Tel. No.	Page ____ of ____
Person Shipping ( ) Tel. No. / / Date	Packed By	

D. Central Office Scrap Contracts

Contract No. ____
_____ Last Shipment This Contract No.
_____ Shipped To MDC
_____ Maximum Segregation
CLLI Code ____

E. Carrier Information

Carrier ____
Trailer No. ____
Seal No. ____
Bill Of Lading No. ____
Gross Weight ____

F. Accounting Classifications

Estimate/Job Auth. No. ____

Prorate Transportation & Scrap Credit As Follows:
Credit Type (Select One)
___"C" ___"X" ____"M"

Account (FRC/FC)	Percent
	100%

G. Packing Description (Indicate No. Of Each, If Applicable)

___ Bags ___ Baskets ___ Boxes ___ Bundles ___ Coils ___ Crates
___ Drums ___ Pallets ___ Loose (See Items Listed Below)

H. Originator			I. For MDC/"On−Site" Rep. Use Only						J. Hdqrs. Use Only	
1	2	3	1	2	3	4	5	6	7	8
Description	Qty.	Estimated Weight	Line No.	Date Shipped/ Recieved	Scrap Material Class	Gross Weight	Net Weight	Lot Number	Vendor Type	Misc. Sales Amount
			1							
			2							
			3							
			4							
			5							
			6							
			7							
			8							
			9							
			10							
			11							
			12							
	Total				Total					

Comptrollers	Hdqtrs. Materials Mgmt.
Audited By:	Audited By:
Date	Date

Note: See reverse side of last sheet for instructions.

ORIGINATOR

Exhibit 3 − Scrap Disposition Record
Page 1 of 2

Instructions For Completing Form RF−1020−B

Form RF−1020−B is a multi−purpose form designed to document shipments of Network Engineering scrap material and hazardous material. This form, completed with the required information, must accompany each shipment of material to the Materials Disposition Center (MDC), direct to a vendor from central office contract removal sites or direct shipments of hazardous material to an approved disposal facility.

The Accounting classification, section F, must be complete accurately to insure proper peroration of scrap credit and transportation charges, if applicable.

NOTE: Please refer to the appropriate BellSouth practices listed below for established procedures pertaining to handling scrap or hazardous material:

748−400−002SV	Handling Scrap Material − Field Locations
790−100−560SV	Scrap Disposition Procedures
748−300−002SV	Scrap Disposition Procedures Central Office Equipment

Packaging, labeling and shipping of hazardous material must be in compliance with federal, state and local laws and regulations.

1. General Requirements

On ALL shipments of scrap material, Blocks A, B, C (as applicable) E (if shipped by common carrier, F, G and H will be filled in. Listed below are additional instructions for blocks C, E, and G

Block	Line	Instructions
C	State Code	For the location receiving scrap credit enter the common 2−digit abbreviation for the State/Area preceded by SB (Southern Bell) or SC (South Central Bell); i.e. SCAL(AL.), SBNF (North Fl.), SBSF (South Fl.)
E	Bill of Lading No.	If shipment is to a scrap vendor, enter Lot No. For common carrier shipments to the MDC, enter the red pre−printed number.
G.	Packing Description	If more than one container is shipped per form, write the geographic location code on the containers to ensure that appropriate scrap credit will be received.

11. Scrap Shipments From Central Office Contract Removal Sites

Enter required information in Blocks A, B, C, E, F, and G. Blocks D and i should be filled out according to the following instructions:

Block D − Central Office Scrap Contracts

1 − Enter appropriate contract number for material being shipped
2 − Check if last shipment to vendor on contract number entered on line 1
3 − Check if material is being shipped to MDC, per instructions from the Materials Management COE Disposition group
4 − Check if material shipped to MDC is maximum segregated
5 − Enter CLLI Code Of Shipped From location

Block 1 − “On−Site” Representative

1 − Enter Date Shipped
2 − Enter Scrap Material Class
3 − Enter Gross Weight
4 − Enter Net Weight of scrap material
5 − Enter Lot Number of shipment

111. Distribution of Form RF−1020−B

Shipments to MDC

Originator − Retain Copy 1. Forward Copies 2, 3, 4, 5 and 6 to the person responsible for shipping the material (shipper).
Shipper − Retain Copy 6. Forward Copies 2, 3, 4 and 5 with the material to the MDC. (Forms should be placed in plastic packing envelope and attached to the scrap container.)
MDC − Retain Copy 4. Forward Copies 2, 3 and 5 to Headquarters Materials Management − Disposition. If a copy is required by a contract hauler reproduce locally.

Shipments To Vendor

Copy 1, Retain by the originator
Copies 2, 3 & 5 − Mail, along with last copy (4th copy) of Straight Bill of Lading, Form RF−1800−SB or SCB to headquarters:
Super visor − Tracking and Payment
2121 8th Avenue North, 12th Floor
Birmingham, Alabama 35203

Copy 4 − Place in plastic packing envelope (along with Carrier Copy of Straight Bill of Lading, Form RF−1800 SB or SC B) and attached securely to rear, right−handed inside wall of trailer. Exception: When shipping hazardous material, give to the driver.

Copy 6 − Retained by shipper

Exhibit 3 − Scrap Disposition Record
Page 2 of 2

RF−1800−SCB
(6−84)

Straight Bill Of Lading − Short Form − Original − Not Negotiable

(1) Name of Carrier | Page of

Shipper No.: (Must Be Entered On Carrier Freight Bill) | Carrier's No.:

Received, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading.

At | Date:

From: BellSouth Services, As Duly Authorized Agent For South Central Bell Telephone Company.

the property described below in apparent good order, except as noted (contents and condition of contents of packages unknown), marked consigned and

destined as indicated below which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possessio nof the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route otherwise to deliver to another carrier on the route to said destination, it is mutually agreed as to each carrier of all of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property that hereof if this is a rail or rail−water shipment or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading including those on the back thereof, set forth in the classification or atariff which governs the transportation of this shipment and the said terms and conditions are hereby agreed to by the shipper and accepted to himself and his assigns.

(2) Consigned To

Address | State | Zip | Delivery Address*

(*To be filled in only when shipper desires and governing tariffs provide for delivery thereat)

Route

Delivering Carrier | Car or Vehicle Initials | No.

Check Service Required: ☐ Door to Door ☐ Door to Depot ☐ Depot to Depot ☐ Depot to Door | Billing Indicator | Billing Authority | EXTC/FC or FRC

RC−O | RC−C | Geo. Loc. | Auth. No.

(3) RMN or REQ (For Internal Use Only: Do Not List On The Freight Bill)

(4)

NO SHIPPING UNITS	HM	Kind of Package, Description of Articles, Special Marks and Exceptions. (IF HAZARDOUS MATERIALS − USE PROPER SHIPPING NAME)	HAZARD CLASS	WEIGHT (Sub to Cor)	CLASS OR RATE

	Description	WEIGHT (Sub to Cor)	Class or Rate	No. Shipping Units	Description		
	Cable				Telephone Equipment/ Repair		
	Cable Reels, Empty				Telephone Parts		
	Central Office, Re−use				Stationery		
	PICS						

* If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight".

Subject to Section 7 of Conditions of applicable bill of lading if this shipment is to be delivered to the consignee without recourse on the consignor , the consignor shall sign the following statement.

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of Consignor)

If charges are to be prepaid, write or stamp here "To be Prepaid"

To Be Prepaid

Rec'd $ ___________ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per ___________
(The Signature here acknowledges only the amount prepaid.)

Charges advanced

$ ________________

(5) NOTE − Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

$ per

(6) This is to certify that the above−named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department Of Transportaiton

per

(7) Special Instructions:

(8) PLACARDS TENDERED: YES ☐ NO ☐

Carrier

(9) Shipper

Per | Date

(11) BILL TO: **BellSouth Services**

(10) Materials Received in Proper Condition? YES ☐ NO ☐

Permanent Post Office Address of Shipper:

It No − Specify:

SHIPPER'S COPY

Exhibit 4 − Straight Bill Of Lading − Short Form
Page 1 of 2

Straight Bill Of Lading − Short Form

Instructions

The following instructions were designed to aid in the correct completion of this bill of lading. In addition, this form meets all Department of Transportation (DOT) requirements for shipping both hazardous and non−hazardous material. The RF−1800 form should be used when shipping any material via common carrier. This bill of lading must be legible, written in ink, indelible pencil or preferably typed in English.

Section 1:

Name of Carrier	Enter contracted transporting company's name.
Page X of X	Enter page # and total pages of the entire order.
Shipper No.	Enter the nine (9) digit number obtained from the Head−quarters Transportation & Materials Distribution Routing Guide.
Carrier No.	Provide and entered by transporting company.
At	Enter address where material is being shipped from, along with the date of shipment.

Section 2:

Consigned to	Enter individual or company name where shipment is being delivered.
Address	Enter address where shipment is being delivered.
Route	The routing information must be obtained from Head−quarters Transportation & Materials Distribution Routing Guide.
Delivering Carrier	Enter name of freight line that's transporting material.
Car or Vehicle Initialds	Enter transporting vehicle I.D. initials.
No.	Enter transporting vehicle I.D. number(s).
Check Service Required	Enter check mark in appropriate box.
Mailing Indicator	Enter the appropriate billing indicator code.
Billing Authority	Enter the appropriate billing authority number.
EXTC/FC or FRC	Enter the appropriate FAS Code.
RC−O	Enter the appropriate Responsibility Code Originator
RC−C	Enter the appropriate Responsibility Code charged only if different from RC−O.
Geo. Loc.	Enter Geographical location code where material is being shipped from.
Auth. No.	Enter Authorization number of personnel authorizing shipment.
Warning:	Failure to package and ship hazardous materials/waste in accordance with guide−lines and regulations may result in a violation in which fines and/or civil and criminal penalities may be levied against not only the corporation, but the individuals responsible for the violations.

Section 3:

Space provided to list requisition or internal document numbers.

Please read all information in this section and sign or complete as appropriate NOTE: "TO BE PREPAID" must be marked through if material is being shipped collect.

Section 4:

No. Shipping Units	Enter the number of items being shipped.
HM	Place an "X" mark in this column if Hazardous Material. Enter HM items first if both HM and non−HM are being shipped.
Description	Give complete and exact description of all materials being shipped, if not already pre−printed. If shipping hazardous material, use proper shipping name.
Hazard Class	Contact T&MD and enter provided information on this line
Weight	Enter actual weight of shipment.
Class or Rate	Class or Rate information can be obtained from the Headquarters Transportation & Materials Distribution Routing Guide.
Section 5:	Provide the value of the material being shipped and sign statement if appropriate.
Section 6:	This certification statement must be signed by shipper if shipping hazardous material.
Section 7:	Special Instruction, i.e., freezables, transit privileges, damage used, etc. should be stated on this line.
Section 8:	This section must be completed by carrier's agent it must be signed and dated.
Section 9:	This section must be signed by shipper.
Section 10:	This section must be completed by carrier agent
Section 11:	Tnter the shipper's official mailing address.
Warning:	Section 11904 (aX1) of The Interstate Com−merce Act and The Elkins Act provide heavy penalities for intentionally misdescribing shipments to obtain lower freight rates and charges.

Exhibit 4 − Straight Bill Of Lading − Short Form
Page 2 of 2

RF 5338
(4−86)

Notification Of Central Office Equipment Removal

☐ BellSouth Services ☐ Southern Bell ☐ South Central Bell

Sheet ______ of ______

☐ Notification Of Disconnect ☐ Request For Disposition		Date	Issue/Serial No.
Equipment Engineer's Name	Address	Geo. Loc. Code (Area No.)	☐ Partial Removal ☐ Final Removal
City, State, Zip	Office	Telco Order No.	Vendor Order No.

Quantity Of Units/Frames	Manufacturer's Code	Equipment Description (Title)	Frame/Relay Rack Location From Which Disconnected	Date Disconnected
A	B	C	D	E

Exhibit 5 − Notification Of Central Office Equipment Removal

Exhibit 6 – Lockout

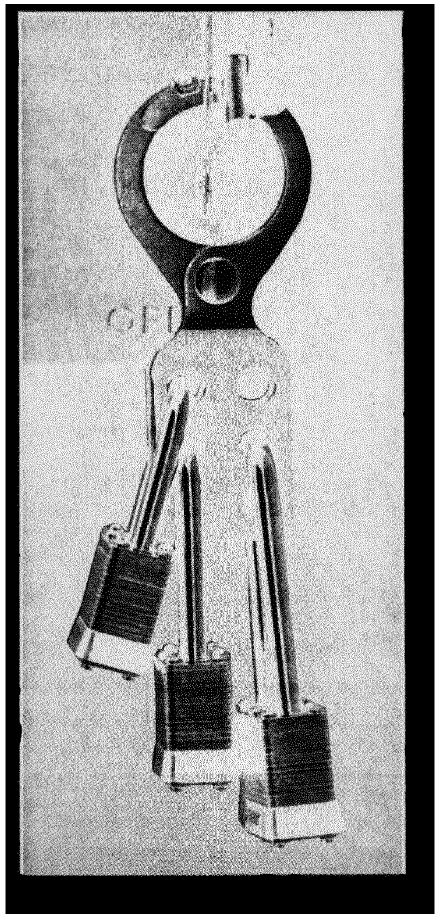

Exhibit 7 − Multi−Lock Adapter

RF 4330 [illegible]

Request For Disposition Of Surplus Material

Request Number	Date

Page ______ Of ______ Sheets

For Installer's Use	To Equipment Engineer: (Attention Of)					TELCO Requisition Number
					TELCO	TELCO Special Number
	Street Address		Town And State			App. Number
	Town And State	Office	Vendor Order Number	Vendor Spec. Number		App. Number

For TELCO Use	Area Or Serial Number	Account Number	Estimate Number	RMN Number	TR Number	Other Number	Issued By	Title
	Ship To			Street Address			Town And State	

	For Installer's Use				For Telephone Company's Use			
LN.	Quantity	Code No.	Description	Class (See Note)	Price	Unit	Amount	Account Code
	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

(See Spec. Note 8)

Tear On Dotted Line When More Than One Is Used.

To Be Filled In By The Installer

Forward Disposition Papers To: (Installer C/O TELCO)	Street Address	Town And State
Date Disposition Required	Probable Shipping Date	Direct Supervisor

Note: In Column "Class" Use Letter Symbols As Follows:
A - Removed From Existing Plant
B - Furnished In - Vendor Spec. - Not Installed
C - Furnished By TELCO (New) - Not Installed
D - Excess Ordered In Spec. Or Req.
E - Furnished By TELCO (Reused) - Not Installed
F - Defective - Replaced
G - Wrong Material Ordered
H - Wrong Material Shipped - Correctly Ordered
J - Excess - More Shipped Than Ordered
K - Other Reason (Explain On Reverse Side)

Exhibit 8 – Request for Disposition of Surplus Material

SECTION 19	Effective Date January 4, 1999	Page 1 of 1

★★

CHANGE:	DATE	REVISION LEVEL
No Changes	10/01/97	G
Entire Section	1/4/99	G

METHOD OF PROCEDURE – INSTALLATION PROCEDURES

1. General

1.1 This section covers BellSouth Telecommunications Inc. (BST) policy and procedures for preparing a written Method of Procedures (MOP). It provides the minimum requirements for a MOP. Local conditions and organizations may require additional information.

1.2 The services supplier may mechanize the BellSouth standard MOP (Exhibit 1), however, it must be kept in the same format. An electronic copy of the MOP, with the recipient's concurrence, may be transmitted via Electronic mail for the purpose of expediting MOP approvals. If a supplier sends a completed electronic copy of the MOP to a C.O. Supervisor and the MOP is acceptable, the supervisor may send an electronic acceptance back to the supplier. This electronic acceptance will suffice as the C.O. Supervisor's electronic signature accepting the MOP.

It is expected that the supplier will still place a courtesy phone call to the C.O. Supervisor to inform them of transmission of the MOP and to ensure that the recipient has access to some form of Electronic Mail. If the C.O. Supervisor does not have access to Electronic Mail, the supplier should continue to Fax/Deliver MOP's to the Supervisor.

Utilizing an electronic MOP does not eliminate the need for face to face MOP meetings if the job dictates.

1.3 A MOP must be prepared for any work activity (i.e. installation, removal, rearrangement, modification, change notice) in a central office, hut, CEV and customer premise.

2. Method of Procedures Approvals

2.1 The MOP must be initiated by the installation services supplier and approved by the local Operations Supervisor or designee prior to any work activity.

2.2 The installation services supplier shall post the approved MOP at a mutually agreed upon location, during the course of the project.

2.3 After a MOP has been adopted and approved, the installation services supplier shall not deviate from it without written approval of the BST representative(s) who approved the MOP.

2.4 A copy of the final approved MOP (e.g., all signatures on the mandatory signatures portion of the MOP) shall be provided to the appropriate signatories.

3. Types of Method of Procedures

3.1 For projects, where the scheduled completion date is greater than five days from order receipt then the BellSouth standard MOP (all nine pages) shall be used.

3.2 For projects, where the scheduled completion date is less than five days from order receipt then a three page MOP shall be required. Pages 1, 2 & 8 of the BellSouth standard MOP shall be used. Additional pages may be added if the project warrants it.

3.3 For outside plant projects (i.e., CEV, huts and customer premise), page 1 of the BellSouth standard MOP will be the minimum requirement.

3.4 All MOP must be filled out completely and accurately. If a section or page does not apply, then it shall be crossed−out and marked NA (not applicable).

4. Detailed Steps Procedures

4.1 Work operations that require a detailed MOP can be discussed with the local Operations representative. This break−down of work operations should be discussed when reviewing page 3 of the BellSouth standard MOP.

4.2 Work items that require a detailed MOP are: Upgrading circuit packs, adding new lines, change notices, power work, and field terminated BNC connectors. Detail MOP's are not limited to these work items and shall be initiated by the services supplier when any critical work is associated with a project.

4.3 The minimum number of pages for a Detailed MOP shall consist of pages 1, 2 & 8 of the BellSouth standard MOP.

4.4 Each detailed MOP must have the MOP number field (upper left−hand corner) populated.

4.5 Detailed MOP or subsequent MOP require approval.

4.6 Detailed MOP or subsequent MOP must be attached to the original (#1).

4.7 The service supplier shall provide a step−by−step description of the work that will be performed, this would include test equipment, test to be conducted and tools required to safely complete the work.

4.8 Information items outlined on page 7 of the BellSouth standard MOP must be followed, when initiating a detailed MOP.

5. Service Interruptions

5.1 If a service interruption occurs, immediate restoration of service is a joint responsibility of the services supplier and BellSouth.

5.2 In the event of a service interruption attributable to the installation work being performed, the Services Supplier shall immediately notify the NRC (identified on page 2 of the MOP) and then proceed with restoration procedures.

5.3 Any service interruption, attributable to the installation work being performed,must be reported in writing within 48 hours after resolution to the BellSouth Quality Assurance organization (identified on page 2 of the MOP).

6. Cable Penetrations

6.1 Page 7 of the BellSouth standard MOP shall be used when accessing any cable penetration. This log which is part of the posted MOP, must be updated during the course of the project.

6.2 All cable penetrations shall be closed at the end of each shift or at the completion of a cable operation, whichever occurs first or as specified in the MOP.

MOP Number _________

Method of Procedure (MOP)
For
BellSouth Telecommunications, Inc. (BST)

BST Order No:		Installation Supplier Order No:
Job Start Date:	Work Start Date:	Job Completion Date:
Installation Supplier Company/Phone:		
Subcontractor Company/Phone:		

Office CLLI code and address where job is performed:					
General description of work:					
MOP prepared by:	Title:			Date:	
Related MOP Numbers:					

Responsibility for supervision of this job is assigned to: (Type or Print)

		Job Supervisor	Work Phone	Pager	Emergency Number
	Installation Supplier				
	BellSouth Representative				

The undersigned authorize and approve the requirements stipulated in this MOP.

Installation Supplier:

____
(Name) (Title) (Date)

____
(Name) (Title) (Date)

BST Representative:

____
(Name) (Title) (Date)

____
(Name) (Title) (Date)

Circulation and Display of MOP

This job has been reviewed and agreement has been reached on the items included in this MOP. No changes may be made in this MOP without the approval of the Network Manager. **A copy of this MOP must be provided to the Network Manager (C.O. Supervisor) and be posted on the central office bulletin board or near main entrance of the central office.**

MOP Number _________

BellSouth Telecommunications Personnel

BellSouth management/non-management personnel connected with this job:

Name	Title	Responsibility	Telephone Work/Emergency

Related organizations phone numbers:

Network Reliability Center (NRC):

(AL,LA,MS) Charlotte	557-2074
(FL) Charlotte	780-2074
(TN,KY) Nashville	557-2225
(NC, SC,GA except Atlanta) Nashville	780-2225
(ATLANTA) Nashville	(404) 780-2225

BellSouth Building Service Center (BSC) and Environmental Management:

(FL,GA,NC,SC)	780-2740
(AL,KY,LA,MS,TN)	557-6194

BellSouth Quality Assurance:	(404) 927-7318
Fax	(404) 876-3514

Emergency (if other than 911)

Police:	Fire:	Ambulance:

Installation Supplier/Subcontractor

Company Name	Address	Telephone

Installation Supplier Management/non-management personnel connected with this job:

Name	Title	Responsibility	Telephone Work/Emergency

MOP Number __________

A. Work Schedules, Conditions, and Approvals:

1. Shift start times are: day _____, evening _____, and night _____, unless arranged otherwise due to job conditions. Length of a shift is ______ hours including meals and breaks.

2. Power systems/equipment and other critical work activities that could jeopardize service shall be performed during the hours of ______ and ______.

3. Any additional work efforts that will be billed to BST must receive prior approval from the Capacity Manager.

4. If evening or night shift work activity is to be started or stopped, Network Operations must be notified 72 hours in advance.

5. Supplier must notify the NRC upon entry and exiting building when performing any work activity that has the possibility of affecting equipment or customer service. (See Page 2)

B. Summary of Major Work

What will be added, removed or modified and when will installation/acceptance tests and job verification start. Check mark denotes detailed MOP or step-by-step procedures required.

	Date		Work Operation and Equipment		Detail Req'd
					☐
					☐
					☐
					☐
					☐
					☐
					☐
					☐
					☐
					☐

Other existing equipment/circuits/services that may be impacted by this job are:

Hazardous materials associated with this job are:

Handbooks, technical documents, practices, and bulletins related to this MOP are:

MOP Number ________

C. Installation Supplier Assurance

1. All work will be completed in accordance with BellSouth requirements and workmanship standards published in TR 73503, 73508, 73519, and 73564.

D. Service Interruption

1. An Emergency Restoration Plan for all equipment/systems shall be submitted to and approved by Network Operations prior to beginning any work activity on equipment in the central office.

2. Each Plan shall provide information sufficient to restore service within a prescribed time frame. Information that shall be included in the Plan is identified below.

Emergency Restoration Plan

If any service degradation, equipment failure or outage occurs, the supplier must immediately notify the local Electronic Technician, Network Reliability Center, Network Manager and Area Manager in that order. (See page 2)

Sequence for escalating problem if service cannot be restored within ____________________.

Who	Title	Work/Emergency No.

Major services/systems/equipment/circuits that can be impacted and who can help.

Services/Systems/Equipment/Circuits	Qualified Personnel	Work/Emergency No.

Sequence of actions to be taken to eliminate the problem within the restoral time frame.

1. ______
2. ______
3. ______
4. ______
5. ______
6. ______
7. ______
8. ______
9. ______
10. ______
11. ______
12. ______

MOP Number _________

3. If a service interruption occurs, immediate restoration of service is the joint responsibility of BST and installation supplier. Each shall immediately notify the other of the problem and proceed to implementing the Emergency Restoral Plan.

4. BST may suspend job until a service interruption or degradation condition is corrected.

5. All service interruption and degradation problems encountered must be reported by Installation Supplier to the BST Quality Assurance organization in writing within 24 hours after occurrence.

6. The written report shall include:
   a) Central Office Location
   b) Time and duration of occurrence
   c) Description of the equipment affected
   d) Nature of the occurrence
   e) Your name, company and contact number

E. Delivery, Storage and Staging of Equipment

1. All equipment shall be uncrated or opened by the installation supplier in a protected storage area designed by BST. A storage area key, if required, can be obtained from Network Operations. Any shortage shall be reported to ______________________________.

2. Disposal of packing materials, and all plans/tools/materials for hoisting, hauling, and protecting equipment in the central office shall be approved by Network Operations.

3. Special requirements related to storing, staging, and/or moving equipment are:

   ____
   ____
   ____
   ____

F. Testing, Observations and Job Verification

1. All persons performing work in connection with this MOP must be aware of its location and content.

2. Installation supplier must notify Network Operations at least 72 hours prior to starting any testing.

3. On a daily basis, installation supervisor must notify Network Reliability Center on telephone number _______________ when entering and leaving an unattended central office.

4. Monitoring and reacting to alarm indications related to equipment and circuits removed from service shall be performed jointly by the supplier and Network Operations and coordinated with the NRC.

5. The installation supplier shall test prior to and upon completion of this job all alarms related to equipment added/removed/modified/impacted by this MOP.

MOP Number _________

6. All fusing and fuse records for equipment added/removed/modified by this MOP shall be verified/updated upon completion of this job by installation supplier.

7. Fuses and jumpers shall be removed by Network Operations.

8. Before disconnecting or cutting any cables or wires associated with equipment, the installation supplier shall verify that they are not active, and obtain concurrence from Network Operations that the associated equipment has been made spare.

9. Special testing, observation and/or verification requirements for this job are:

____

____

____

G. Safety, Security Requirements and BellSouth Rules

1. The following requirements and rules have been discussed with and concurred by the installation supplier as initialed. Refer to appropriate notes that follow for clarification.

Initial			Note
_______	a.	wearing safety glasses/goggles, protective/clothing/hard hats	_______
_______	b.	sign-in logs/wearing badges/securing area	_______
_______	c.	location of fighting equipment and fire exits	_______
_______	d.	use of flame retardant and static free material	_______
_______	e.	existing hazards/specific warnings (from walk through)	_______
_______	f.	condition/type/size of mechanical tools	_______
_______	g.	grounding/protection/calibration for electrical tools	_______
_______	h.	identification/storage/handling/disposal of hazardous materials	_______
_______	i.	special requirements protecting equipment/facilities	_______
_______	j.	location/use of employee conveniences (rest/lunch rooms, parking)	_______
_______	k.	housekeeping requirements, rules of conduct, use of phones	_______
_______	l.	location of power plants, distributing systems, and select circuits	_______
_______	m.	Use of insulated tools and protective covers	_______

Note	Clarification
_______	______________________________
_______	______________________________
_______	______________________________
_______	______________________________
_______	______________________________

MOP Number _________

The installation supplier shall maintain a log of the cable holes opened/closed, where, and on what dates/times. **At the end of each shift, the installation supplier must secure the cable holes per TR73503**. A Cable Hole List form is provided below for that purpose.

Cable Hole List

Cable Hole and Location	Date/Time Opened	Date/Time Closed

(Attach additional sheets if required)

H. Detailed Steps

When detailed procedural information or instruction is required for this MOP, the Detailed Steps form on the next page shall be used. The form shall be reproduced and completed in sufficient quantity to provide all detail needed to do the work completely and accurately.

The Detailed Steps shall be completed as specified in the order listed. No deviations are allowed unless prior authorization is received from Network Operations.

The Detailed Steps must include the following information:

1. Installation supplier shall insure that workers are aware of and follow the safety, security and telephone company rules identified above and defined on the following note pages.

2. Indication if step is a critical work activity. Information items 5, 6, 7, and 8 are mandatory for critical work activities.

3. Who is accountable for the completion of each step -- installation supplier, BST, or both.

4. What work action is to be performed? Work action must be a verb such as add, remove, apply, route, wire, connect, operate, adjust, test, observe, verify, etc.

5. Detailed step-by-step procedures (either listed or referenced), special test equipment or tools, input materials or resource needed to complete the work activity.

6. Name of person who will perform the step(s) and on what dates and times.

7. Special standards and expected output results.

8. At what steps, or where in the detailed procedure can work be safely stopped.

9. Date when a step or work activity is actually completed.

10. Initial of installation supplier and/or BST person who completed the step or work activity.

MOP Number __________

2	3		Detailed Steps		8	9	10	
	Rep		4	Work Action and Specific Equipment Involved			Initials	
Critical	Supplier	BST	5 6 7	Detailed Step -by-Step Procedures Who Will Perform and When Expected Standards and Results	Safe Stop	Date Compl	Supplier	BST
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MOP Number _________

I. Job Closure:

1. Upon job completion, installation supplier shall complete a Confirmation of Job Completion form and send it to ____.

2. If job is rescheduled or extended, a Notification of Revised Completion Date form shall be prepared by the Installation Supplier.

3. All work left outstanding by the installation supplier and all workmanship quality defects identified by BST, must be completed or corrected by the installation supplier within _______ days of the job completion date.

4. The installation supplier shall prepare a new MOP to complete all outstanding work and correct all defects in workmanship quality if requested by BST.

5. BST shall withhold final payment to the installation supplier until authorized by _____________.

6. At job completion, the installation supplier shall remove all trash and excess material from BST premises.

7. At job completion, all documentation/materials due to BST shall be turned over to ___________ by the installation supplier.

8. The installation supplier shall inform Network Operations 72 hours in advance as to when a final job completion walk through is desired.

The confirmation of Job Completion form must be forwarded <u>no later than Monday following the completion date to the following personnel:</u>

Capacity Manager:
Network Manager (C.O. Supervisor):

SECTION 20	Effective Date January 4, 1999	Page 1 of 1

★★

CHANGE:	DATE	REVISION LEVEL
Change Section 5, General Change Paragraphs 1.3, 5.1, 5.2, 5.12, 5.18, 6.2, 6.10, 8.1, 8.12, 8.13, 8.14 and 13.5 Delete Paragraphs 4.5, 11.1, 12.2, 12.3 Correct spelling in Paragraphs 13.14 Add new paragraph 13.2 and renumber remaining paragraphs	10/01/97	G
Add to Paragraph 13.5	1/4/99	G

EQUIPMENT REMOVAL REQUIREMENTS − INSTALLATION PROCEDURES

CONTENTS

EQUIPMENT REMOVAL REQUIREMENTS − INSTALLATION PROCEDURES

1. General

1.1 This section provides generic workmanship requirements for equipment removal activities, and are intended to be used in conjunction with the job documentation and the applicable sections of this generic requirement. The workmanship requirements in this section are general guidelines and are not all inclusive or an exhaustive treatment of the subject.

1.2 Additional items, conditions, local issues, etc., may need to be discussed and agreed upon prior to the start of the removal activity.

1.3 Before any equipment is removed, from a Central Office, Hut or CEV the installer shall contact the local BST operations representative and determine if the equipment has been withdrawn from service. It is the responsibility of Network Operations to disconnect equipment from service such as removal of distributing frame cross connects, patch cords, and all power (fuses) from equipment scheduled for removal unless common to other working equipment.

1.4 Unless otherwise specified, the Installation Supplier shall utilize the Job Information Memo (or equivalent), as specified in this generic requirement, for required written responses to the Capacity Manager.

1.5 An inspection of the facilities and equipment shall be made by the Installation Supplier and the Capacity Manager prior to the start of the removal activity. The purpose of the joint inspection is to disclose any potential hazards that may jeopardize personnel safety and/or equipment operation and maintenance. In addition, this inspection shall identify any unusual work conditions, additional work effort, and/or additional or unique material items that may need to be addressed due to existing office conditions.

1.6 The appropriate sections of the generic requirement shall be reviewed prior to the start of the removal activity. Special attention shall be given to the following sections:

Section	Title
17	Administrative Information
18	General Information
19	Method of Procedures
21	Hazardous Materials/Waste

1.7 All equipment remaining in the removal area, and associated with the removal activity, shall meet requirements as specified in the job documentation and this generic requirement. The Installation Supplier shall notify the Capacity Manager, in writing, of any conditions remaining in the removal area, and associated with the removal activity, which do not meet requirements specified in the job documentation and/or this generic requirement.

2. Hazardous Material/Waste

2.1 See Section 21 of TR 73503, “Hazardous Material Disposition” for additional requirements and issues regarding hazardous material.

2.2 The installer must contact the Capacity Manager or Central Office Removal and Disposition Group (CORAD) prior to any removal work being performed on equipment that contains hazardous material.

3. Scrap Material

General

The following forms provide the installer with the procedures needed to process scrap material:

- RF−5433 COE Scrap Return Authorization
- RF−1020−B Scrap Disposition Record
- RF−1800 SCB/SB Straight Bill of Lading

Forms are exhibited in Section 17.

3.1 Material for which there is no reapplication/reuse, such as obsolete equipment,short lengths of cable, miscellaneous ironwork piece parts, is considered scrap material. If disposition instructions are not included in the Telephone Equipment Order (TEO) or specific installation instructions, the installer shall contact the Capacity Manager.

3.2 Depending on the amount of scrap involved, the installer may be referred to Materials Services for coordinating the on−site removal, sale and shipment procedures, including the removal of hazardous material. Scrap not sold directly to a contracted reclamation center shall be shipped to a Material Disposition Center (MDC).

3.3 For scrap junked locally, all hazardous material and high value scrap must be removed and processed in accordance with the Capacity Manager or CORAD Group instructions prior to disposing of the equipment.

3.4 The Installation Supplier shall contact the Capacity Manager for direction or resolution of any questions pertaining to scrap material segregation, scrap material classification, scrap material packaging, weighing of scrap material, coordination of disposition, required receipts, etc.

3.5 The Installation Supplier shall contact the appropriate Capacity Manager for direction on the required signatures on receipts, certificates, seals, bills of lading, etc.

3.6 The Installation Supplier shall obtain and pay for all applicable permits, as required, for the installation of platforms, ramps, etc. and the blocking of parking spots to load scrap material into trucks and/or trailers.

Disposition

3.7 Required scrap segregation shall be maintained during packaging and disposition. On multi−class shipments the classes shall be separated and designated.

3.8 Packaging requirements (if any) shall be specified in the MOP or the job documentation.

3.9 Adequate steps shall be taken to avoid pilferage of high value scrap material

3.10 The Installation Supplier shall coordinate with the trucking, hauling, or scrap company specified in the job documentation for disposition of the scrap material.

3.11 Truck loads of scrap material shall be weighed on a public scale whenever possible.

3.12 Except under specific written authorization from the Capacity Manager, scrap material disposed of locally on a weight basis shall not be weighed on the scrap dealer's scale.

3.13 Unless otherwise specified by the Capacity Manager, the Installation Supplier shall:

- Observe that truck loads of material arrive at public scales intact.
- Certify the unloaded weight of the truck and the weight of the scrap material.
- Assure that the weight certificates for material sold locally on a weight basis are signed by the scrap dealer or representative.
- Assure that the weight of the material shipped is shown on all copies of the shipping ticket, including the one which accompanies the material.

4. Retired In−place Material

General

This is material that is withdrawn from service and will remain in place. The installer will be instructed in the TEO or specific installation instructions as to the work involved with this equipment such as the update of fuse record books, AC power circuit breakers, fuse and alarm charts indicating Retired In Place (RIP). The Capacity Manager will provide tags.

4.1 The retired equipment shall have its cables cut in such a manner that under no circumstances could this equipment be used for service.

4.2 Retired equipment shall have a tag or mark showing "RIP", or "No Longer In Service." All office drawings must reflect the same information. Equipment shall be taken out of the index of working equipment.

4.3 The Installation Supplier shall be required to tag or stencil associated relay racks and units with the RIP designation. Information shall contain authority number, specification number, and the date of RIP.

4.4 Stenciling information on far end terminations of disconnected equipment shall be removed.

4.5 Dummy fuse(s) shall be substituted for the removed fuse(s).

4.6 Where circuit breakers are used, they shall be identified as feeding RIP equipment.

4.7 The fuse record book shall be changed to reflect equipment RIP.

4.8 Central office records (Cardex, Frame Location Records, etc.) shall be updated to reflect the RIP items.

4.9 Appropriate drain tables shall be changed, on fuse assignment drawings, to reflect current drains of equipment RIP.

4.10 Power feeders disconnected from fuse post shall be cut back and removed as far as practical or as per the job specifications. They shall be laced down with their ends covered with heat shrink caps at the RIP equipment.

4.11 Designation pins shall be removed from 70 type fuse panels for equipment RIP.

4.12 All associated power feeders shall be removed from the battery distribution fuse bay/main power bay which supply power to the RIP equipment, or at the gutter tap where the fuse supplies more than the bay being retired. After removal, the cable ends shall be covered.

4.13 Stenciling associated with power source(s), shall be removed.

4.14 Terminal strips vacated due to retired equipment should be removed.

4.15 If the job specification calls for cables to be cut at the distributing frame DSX and DCS bays, and not at the RIP equipment, then the appropriate stamping shall show "Equipment Retired in Place" or "No longer in service."

4.16 Distribution frame cross connections shall be removed as specified in the MOP.

4.17 All central office alarm and night transfer data bases shall be changed to delete the equipment retired in place. Alarm bridging or multiple leads shall be extended to working equipment to maintain office alarm integrity.

4.18 All current power supplies and/or ringing power supplies shall be properly terminated and readjusted to meet the office requirements reflecting equipment RIP.

4.19 Any frame communication line or 48 volt and ground block, that is used for testing, shall not be removed.

4.20 Any hazardous waste material in the RIP equipment shall be disposed of in accordance with the guidelines found in the BST Hazardous Materials/Waste Management Handbook, and/or Section 21 of this generic requirement.

4.21 All circuit packs in bays of retired equipment shall be returned to a designated location as outlined in the MOP, to enable the company to redeploy or sell them to regain salvage cost.

4.22 Notify the Plug–in Administrator (PIA) of any deferrable plug–in units. Plug–ins shall be removed from equipment before RIP and the PIA determine their disposition.

4.23 Frame ground shall not be disconnected to any RIP equipment. This shall be disconnected or rearranged at the time of physical removal of equipment.

5. Equipment Removed For Reuse

General

This is material removed from one office that can be reused in another office. Care shall be exercised when removing equipment for reuse to avoid damage. Equipment removed for reuse and adjacent equipment remaining in service shall be protected from dropped objects, solder splashes, wire clippings and all other debris. All components reserved for reuse should be removed in accordance with the specifications provided.

The installation supplier (removal vendor) is commissioned to identify all defects detected in equipment selected for reuse by BST. All equipment delivered to the BST Regional Reuse Warehouse is assumed to be in excellent operating condition. The removal vendor will be held responsible for any improperly removed equipment delivered to the Regional Reuse Warehouse.

5.1 The Installation Supplier shall make a visual inspection of the equipment being removed for reuse within five business days of the job start date. Each item of equipment selected by BST for reuse should be inspected to identify and document any physical defects or missing components (i.e., broken or bent terminals, damaged circuit pack back plane assemblies, missing packs or assemblies, etc.). The inspection shall be conducted prior to the equipment being tagged or shipped to the Regional Reuse Warehouse. (See Exhibit 2)

5.2 The installation supplier shall notify the Capacity Manager and Reuse Specialist immediately if equipment selected for reuse by BST is determined to be deficient in any way. Following the initial notice, the installation supplier shall provide a written summary of the defects discovered within 72 hours. This documentation is required in all cases where the equipment appears to have physical damage, defects or other conditions which could hinder installation, maintenance or working capabilities when it is placed back in service. The written documentation shall contain the installation supplier's company name, BST project number, inspection date and a detailed description of the location and condition of the defect. (See Exhibit 2)

5.3 Unless otherwise specified by the Capacity Manager, the Installation Supplier shall not ship, to the Reuse Equipment Disposition Group, equipment which appears to have physical damage or other conditions which may hinder its installation, maintenance, or working capabilities when it is to be placed back in service.

NOTE: **The Capacity Manager shall contact the Reuse Equipment Disposition Group Coordinator upon notification that a piece of equipment, which has been identified for reuse, is physically damaged or defective.**

The Reuse Equipment Disposition Group Coordinator may, based on the information received from the Capacity Manager, request that the damaged or defective equipment be scrapped.

5.4 The Installation Supplier shall utilize the proper tools, methods and procedures necessary, during all aspects of removing equipment identified for reuse, to ensure that the equipment is not damaged during the removal process. If the equipment is damaged during the removal activity, the Installation Supplier shall notify the Capacity Manager.

5.5 The Reuse Equipment Disposition Group will supply, on a one time only basis, equipment identification tags for the equipment that has been identified for reuse. The tags are to be placed on equipment frame or bay upright and on the outside of shipping cartons. The installer shall consecutively number all cartons starting with number one (#1) in accordance with items listed on the Form RF−8010, Transfer Report. Should equipment be received unmarked or incorrectly marked, the Installation Supplier will be required to go to the warehouse to identify and mark the cartons.

5.6 The Installation Supplier shall safeguard against the loss of equipment identification tags supplied by the Reuse Equipment Disposition Group. If equipment identification tags are lost, the Installation Supplier shall make arrangements for their replacement. The tags shall have an adhesive back, be 1−3/4 inch x 7 inch in size, and contain the information specified in the Material Transfer Reports.

5.7 The Installation Supplier shall sign, date, and return to the Reuse Equipment Disposition Group photo copies of all Material Transfer Reports prior to shipment of the equipment.A copy of RF−8010, Transfer Report, will be included with each shipment of equipment.

5.8 The Capacity Manager shall make arrangements for the Installation Supplier to receive the shipping and packing materials necessary for shipment of equipment to the Reuse Equipment Disposition Group.

5.9 The Installation Supplier shall utilize the packaging manufacturer’s carton assembly and packing instructions when preparing to ship equipment removed for reuse. All equipment must be packed and secured as specified by the packaging manufacturer’s instructions to safeguard against possible equipment damage during shipment.

5.10 Unmounted units shall be palletized using BST standard pallets. Cartons shall be stacked on pallets so that all tags are visible.

5.11 During shipment, equipment frames shall be adequately spaced, carefully positioned and securely fastened so as to eliminate the possibility of damage. Under no circumstances shall equipment frames be stacked one on top of the other during shipment.

Workmanship Requirements

5.12 Prior to dismantling equipment designated for reuse, the installation supplier shall verify that all electric power to the equipment has been removed. All fuses shall be removed and all filter capacitors shall be discharged prior to removal of the power feeder. Disconnect (do not cut) DC and AC power feeders and secure any loose ends to the bay framework.

5.13 When removing supplemental frames (normally associated with electromechanical and electronic switching systems), disconnect and clean all wiring terminals associated with the removed interframe cables at the basic frame. Secure the interframe cable form to the supplemental frame.

5.14 Cable forms and wire installed as part of the manufacturing process shall not be altered, cut or damaged, and shall be adequately secured and protected for shipment.

5.15 Disconnect all cables and wire and clean all wiring terminals associated with “installer run cables and wire” on equipment to be removed for reuse.

5.16 Do not disconnect or change any internally hardwired equipment options.

5.17 Installer run and terminated connectorized cables shall be disconnected (not cut). The connector end of the cable, attached to the equipment, shall be capped or protected and securely fastened to the equipment.

5.18 Circuit packs and plug−in units shall be secured in place by using 1−1/2 inch masking tape diagonally across the pack or unit and the associated housing. Circuit pack designation strips shall be secured in the down position with nylon tape. All plug−in units removed from the equipment shall be disconnected and packaged in accordance with NG250J, “ESD and Circuit Pack Protection”.

5.19 The Installation Supplier shall not remove any equipment designations indicating the equipment type, model, part number, etc., or its “Equipped With” information.

5.20 Secure all removal or hinged covers.

5.21 Secure all removal equipment designation strips with masking tape.

5.22 Remove and secure to the equipment framework any base mouldings, base covers, frame junction material, fuses, nuts, bolts, etc. that the frame or equipment is equipped with.

5.23 Secure, to each unmounted unit, all associated mounting screws.

6. Unit And Equipment Frame Removals

6.1 Prior to the equipment frame or bay removal, the Capacity Manager and the Installation Supplier shall jointly decide the methods, procedures, and tools to be used for hoisting and transporting of equipment frames within the office. The results of these decisions shall be specified in the MOP. Also, at this time, the route(s) to be used to transport equipment frames through the office to the staging area shall be identified.

6.2 Equipment frames and bays shall be removed systematically and shall be raised or lowered with hoisting equipment of an adequate size and type to safely perform the hoisting activity. Under no circumstances shall the equipment frame or bay removal process involve dropping frames or bays to the floor. Any damage incurred during the removal process shall be reported to the Reuse Specialist immediately and provide written documentation within 72 hours.

6.3 If working equipment is adjacent to the route that is to be used to transport equipment frames through the office, the working equipment shall be adequately protected as outlined in the MOP.

Workmanship Requirements

6.4 The Installation Supplier shall identify and designate or tag the equipment that is to be removed, prior to the start of the removal process. The designations or tags shall be plainly visible, placed on the front and rear of the equipment, contain the CON/job number, the Installation Supplier’s name and the date they were designated or tagged. The method of identification and designation shall be specified in the MOP.

6.5 The Installation Supplier shall remove, relocate, or add all end guards, end shields, frame work details, units/equipment, equipment frames, equipment bays, cable and wire terminations, terminal blocks, etc. as specified in the job documentation.

6.6 Equipment associated with the removal activities, and remaining in the removal area, shall meet the requirements specified in the job documentation and the appropriate sections of this generic requirement.

6.7 Scrap material associated with units/equipment and equipment frames shall be kept segregated as specified in the job documentation.

6.8 All far end connections and designations/stenciling, in the removal area and associated with removed units or equipment frames, shall be removed. All connections shall be disconnected (not cut).

6.9 When units are removed from equipment frames or bays that are going to remain in the removal area, the Installation Supplier shall cut back the associated cable or wire as close as practical to the cable bracket or wire form to which they were last secured (or as specified in the job documentation). The exposed ends shall be insulated with two layers of electrical tape and resecured to the cable bracket or wire form.

6.10 Mounting screws shall be removed with the appropriate tools. Under no circumstance, shall a hammer be used to strip out threads in order to remove mounting screws.

6.11 All wiring and connections remaining in the removal area, and associated with the equipment removal activities, shall be protected from hazardous conditions such as metal edges, excessive strain, etc. and meet the requirements specified in the job documentation and the appropriate section(s) of this generic requirement.

6.12 Central office ground shall be extended, as specified in the job documentation, to maintain continuity of the equipment frame grounding system when equipment frames are removed from an equipment line−up.

6.13 Jack boxes, jack mountings, terminal blocks, etc., shall be removed from distributing frames when the associated equipment has been removed, unless otherwise specified in the job documentation.

6.14 Designations and stamping associated with removed circuits or equipment shall be removed from terminal blocks, unless otherwise specified in the job documentation.

6.15 All remaining anchor bolts associated with the removal activity shall not protrude above floor (e.g., concrete slab) level.

6.16 Equipment line−ups associated with the removal activity shall have the endguards restenciled or blank designation cards inserted to indicate the equipment frames or bays remaining in the equipment line−up.

7. Equipment Protection

7.1 The Installation Supplier shall provide adequate protection for working equipment in the vicinity of the removal activity.

7.2 At the completion of the removal activity, all associated equipment protection shall be removed.

7.3 All materials used for equipment protection shall be either noncombustible or treated with an approved fire retardant material.

7.4 The following examples of equipment protection should be viewed as examples only. These are not the only cases where protection is required. These examples are:

- Fiber board or plywood sheets treated with an approved flame retardant shall be used to protect the floors and equipment from physical damage.
- Static resistant and fire retardant plastic shall be used to protect working equipment from dust and debris.
- Temporary walls or partitions may be required to protect sensitive working equipment.
- Use of pipe stanchions for temporary support of auxiliary framing.

7.5 All cables shall be removed from distribution frames and DSX bays. All fiber optic jumpers are to be mined from the fiber cable protection pathway. "UNDER NO CIRCUMSTANCES" shall the fiber optic jumper be cut by the installation supplier unless written authorization from Common Systems Capacity Management is procured. All removed fiber optic jumpers are to be packaged individually and labeled (i.e., SC to ST − length 30 feet). In those instances where the fiber optic jumper can not be easily removed from the pathway, the fiber optic jumper is to be left in place and labeled at both ends. It is the responsibility of the installation supplier to verify that NO ALARMS are present after disconnecting the fiber optic jumpers from the equipment of LGX frame.

8. Tools And Supplies

8.1 Heavy equipment or demolition devices such as tractors, fork lifts, jack hammers, etc. shall not be used for removal purposes without prior written approval from Network Operations. The Installation Supplier shall identify and detail the intended use of any heavy equipment or demolition devices in an approved MOP.

8.2 Gas and arc type welding or cutting devices shall not be used under any circumstances for any part of the removal activity.

8.3 Internal combustion engines used to operate heavy equipment, demolition devices, portable compressors, generators, hydraulic equipment, etc. shall not be operated within a central office environment.

Portable Ladders

8.4 Portable ladders and their use shall comply with all applicable federal, state, and local safety regulations and codes.

8.5 Portable ladders, used or transported in the vicinity of working equipment or electrical circuits, shall be constructed of an electrically non−conductive material to prevent the possibility they may come in contact with working equipment.

Scaffolds

8.6 Scaffolds and their use shall comply with all applicable federal, state, and local laws, and all appropriate regulations and codes.

8.7 Metal scaffolding shall not be used in the vicinity of working equipment when there is the possibility of it contacting working equipment or electrical circuits.

8.8 The conditions and environment, where scaffolding may be used for removal operations, shall be outlined in the MOP and be approved by the appropriate Capacity Manager.

Hoisting Centers

8.9 The location of hoisting centers and the hoisting procedures to be used for the removal activity shall be outlined in the MOP and be approved by the appropriate Capacity Manager.

8.10 Hoisting equipment and the associated rigging shall be in good working condition and of the proper size and type for the equipment which is to be hoisted.

8.11 Hoisting equipment shall not be left unattended while supporting a load.

Packing: Equipment Containers and Scrap Bins

8.12 Vendors that provide the packaging utilized to contain equipment selected for reuse shall be specified by the Regional Reuse Group. Utilizing the vendor specified, the installation supplier shall provide the packing material required to protect the equipment removed.

8.13 Package tilt indicators shall be applied to the equipment frame and on the outside of each container. Serialized tilt indicators (such as **EXACTilt**) shall be utilized on all packages. The serial number shall be recorded on the transfer report next to the item of inventory associated with the tilt indicator.

8.14 The conditions, environment and type of scrap material containers which may be used for the removal activity shall be outlined in the MOP and be approved by the appropriate Capacity Manager. Scrap material containers and their use shall comply with all applicable federal, state and local safety and fire regulations and codes. Scrap containers shall not be located in areas where they would be a potential hazard.

8.15 Scrap material bins and containers shall be removed from the building at the end of each working day or placed in a suitable location, as authorized by the Capacity Manager and outlined in an approved MOP.

8.16 Corrugated fiberboard pallet boxes (treated with an approved flame retardant) shall be equipped with covers (masonite hardboard or equivalent) and kept closed when not in use.

9. Equipment Alarms

9.1 Refer to Section #18 Alarms

10. Grounding

10.1 Central office ground shall be extended to all equipment frames, bays, equipment bays, main distribution frames, protector distribution frames, etc. per the job documentation and the appropriate section(s) of this generic requirement.

10.2 All equipment frames and bays remaining in the removal area shall meet the requirements specified in the job documentation and this generic requirement.

10.3 When there is equipment utilizing an isolated ground system in the vicinity of the removal activity, precautions shall be taken to avoid the possibility of accidentally violating the isolated ground plane

11. AC Circuit And Conduit Removal

11.1 Only circuits specified in the job documentation shall be removed or turned off. The Installation Supplier shall contact the appropriate Capacity Manager if any additional circuits need to be removed or turned off.

11.2 When work is to be performed on live AC circuits or ringing supply circuits of 100 volts or higher, fuses shall be removed or switches opened wherever it is practical to do so without causing a service interruption.

11.3 Frame and aisle lighting and appliance outlet circuits are not essential for maintaining equipment operation. If possible, these circuits shall never be worked on while live. This applies to other AC circuits which do not furnish power to working equipment.

11.4 The leads associated with removed AC circuits shall be removed from their assigned terminals and the wire ends insulated.

11.5 Equipment designations and fuse capacity stamping, associated with removed AC circuits, shall be removed.

11.6 Circuit identification cards inside of AC service cabinets shall be updated

11.7 Conduit remaining in the removal area shall be run and supported as specified in the job documentation, be securely fastened, and all unterminated ends closed.

11.8 Conduit and conduit supports associated with removed equipment shall be removed from its served point (far end) back to the distribution point, unless otherwise specified in the job documentation.

11.9 Open but unused knockouts, in AC service cabinets, conduit junction boxes, etc., remaining in the removal area shall be closed.

11.10 Conduit junction boxes and fittings remaining in the removal area shall be equipped with covers.

11.11 Any AC wire nut connections remaining in the removal area shall be reconnected in an enclosed location, such as a conduit junction box.

Appliance Outlets, Lights, Switches And Risers

11.12 The Installation Supplier shall notify the Capacity Manager, in writing, of any appliance outlets, lights, switches, or risers remaining in the removal area and associated with the removal activity, which do not meet requirements as specified in the National Electrical Code, job documentation, or the appropriate section(s) of this generic requirement.

11.13 All appliance outlets, lights, switches, and risers shall be removed or relocated per the job documentation and the appropriate section(s) of this generic requirement.

11.14 All appliance outlets, lights, switches, and risers remaining in the removal area, and associated with the removal activity, shall be properly wired per the job documentation.

11.15 All working appliance outlets remaining in the removal area, and associated with the removal activity, shall have the correct polarity and be equipped with a continuous fault return ground.

11.16 All switches and switch risers, remaining in the removal area and associated with the removal activity, which have had their associated end guards removed, shall be relocated to an appropriate switch location, (e.g., a column, a wall, etc.) or be rewired to another switch. Switches and switch risers shall not be placed on or be secured to overhead ironwork, such as auxiliary framing, cable rack, bracing, etc.

11.17 All armored cable connections, remaining in the removal area and associated with the removal activity, shall be tight.

12. DC Power Circuit And Fuse Removal

12.1 The Installation Supplier shall contact the Capacity Manager as soon as possible if any additional fuses need to be removed, or any discrepancies exist between the job documentation and the actual configuration of the office.

12.2 The Installation Supplier shall place a warning tag on fuse clips or switches when electrical potential is removed in order to work on the circuit. Each circuit shall be identified "Warning − Person Working on Circuit," and have the Installation Supplier's company name and the job number that the contractor is working on.

12.3 Adequate protection and insulation shall be placed on tools, bus bars, framework, etc. when working in or on live MPBs, BDFBs, ADCs, etc. to prevent accidental short circuits.

12.4 When a fuse and associated power circuit are removed from a MPB, BDFB or fuse bay, the associated feeders(cable or wires) shall be disconnected from the terminals and/or buses, cut back to the cable form(or specified in the engineering specification), have the exposed ends insulated and secured to the cable form.

12.5 When a fuse and associated power circuit is to be removed from a MPB, BDFB, or ADC the associated alarm fuse shall be removed.

12.6 Equipment designations and fuse capacity stamping shall be removed from associated fuse and power circuit.

12.7 Dummy fuses shall be installed at all vacant fuse positions.

12.8 Fuse capacity designation pins shall be removed.

13. Cable Removal And Mining

13.1 For the purpose of this section the following definitions shall apply:

(1) “cable mining” means, that a cable(s) is removed in its entirety(from the originating to the terminating point). This work operation will require the physical displacement of adjacent cables.

(2) “cable removal” means, removing the cable as far as possible, without going into a “cable mining” operation. For example; removing cable from a cable rack where it is on the top layer or that it requires minimal rearrangement of adjacent cables.

13.2 When the installation supplier is removing miscellaneous equipment bays, the installer should remove the cable as far as possible, without going into a “cable mining” operation.

13.3 All applicable safety precautions shall be adhered to during cable removal and mining operations. Sharp objects shall not be used to separate cable bundles. Tools such as picks, probes or wedges shall be taped or covered with heat shrink tubing to prevent damage to cable sheath.

13.4 The Installation Supplier shall be equipped with a cable splicing kit capable of splicing 25 pairs of 22, 24, or 26 gauge conductors at one time. The installation supplier shall be qualified to repair lightguide equipment in the event of service interruption.

13.5 All cable shall be removed from distribution frames and DSX bays. All fiber optic jumpers are to be mined from the fiber cable protection pathway. “UNDER NO CIRCUMSTANCES” shall the fiber optic jumper be cut by the installation supplier unless written authorization from Common Systems Capacity Management is procured. All removed fiber optic jumpers are to be packaged individually and labeled (i.e., SC to ST − length 30 feet). In those instances where the fiber optic jumper can not be easily removed from the pathway, the fiber optic jumper is to be left in place and labeled at both ends. It is the responsibility of the installation supplier to verify that NO ALARMS are present after disconnecting the fiber optic jumpers from the equipment or LGX frame.

Cable Cutting Procedures And Precautions

13.6 Power cable shall be metered at the equipment end, to ensure that voltage is not present, prior to cutting.

13.7 During cable removal or mining operations, cable ends shall be passed through the protective ring of cable cutting tools when they are to be cut.

13.8 Under no circumstances, shall a loop of cable or wire be inserted through the protective ring of a cable cutting tool to be cut.

13.9 Under no circumstances, shall cable or wire be cut while the cable is dressed on a cable rack.

13.10 All cables to be cut, during a cable removal or mining operation, shall have their ends hanging off the cable rack and all cuts shall be made a minimum of 18 inches below or to the side of the cable rack. Cut sections of cable shall be carefully placed in scrap cable containers or bags.

13.11 Caution and adequate equipment protection shall be used when cutting and removing armored or BX type cable in the area of working equipment.

13.12 When loosening cable or wire for removal(cutting stitches or removing cable clips), while on the cable rack, the Installation Supplier shall exercise caution and utilize the appropriate tools to ensure that adjacent cables, which may be live, are not damaged or cut.

13.13 The exposed ends of dead cables or wire remaining on the cable rack shall be insulated with two layers of electrical tape or a heat shrink cap when they are visible from the floor.

13.14 Exposed ends or sections of dead power cable shall always be protected with a heat shrink cap. Regardless, of their visibility from the floor.

13.15 All unused lengths of cord and cable clips associated with removed cables and remaining in the removal or mining area shall be removed from the cable racks.

Cable Cutting Tool Requirements

13.16 Cable cutting tools shall be equipped with a protective ring during cable removal or mining operations. This is intended to prevent the cutting of cables unless the cable ends are passed through the protective ring. (See Exhibit 1 for an example of protective rings.)

13.17 The inside diameter of a protective ring shall not exceed the distance between the inside edges of the cable cutting jaws when the cable cutting tool is opened for normal cutting purposes. The intent of this specification is to limit the size of protective rings, thus reducing the possibility of cutting loops of cables which may accidentally enter large diameter protective rings.

13.18 The protective ring shall be constructed so that its shape cannot be easily altered by hand.

14. Mechanical And Crimp Type Power Connections

14.1 All power connections shall meet the requirements specified in the job documentation and Section 23 of this generic requirement.

14.2 When a mechanical power connector is removed from a power cable, thereby exposing a section of the conductor, the insulation from a similar size cable or multiple layers of rubber tape shall be built up around the conductor to a point where it is even with the outer layer of the existing cable sheath. Then the outer sheath shall be wrapped with two half–lapped layers of electrical tape.

14.3 When a cable is cut off from one side of a parallel connector, thereby exposing a portion of the end of the cable or parallel connector, sheet fiber and/or two layers of electrical tape shall be installed on the inside of the connector cover so as to effectively insulate the exposed portion.

14.4 When a cable from one side of a mechanical parallel connector is removed and the connector is to remain in place, a dummy cable of the proper size shall be added to evenly distribute the clamping pressure.

15. Terminal Block And Circuit Removal

15.1 The Installation Supplier shall identify and designate or tag the terminal blocks that are to be removed prior to the start of the removal process. The designations or tags shall be plainly visible, contain the TEO number, the Installation Supplier's name, and the date they were designated or tagged. The method of identification and designation shall be specified in the MOP.

15.2 Unless otherwise specified in the job documentation, terminal strips/blocks vacated due to circuit or equipment removal shall be removed from all distributing frames.

15.3 Circuit designations/stenciling and connections, associated with removed circuits or equipment, shall be removed from terminal blocks which are to remain.

15.4 Wire−wrapped connections, associated with circuits which have been removed from equipment which is going to remain in the removal area, shall be unwrapped, cut back to the existing wire form and have the wire ends insulated, unless circuit conditions or the job documentation specifies otherwise.

15.5 The Installation Supplier shall notify the Capacity Manager, in writing, of all locations where wire−wrapped connections associated with the removal activity have not been unwrapped and removed.

16. Rolling Ladders

16.1 Rolling ladders and ladder track shall be removed or relocated as specified in the job documentation.

16.2 The Installation Supplier shall notify the Capacity Manager, in writing, of any rolling ladders or ladder track remaining in the removal area, and associated with the removal activity, which do not meet the requirements specified in the job documentation and Section 25 of this generic requirement.

16.3 When applicable, the Installation Supplier shall contact the Capacity Manager for direction on the disposition of rolling ladders.

16.4 Rolling ladders shall not be used when dismantling overhead ironwork.

17. Overhead Ironwork And Bracing

17.1 Prior to removing equipment frames which support auxiliary framing and cable racks, the Installation Supplier shall install adequate temporary support. Normally this requires installing additional threaded rods and/or stanchions.

17.2 When applicable, auxiliary framing and cable rack shall be permanently resupported prior to the removal of equipment frames.

17.3 When the removal activity involves work operations that are to be performed above the top of the equipment frame, the Installation Supplier shall adequately identify and mark the area of activity with warning signs "HARD HAT AREA − HARD HATS REQUIRED".

17.4 When the job documentation specifies the overhead ironwork is to be removed, the Installation Supplier shall remove the rolling ladders prior to dismantling or removing the overhead ironwork.

17.5 Overhead ironwork shall be removed systematically and in sections or portions which can be easily and safely handled by the Installation Supplier's personnel. Under no circumstances shall the overhead ironwork removal process involve dropping material to the floor.

Workmanship Requirements

17.6 Auxiliary framing and bracing arrangements, remaining in the removal area and associated with the removal activity, shall meet support and bracing requirements specified in the job documentation and Section 25 of this generic requirement.

18. Battery Removal

18.1 The Installation Supplier must contact the Capacity Manager for direction before any activity relating to hazardous material waste is started. The BST shall adhere to guidelines and procedures as documented in their Hazardous Material Waste Management Handbook. The Capacity Manager shall obtain from the Environmental Management Group or Procurement Group the names of hazardous material/waste contractors who have been prequalified to handle hazardous waste.

18.2 For additional information associated with batteries, refer to the job documentation and Section 27 of this generic requirement.

18.3 The Installation Supplier shall not begin any battery removal activity without an approved and posted (on job site) detailed MOP.

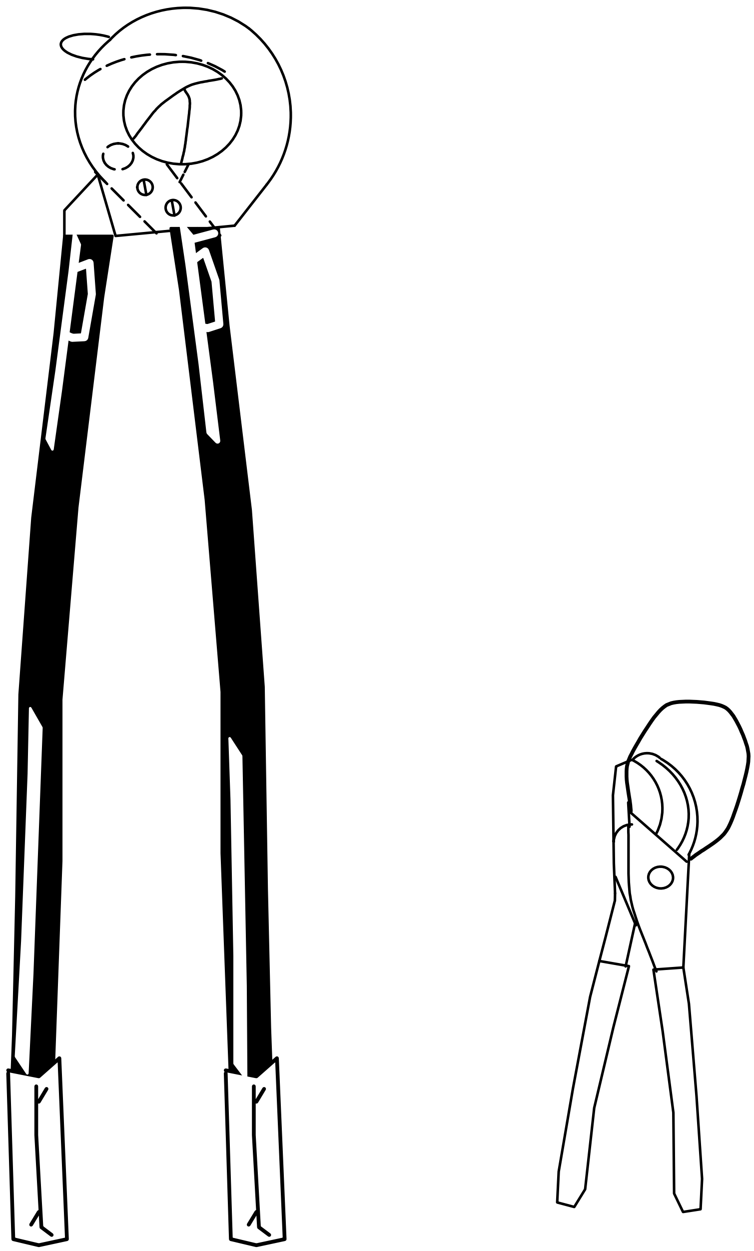


EXHIBIT 1 − Ringed Cable Cutters

RCOE Checklist − Reused Equipment Installations

ITEM	CHECK BOX	Date Completed	Description of the Activity
1			Carefully remove and preserve all packaging associated with BST provided material.
			Inspect all tilt indicators *attached to the outside of cartons* and note any indication of container tilt on the transfer report.
			Disassemble all large shipping containers at the CEntral Office location and reconfigure the package for return shipment.
			Return disassembled containers to the regional warehouse.
			Inspect all tilt indicators *attached to the equipment* and note any indication of equipment tilt on the transfer report.
2			Complete inspection of all items provided by BST Reuse within five business days of job start.
			Timely completion of the inspection: Was the inspection of BST provided material completed within five Business days of the job start date? Yes or No
			Verify all components appearing on the transfer report are present within the shipment.
			Review all equipment specified on the Transfer Report − Engineering (Form RF 8010) to ensure the physical equipment matches the items on list form.
			Identify and document all defects and notify the Regional Reuse Group.
3			Provide "information" copies of all JIMs related to the material condition of BST provided equipment to the Regional Reuse Group.
4			Notify engineering vendor of any missing cabling or subassemblies.

EXHIBIT 2 − RCOE Checklist
Reused Equipment Installations
Page 1 of 5

RCOE Checklist − Reused Equipment Removals

ITEM	CHECK BOX	Date Completed	Description of the Activity
1			Contact BST Operations and ensure equipment is out of service.
2			Complete inspection of facilities and equipment to disclose potential hazards to personnel, equipment operation or maintenance.
			Identify unusual working conditions
			Identify any unusual facility or equipment arrangements that would require additional work effort
			Specify any unique material items required to complete the work
3			Identify all items reserved for reuse and validate accurate descriptions on the documents provided.
4			Provide protection for the equipment reserved for reuse against dropped objects, solder splashes, wire clippings and other debris.
5			Within five business days of the job start date, inspect all equipment for defects, including but not limited to:
			signs of pilferage (loose screws, items in disrepair)
			missing back planes
			missing circuit cards and other components
			physical damage (bent pins, broken wires and bent or broken terminals)
6			Notify Capacity Management and Regional Reuse of all defects and provide written documentation within 72 hours.
7			Obtain an approved MOP outlining any required interruption in AC or DC power.
8			Remove all fuses and discharge all filter capacitors.
9			Provide protection for working equipment in the vicinity.
10			Disconnect (do not cut) all AC and DC Power feeders. Secure loose ends to the bay framework.
11			Secure all modular components:
			circuit packs
			plug−in units

EXHIBIT 2 − RCOE Checklist
Reused Equipment Removals (1 of 2)
Page 2 of 5

RCOE Checklist − Reused Equipment Removals Continued

ITEM	CHECK BOX	Date Completed	Description of the Activity
12			Secure all peripheral assemblies, including but not limited to:
			end guards
			end shields
			cables
			doors
			terminal blocks
			wire terminations
13			Attach **EXACTilt**© tilt indicator directly to all major bays and frames.
			Record the serial number from the tilt indicator onto the transfer report next to the associated equipment description on the report
14			Secure the equipment within the appropriate packaging. Notify Capacity Management and Regional Reuse of any additional packaging requirements.
15			Attach **EXACTilt**© tilt indicator to the outside of all major bay and frame cartons.
			Record the serial number from the tilt indicator onto the transfer report next to the associated equipment description.

EXHIBIT 2 − RCOE Checklist
Reused Equipment Removals (2 of 2)
Page 3 of 5

Reused Central Office Equipment (RCOE) Summary of Equipment − Quality Check List			
Project Data			
Office Location (CLLI):		Removal Authority Number:	
Reuse Specialist:		Removal Project Number:	
Removal Vendor:		Site Supervisor:	
PROJECT PHASE: Pre−Removal Inspection (BST) Post−Removal Site Inspection (BST)		Vendor Inspection Warehouse Inspection	

Equipment Data			
Aisle	**Equipment Designation**	**Equipment Description** (Provide a general description of the equipment, including the basic unit and part description).	**Equipment Condition** (Note: Attach exception form to describe any defects detected).
			Good Exception
			Good Exception
			Good Exception
			Good Exception
			Good Exception
			Good Exception
			Good Exception
			Good Exception
			Good Exception
			Good Exception
			Good Exception
			Good Exception

EXHIBIT 2 − RCOE Checklist
Summary of Equipment − Quality Check List
Page 4 of 5

Reused Central Office Equipment (RCOE)

Summary of Equipment − Exception Report

Project Number:	Office Location:	Site Supervisor:
Aisle:	Equipment Designation:	Equipment Description:

Defect Type	Defect Description	Defect Type	Defect Description
1	Missing Equipment Components	2	Missing Back Plane Assemblies
3	Missing Circuit Packs	4	Missing Guard Rails
5	Missing End Rails	6	Bent, Dented or Scraped Frame
7	Broken Terminals	8	Bent Terminals
9	Missing Fuses or Fuse Caps	10	Paddle Board Cables Present
11	Power Cables Cut Too Short	12	Wire Scrap Present on Frame
13	Trash In Equipment Container	14	Trash at Site of Removal
15	Internal Frame Wiring Damage	16	Indications of Electrical Damage
17	Connectorized	18	Other (Explain in Space Below)

Instructions:

One copy of this form should be completed for each exception item noted in "Summary of Equipment − Quality Check List".

This form and the Summary Page should be submitted to the Reuse Specialist within 5 business days of the job start date.

If any defects are noted, the Reuse Specialist should be notified (by telephone) immediately.

Following the initial notice, the removal vendor shall provide the Reuse Specialist with written documentation summarizing the results of the inspection of all components reserved for reuse. This notification is required within the first five business days of the job start date. If defects are noted, the written documentation is required within 72 hours from when the defect was identified.

EXHIBIT 2 − RCOE Checklist
Summary of Equipment − Exception Report
Page 5 of 5

HAZARDOUS MATERIAL DISPOSITION PROCEDURES

CONTENTS

HAZARDOUS MATERIAL DISPOSITION PROCEDURES

1. General

1.1 Description − This section establishes operating procedures for BellSouth Telecommunications (BST) and Installation Suppliers while performing services on BST premises as they relate to the removal and disposition of hazardous material from company locations to conform with corporate policy. It is intended to unify those practices already in existence and outline material disposition functions which will provide a smooth efficient flow of events from initial request for services to job completion. The information contained herein is considered minimum requirements to administer the disposition of hazardous material.

1.2 Staff Support − The Material Services organization within the Procurement, Property and Services Management Department (PPSM) is responsible for the administration, coordination and issuance of the Hazardous Materials Disposition Procedures.

1.3 References − Listed below are BellSouth Practices (BSPs) covering precise requirements. All BST employees responsible for the disposition of hazardous material should familiarize themselves with these BSPs to ensure conformance with BellSouth Standards.

DOCUMENT NUMBER	DOCUMENT TITLE
GU−BTEN−001BT	Chapter 4 − Hazardous Material/Waste Management
010−170−001BS	Hazardous Communication “Right to Know”
622−395−301SV	Main Conduit − Asbestos Conduit Repair
744−200−001BT	Department of Transportation Shipping Papers − Motor Carriers
740−200−002SV	Safety Precautions
746−300−003SV	Batteries (wet)
746−300−004SV	Mercury Relays & Switches
746−300−006SV	Polychlorinated Biphenyl (PCB) Capacitors/Lighting Ballasts
746−300−013SV	Batteries − SLC (wet)

DOCUMENT NUMBER	DOCUMENT TITLE
Not Assigned	Cold Cathode Tubes (The BSP Section(s) covering Cold Cathode Tubes is under development). Reference data is covered in BellSouth Services "SAFETY AWARENESS PACKAGE FOR COLD CATHODE TUBES" Publication number 74883.
746−300−902BS	Respirator Protection (Disposition and Handling of Asbestos)
748−400−002BT	Handling Scrap Materials − Field Locations
748−400−007BT	Disposal of Material from General Stock − Accounts 1220.1810 and 1220.1830
790−100−700BT	Activity Reporting (Network)

2. Terms And Definitions

2.1 Terms and Definitions − The acronyms and definitions used throughout this practice are identified in the chart that follows:

TERM	DEFINITION
BSC	Building Service Center. Telephone numbers are 557−6194 (SCB) or 780−2740 (SB).
CAA	Clean Air Act
CFR	Code of Federal Regulation
COE	Central Office Equipment
CORAD	Central Office Removal and Disposition
DOT	Department of Transportation
AEM	Area Environmental Manager
EPA	Environmental Protection Agency
Generator	Any location that produces or causes any substance to be produced that would be defined as a hazardous material/wastes.

TERM	DEFINITION
Hazardous Material	A substance or material, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety and property, when transported in commerce.
Hazardous Substance	A material, including its mixtures and solutions, that is listed in 49 CFR 172.101, and is in a quantity which equals or exceeds the reportable quantity (RQ) listed in 49 CFR 171.101 Appendix, and will be transported in commerce.
Hazardous Waste	A material that is a Resource Conservation and Recovery Act solid waste, and is listed in 40 CFR, Part 261, Subpart D, or exhibits any characteristics specified in 40 CFR, Part 261, Subpart C.
HMD	Hazardous Materials Disposition is the group within Material Services that coordinates the disposition of hazardous materials/ wastes for BST.
Markings	A descriptive name, identification number, instruction, caution, weight, specification, or “UN”/”NA” mark, or combination thereof, required on outer packaging of hazardous materials.
MDC	Material Disposition Center
Microcurie	A measurement of radiation as defined in 10 CFR, Part 20.
MSDS	Material Safety Data Sheet
OSHA	Occupational Safety and Health Act
Overpack	An enclosure that is used to provide protection or convenience in handling of a package or to consolidate two or more packages.
Packing Group	A grouping according to the degree of danger presented by hazardous materials. Packing Group I (PG I) indicates great danger; Packing Group II (PG II) indicates medium danger; Packing Group III (PG III) indicates minor danger.
RT	Remote Transmitter
RCRA	Resource Conservation and Recovery Act

3. Central Office Equipment Removal

3.1 Coordination/Contacts for COE Removal − When hazardous materials are purged from equipment they may be a hazardous waste as defined by federal, state and local environmental regulations, and require special handling and disposal procedures. Operations and vendor personnel involved with removal of equipment should contact Material Services − Hazardous Material/Miscellaneous Services and/or the Capacity Manager prior to removing equipment that contains hazardous material.

The contacts for Material Services−Hazardous Material/Miscellaneous Services Groups are listed below:

If you are in...	Contact
Kentucky Tennessee Alabama Mississippi Louisiana	557−9164
Florida Georgia N. Carolina S. Carolina	780−2740

3.2 Material Services as Removal Contractor − When Material Services is chosen as the removal contractor, a Central Office Equipment Engineer prepares and mails a Work Order, Form RF−1021 (Exhibit 1) to Material Services − Central Office Removal and Disposition Group (CORAD). The CORAD Group will provide the following services (as needed):

- notification of AEM, via an activity report, of future hazardous material/waste removal operation,
- preparation of paperwork, such as RF−1800, Bill of Lading (Exhibit 2) and RF−1020B, Scrap Disposition Record (Exhibit 3),
- removal and disposition labor (if required),
- packing materials, and
- hazardous material markings and labels that identify material classification.

The CORAD Group provides to the involved network engineer a listing of jobs scheduled to coincide with the contracted Central Office removal activities to facilitate coordination of all work. In addition, CORAD insures that instructions, packing material, markings/labels and miscellaneous supplies are delivered to the job site before the start date.

NOTE: **If hazardous wastes are shipped, the required shipping documents (Exhibit 4) are provided by HMD.**

3.3 Completion of Job − Upon completion of the job, the CORAD Group reports, via the Environmental Activity Report, to the appropriate state AEM that the job is closed.

4. Disposition Of Central Office Large Wet Electric Storage Batteries And Battery Electrolyte

4.1 **General −** Since batteries and battery electrolyte represent a potential source of environmental contamination, special control measures are necessary to ensure that the hazardous and toxic materials (the electrolyte and sludges) contained in batteries are properly treated by approved vendors who recycle or otherwise treat batteries in an appropriate manner.

4.2 **Wet Electric Storage Batteries −** BST uses wet electric storage batteries to provide reserve power in numerous facilities. These batteries vary in size, shape and weight, depending on usage and manufacturer. The largest batteries weigh approximately 1750 pounds and contains several gallons of electrolyte (battery fluid). There are two types of solutions used as electrolyte. The most common contains sulfuric acid (lead acid); however, some batteries, such as nickel−cadmium (NiCad) contain an alkaline solution.

4.3 **Acid and Alkali Batteries −** Both types of batteries (acid or alkali) are a hazardous material because of the corrosive nature of the electrolyte. Management controls are required to ensure personnel safety when working with batteries or battery electrolyte. Under certain conditions, (i.e., spills, or surplus quantities of containerized electrolyte), the electrolyte may be considered a hazardous waste.

4.4 Disposition

The CORAD is responsible for the disposition of lead acid batteries as requested by Network. Listed below are the CORAD disposition activities for lead acid batteries.

- Complete the required internal/DOT shipping documents, i.e.:
  - The RF−1021, Work Order
  - The RF−1020B, Scrap Disposition Record
  - The RF−1800, Straight Bill of Lading
- Schedule the shipment with the recycling facility, transporter, and client.
- Ensure closed−loop tracking of the shipping documents, manual and mechanized system.
- Prepare and submit invoice/voucher for payment.

NOTE: The BSC request serves as the AEM activity report.

5. Safety Precautions

5.1 **Handling Electrolyte During Removal −** To prevent electrolyte from splashing or leaking during removal, handling and/or transporting, all filler holes and vent holes must be sealed. Shipping caps from the replacement batteries or “duct” tape may be used to seal the battery. (If tape is used, make two (2) pin−sized holes in the tape, above the filler hole.)

CAUTION: Do not make an air tight seal. Batteries must be ventilated to prevent the accumulation of explosive mixtures of hydrogen and oxygen gases.

5.2 **Explosion Proof Vent Caps −** Explosion proof vent caps do not prevent electrolyte from leaking, therefore all explosion proof type vent caps must be removed before sealing the battery for shipment. Explosion−proof vent caps may be neutralized in a base solution, rinsed with water, placed in plastic bags and disposed of locally, or shipped with the battery for disposal without treatment.

5.3 **Terminal Posts −** Terminal posts should be protected against short circuits with electrical tape, rubber or plastic caps, or other protective packaging.

5.4 **Shipping Disconnected Batteries −** Disconnected batteries with apparently sound casings may sometimes develop cracks or leaks if left standing on battery racks or floors. This condition results from the decomposition of battery plates, or stress and strains caused by lifting and handling. Shipping arrangements should be made to coincide with the battery disconnect and removal operation, or as soon as practical thereafter.

5.5 **Ventilation of Batteries −** Explosive gases may be present in or around each battery. Ensure that there is sufficient ventilation to prevent the possibility of creating an explosive atmosphere. Extreme care should be exercised when working around batteries to prevent the generation of sparks or other sources of ignition.

5.6 **Open Flames, Smoking and Electrical Arcs −** Open flames, electrical arcs, smoking, etc., are not to be permitted in or around the work area. Only insulated tools are to be used on or in close proximity to charged battery terminal posts, exposed bales or bus bars. Tools wrapped with electrical tape are not considered as properly insulated and shall not be used.

5.7 **Personnel Working With or Observing Battery Removal −** For personal protection and protection of clothing, all personnel working with or observing the battery removal should wear splash proof chemical safety goggles, acid resistant gloves, and acid resistant aprons.

CAUTION: If battery electrolyte should make contact with eyes or face, flush the affected area with quantities of plain water for 15 minutes. If an eyewash station capable of delivering 15 minutes of continuous flow is not available, an eye wash kit with buffered solution will serve as first aid. Regardless of the type of flush used, obtain medical attention immediately.

6. Electrolyte Removal And Spill Clean Up

6.1 **Electrolyte Removal −** If it is determined that the electrolyte must be removed, ensure that there is sufficient ventilation to prevent the possibility of creating a corrosive or explosive atmosphere. Battery electrolyte should not be removed (pumped) unless:

- the battery is leaking,
- the casing is in such poor physical condition that it is likely to begin leaking during removal, temporary storage or transportation, or
- handling of the battery will pose an unreasonable risk to involved personnel.

6.2 Cleaning up Spilled Electrolyte − Appropriate equipment and supplies (neutralizing materials, non−combustible absorbent material, brooms, approved containers, gloves, rubber boots, goggles, etc.) must be available and should be used when performing the clean up of any spilled electrolyte. Video Training course EM761, Spills & Releases is required before clean up is attempted.

After the electrolyte and/or contaminated debris is picked up, place it in a 4 mil thick plastic bag and then into a DOT approved PG II container. If the job is a CORAD administered operation, the contracted vendor will supply clean up and disposition services. If it is not a CORAD job, the Building Service Center (BSC) is to be contacted. Call 557−6194 for SCB or 780−2740 for SB when the container is ready for disposal.

6.3 **Neutralizing Agents −** When a combined acid neutralizer/absorbent is not available to clean a battery spill, use the following agents as appropriate:

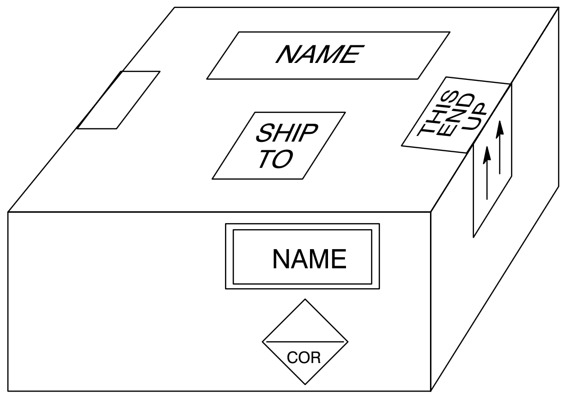
Agent	Solution Use	Preparing Solution
Weak Soda Solution	A weak soda solution should be used to neutralize and clean traces of acid electrolyte that has come in contact with parts of the body other than the eyes.	Dissolve 4 ounces of baking soda (bicarbonate of soda) in 1 gallon of water
Medium Soda Solution	When a small to medium sized spill has occurred, a medium soda solution should be prepared by mixing baking soda with water until a paste is formed. When fumes are no longer emitted from the spill/ paste mixture, the spill has been neutralized. See Note below.	Use 5 pounds of soda Solution paste per quart of electrolyte.
Strong Soda Solution	When a large or concentrated acid spill occurs, a strong soda solution should be prepared. This mixture is then applied to the spilled electrolyte until it is neutralized. See Note below.	Dissolve 2 pounds of baking soda (bicarbonate of soda) and 2 pounds of soda ash (anhydrous sodium carbonate) in 1 gallon of water.
Boric Acid Solution	This agent is used to neutralize alkaline electrolyte. Combine the solution with the spill until all reaction has ceased. See Note below.	Dissolve 1 pound of boric acid crystals in 2 gallons of water.
NOTE: After neutralizing the spill, pick up the paste with pieces of cardboard and pack it in a 4 mil plastic bag. Place the sealed bag in the container used to ship the battery.		

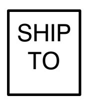
6.4 **Absorbent Material Recommended for Spilled Electrolyte and Neutralizing Solutions −** Vermiculite beads or other non−combustible absorbent material, such as “Cellusorb,” should be used to contain and take up spilled electrolyte and neutralizing solutions. Vermiculite beads are commonly packaged in four cubic foot bags. Each bag will absorb approximately twenty gallons of electrolyte. When using “Cellusorb” or other similar approved products, you should follow the directions printed on the container. Absorbed electrolyte and neutralizing solutions should be picked up (scooped or shoveled) and placed into plastic bags that have a wall thickness of at least 4 mils. The bags should be packed and shipped with the returned battery.

6.5 A combined acid neutralizer/absorbent is preferred over separate Neutralizers and absorbents. One such compound is available from the Charles E. Singleton Co. of FL., PID #058923442, and should be used on all large volume spills.

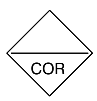
7. Storing And Shipping Large Batteries

7.1 Shipping Large Batteries for Disposal − The DOT and EPA require the use of specific marking, labeling and placarding when storing and shipping batteries. The illustration below explains battery markings/labels. Reference GU−BTEN−001BT, Section 6 for assistance.





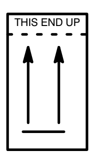
FORM RF−2433
“SHIP TO”



FORM RF−2426
“BATTERY, ACID” OR

FORM RF−2424
“BATTERY, ALKALI” (NOT NICADS)

TWO LABELS REQUIRED FOR EACH BOX
(ONE EACH ON OPPOSING SIDES)



FORM RF−2431
“THIS END UP”

TWO LABELS REQUIRED FOR EACH BOX
(ONE EACH ON OPPOSING SIDES)

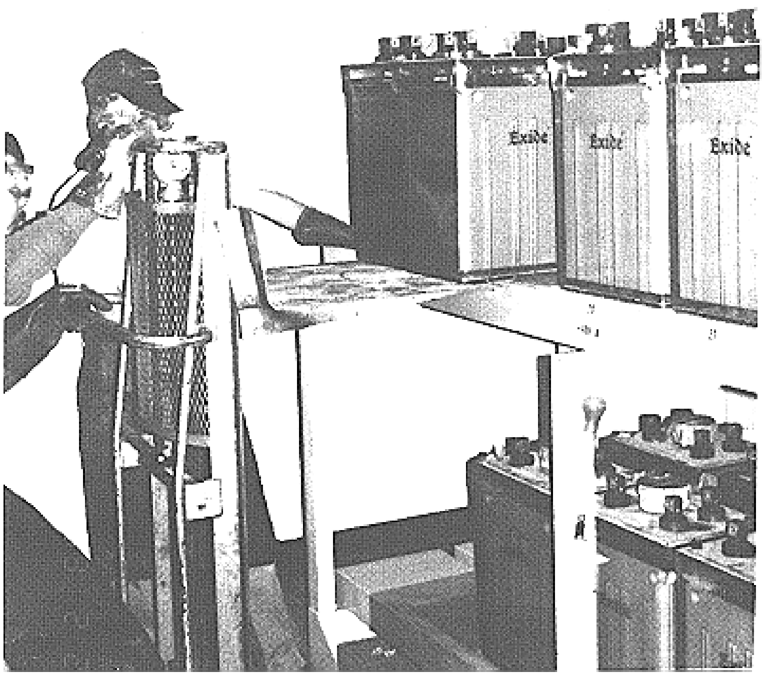
“COMMON NAME”

TWO LABELS REQUIRED FOR EACH BOX
(ONE EACH ON TOP AND SIDE)

7.2 **Hoisting and Hauling Contractor –** To ensure large batteries are properly and economically handled and transported, a "Hoisting and Hauling" contract has been established by Material Services. The services of the Contractor include, but are not limited to the following:

- removing and disposing of explosion proof vent caps,
- plugging/sealing each battery to prevent leakage,
- removing from rack/shelves,
- removing of connecting straps,
- providing special packaging,
- pumping battery electrolyte,
- providing the necessary containers, markings, labels, and placarding, and
- loading and transporting the batteries.

Illustrated below is a battery being hoisted from stand:



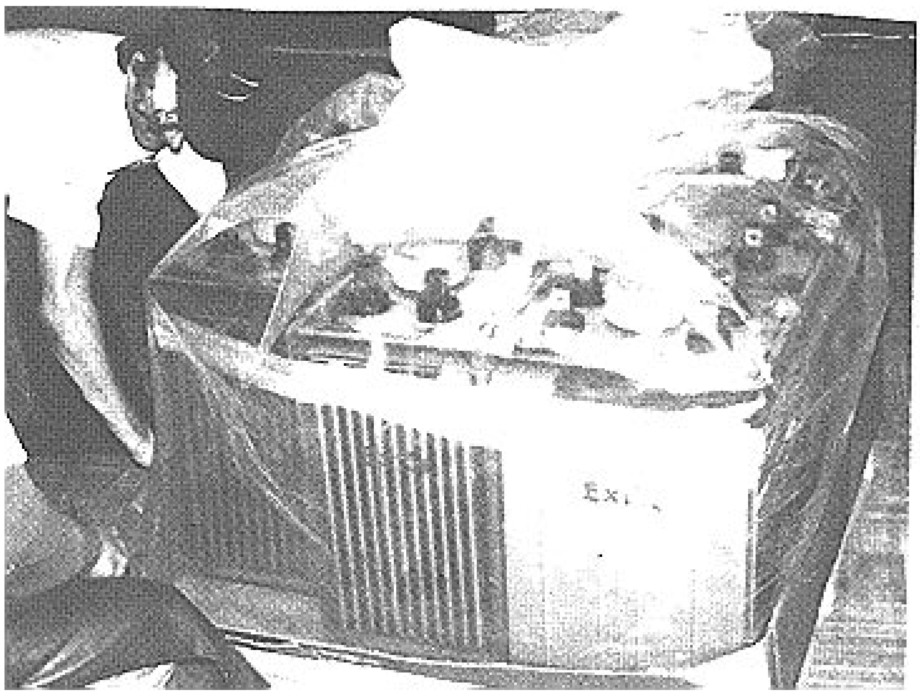
7.3 **Disconnecting Batteries From the Bus Bar –** The vendor does not disconnect the battery from the bus bar. Network Engineering is responsible for disconnecting all batteries from the bus bar, prior to the vendor's arrival. All terminals are to be protected to prevent arcing during handling and transporting.

7.4 **Shipping Documents and Transporting Batteries from Central Offices –** Before batteries from Central Office locations are shipped, the Material Services – Hazardous Materials/ Miscellaneous Services representative should be contacted to provide shipping documents and arrange for transport.

8. Disposition Of Small Batteries

8.1 Removal and Handling Small Batteries – For disposition purposes, batteries weighing less than 75 pounds are rated as small batteries. Example of small batteries are engine start batteries, digital loop carrier batteries, Gates “six packs”, and NiCads. Unusable and/or discarded NiCad and Lithium batteries are classified as hazardous wastes and are not shipped on company trucks. The exception is when small quantities of replacement batteries are taken from remote field locations to work centers. Be aware that there are six–pack batteries, used for certain types of equipment, that are alkaline (NiCad) batteries.

Illustrated below is batteries covered with plastic:



Unless otherwise specified, the supervisor with responsibility for equipment maintenance in the geographic area involved is responsible for ensuring that the procedures outlined in this document and BellSouth Practices are followed.

8.2 Removing Batteries From Service – When small wet cell batteries are removed from service, the battery is inspected to ensure that its case is not damaged or swollen.

8.3 Removing Batteries From Remote Locations – If only a few batteries (less than 1,000 pounds of sulfuric acid electrolyte in all states except Louisiana and North Carolina, when 500 pounds is the limit) are being removed from a remote location, they may be transported to the work center. Most replacement batteries are received in a temporary transportation container which should be used to return the old battery to the aggregation point (usually a work center).

If the weight of the batteries being removed from an Remote Transmitter (RT) site exceeds 1,000 (500 in Louisiana and North Carolina) pounds of electrolyte, the plant engineer responsible for that job is required to initiate the preparation of shipping documents as described under Shipping Papers. (The Material Services – Miscellaneous Services Group provides this service upon request.

8.4 Packaging and Storage – If temporary transportation containers are not provided, a sturdy cardboard box, at least as high as the batteries, should be used to pack the batteries. All filler holes must be sealed with the original caps or securely taped with duct tape to prevent spillage. If tape is used, make two pin sized holes in the tape above each filler hole, to allow venting of hydrogen and oxygen gases.

CAUTION: Do not make air tight seals.

Batteries, of similar construction and make up (lead acid with lead acid, alkali with alkali, NiCad with NiCad), will be placed in heavy, liquid tight 4 mil plastic bags, either singularly or in groups. The bag is intended to contain spills of electrolyte should they occur during transport. The bagged batteries are then placed into suitable shipping containers, with the batteries in an upright position.

Illustrated below is batteries packed for shipment:

NOTE: If 4 mil bags are not available, it is permissible to use two or more plastic, 2 mil or greater, trash bags. Care should be taken when loading batteries into boxes, to prevent damage to the bags.

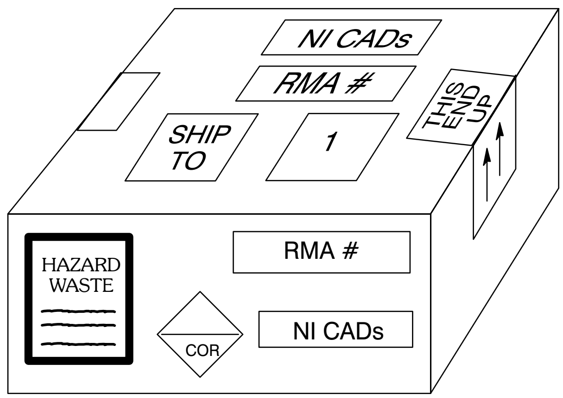
Plastic bags are not required for gel–cell type batteries unless they are leaking electrolyte.

8.5 Packing and Labeling Batteries For Shipping – Packing material should be placed around battery(s) to prevent damage and spilling. All batteries awaiting shipment from the aggregation point should be properly segregated, labeled by type, and placed in a storage area that keeps the batteries off the ground and protected from the elements.

Markings and labels are available through the BST Hazardous Materials Disposition Group and/or Miscellaneous Services Group. Outside vendors under contract to transport and dispose of batteries will also have supplies of these labels.

NOTE: It is BST's responsibility to ensure that all required markings and labels are correct and applied properly before shipment is made.

Illustrated below is battery markings/labels Alkali (NiCad):



SHIP TO — FORM RF−2433 "SHIP TO"

COR — "BATTERY ALKALI"

TWO LABELS REQUIRED (ON OPPOSING SIDES)

THIS END UP — FORM RF−2431 "THIS END UP"

TWO LABELS REQUIRED (ON OPPOSING SIDES)

RMA # — VENDOR ASSIGNED SHIPMENT IDENTIFICATION NUMBER

TWO LABELS REQUIRED (ON TOP AND SIDE)

HAZARD WASTE — FORM RF−2436 "HAZARDOUS WASTE"

NI CADs — NI CAD BATTERIES

TWO LABELS REQUIRED (ON TOP AND SIDE)

1 — NUMBER EACH PALLET SEQUENTLY

(Identify each pallet on the "Certificate of Batteries Shipped" form)

8.6 Handling of Damaged Batteries– If batteries being removed or awaiting shipment are found to be leaking fluid, they should be carefully packaged, or repackaged, in a liquid tight plastic bag to prevent additional spillage. Used cleanup materials should be packed and shipped with the returned batteries. Reference paragraph 8.4 of this document for more information.

Spilled acid electrolyte may be neutralized by using five pounds of baking soda per one quart of electrolyte. The chart in paragraph 6.3 (Medium Soda Solution) of this document explains the use of neutralizing agents, solutions and preparing solutions.

8.7 **Batteries Shipped From Outside Plant Locations −** A request for disposition should be placed to the Building Service Center (BSC) for batteries shipped from an outside plant location. The caller must identify the type of battery (lead acid, NiCad etc.) and the number of batteries to be shipped. The BSC will assign a ticket number for tracking purposes; this number should be recorded on the Form RF−1020−B.

NOTE: The BSC will usually contact the Hazardous Materials/ Miscellaneous Services Group or Hazardous Materials Disposition to provide disposition services.

8.8 **Transporting Batteries −** The proper shipping document for transporting batteries, other than NiCad and Lithium batteries, is the Bill of Lading, Form RF−1800. NiCad and Lithium batteries are classified as hazardous wastes and must be shipped with a Uniform Hazardous Waste Manifest. For instructions on completing Form RF−1800 and the Uniform Hazardous Waste Manifest refer to BSP 744−200−001BT, Issue B.

NOTE: Do not ship Nicad or Lithium batteries to the MDC.

8.9 **Documentation −** Documentation is provided to field locations for vouchering, and should be retained at the shipping location, or its controlling work center, for a period of three years for audit purposes. Refer to your applicable departmental procedures for activity reporting requirements, such as BSP 790−100−700BT regarding Network locations.

9. Removal And Disposition Of Asbestos

9.1 **General −** Asbestos has been identified as a potential health hazard if inhaled or ingested. However, the mere presence of asbestos does not present a health hazard. OSHA Standard 29 CFR 1910.1001 describes the permissible exposure to airborne concentrations of asbestos fibers. BSP 622−395−301SV provides procedures for dealing with transit duct repairs.

NOTE: These procedures apply to the removal of asbestos materials from central office equipment. Building materials containing asbestos will be removed and handled per Property Management guidelines.

There are two forms of asbestos: 1) friable, and 2) non−friable. Friable asbestos is defined as any asbestos containing material (ACM) which may be crumbled or pulverized by hand pressure, which in turn releases fibers to the environment. Examples of friable asbestos are:

- pipe lagging,
- ceiling/wall insulation,
- certain fire−stop “pillows” used in cable vaults,
- engine exhaust pipe lagging, and
- friction clutch/brake shoe dust.

Examples of non–friable asbestos are:

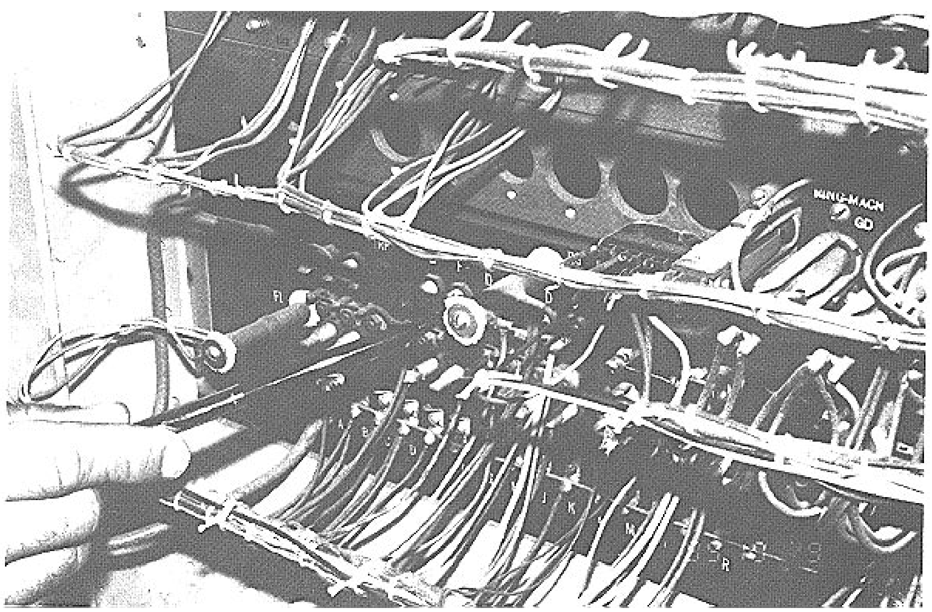
- certain types of floor tile,
- building materials such as shingles, and
- cable vault cover plates.

9.2 **Preventing Asbestos Fibers From Becoming Airborne –** Special encapsulants have been developed to prevent asbestos fibers from becoming airborne. Encapsulants are products that have special properties which:

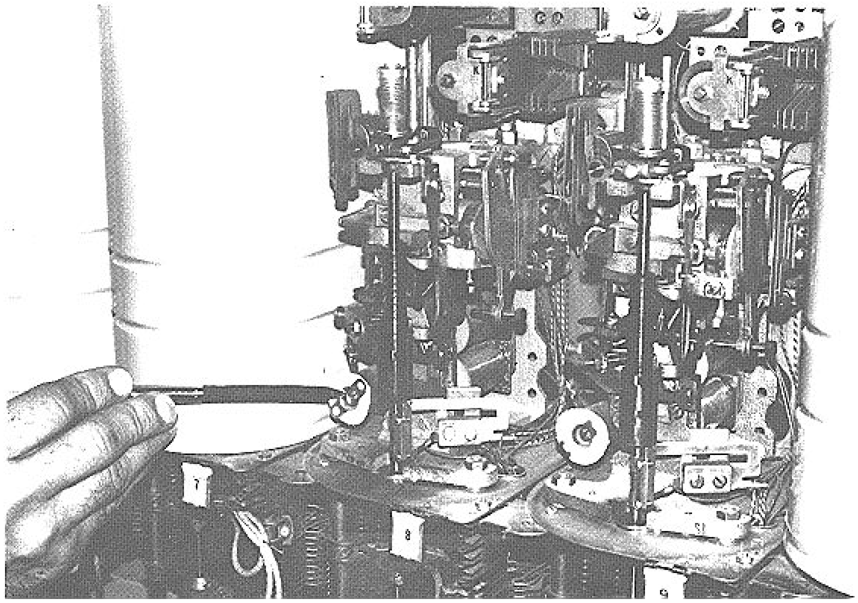
- completely soak the asbestos and encapsulates every fiber,
- after treatment and drying, allow asbestos to be drilled without projecting asbestos fibers into the air,
- can be applied to hot surfaces,
- are non–conductive, and
- are water soluble.

Central Office Removal and Disposition representative provides encapsulants to each vendor presently (under contract) providing COE hazardous material removal services from central office locations. Information on encapsulants is available from Material Services.

Below is an illustration of a Fuse Bay Asbestos Washer:



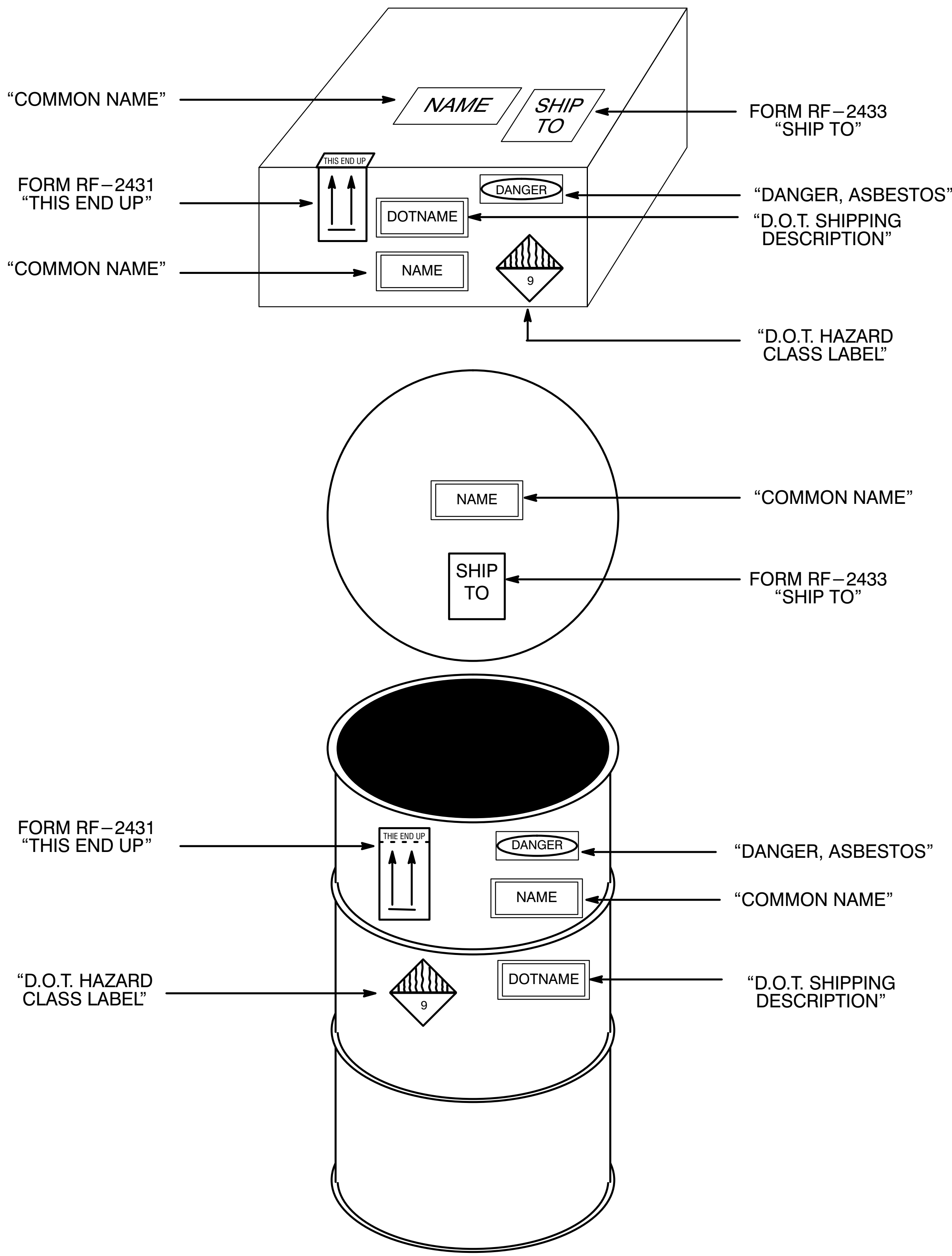
Below is an illustration of S X S Connector Switch Asbestos Washer:



9.3 Hazardous Material Purge of Asbestos Insulators − The following steps should be followed as part of the hazardous material purge of asbestos insulators from under resistors during COE removals.

Step	Action
1	Survey the equipment to be removed to identify all asbestos insulators.
2	Apply encapsulant to each insulator. Most encapsulants can be sprayed, painted or dripped onto the ACM.
3	Allow the encapsulant to dry (approximately 15 minutes, depending on the product). Carefully remove each insulator.
4	Place insulators into an appropriately sized, plastic bag (freezer and "ziplock" bags work well).
5	Place bags of treated ACM into sturdy, appropriately sized cardboard or fiber board containers.
6	Affix all required labels and markings to the shipping containers. Refer to the illustration in 9.4.
7	Place containers in the Hazardous Material/Waste storage area and post to the Hazardous Material/Waste Storage Area log.
8	Prepare shipping papers (Form RF−1800, Bill of Lading) as required by DOT Regulations.
NOTE: When equipment bays are to be removed intact from central offices for shipment to an MDC, the use of encapsulants is not required by field personnel. MDC personnel will follow Steps 1 − 7 as appropriate.	

9.4 Asbestos Markings/Labels − Following is an illustration of asbestos markings/labels:



9.5 Black “Bakelite” power board panels are normally non–friable ACM and are already “encapsulated” by the bakelite resin. In the past, additional fuse positions were occasionally added to these panels by drilling holes. This practice should be discontinued immediately. If additional fuse positions are required, the black bakelite panel should be replaced by modern non–ACM panels, obtainable via the ordering information on the power board equipment drawings. The removed black bakelite panel should be handled carefully to ensure that the resin coating is not damaged, placed in a closed garbage bag (minimum 2 mil), labeled, and stored in the Hazardous Material/Waste storage area. Call the BSC to arrange for MDC disposition. Removal of an out–of–service power board containing these panels should follow similar procedures. If a black bakelite power board panel with exposed asbestos fibers is found (broken, chipped, etc.), then encapsulant should be used to contain the exposed fibers and the panel removed as outlined above.

10. Cold Cathode Tubes (Removal And Disposition)

10.1 **Cathode Tube Removal –** When removing cathode tubes from equipment, care must be exercised to prevent tube breakage. It is recommended that a plastic sheet be placed on the floor during tube removal to facilitate clean up should any breakage occur.

10.2 **Broken Cathode Tube –** Extreme care should be taken when handling cold cathode tubes. Should a cathode tube be accidentally broken, the following step–by–step actions must be taken.

Step	Action
1	Clear the affected area of non–essential personnel.
2	Notify the supervisor, who will report the incident to the BSC.
3	Secure the area from further damage.
4	Clean up the breakage.

10.3 **Removal of Radioactive Tubes –** Radioactive tubes are removed as a first work operation during central office equipment removals. These tubes are identifiable by the dark purple color of the glass envelope.

10.4 **Removal of Hard Wired Tubes –** For hard wired tubes, it will be necessary to use two technicians to safely remove cathode tubes. One technician is needed to support the tube on one side of the frame while the other technician removes the wiring and mounting screw on the wiring side of the frame.

10.5 **Electron Tube Extractor –** For plug–in tubes, a KS–5637 L1 or KS–144428, Electron Tube Extractor is used to prevent damage to the glass envelope during removal, this also speeds the removal process. The tube extractor will be used to remove damaged tubes to prevent hand and finger injuries. After being used to remove damaged tubes, the tube extractor is washed with cool or warm water and mild soap, and then rinsed thoroughly.

10.6 Cleanup Procedures − Do not use vacuum cleaners or brooms to pick up broken parts of radioactive tubes. Pliable puncture resistant rubber gloves must be worn during the clean−up operation.

NOTE: Technicians who have cuts, abrasions or open sores on exposed parts of the body, particularly the hands, should not handle broken parts of cold cathode tubes.

Listed below are the steps (instructions) and procedures for cleaning up tubes:

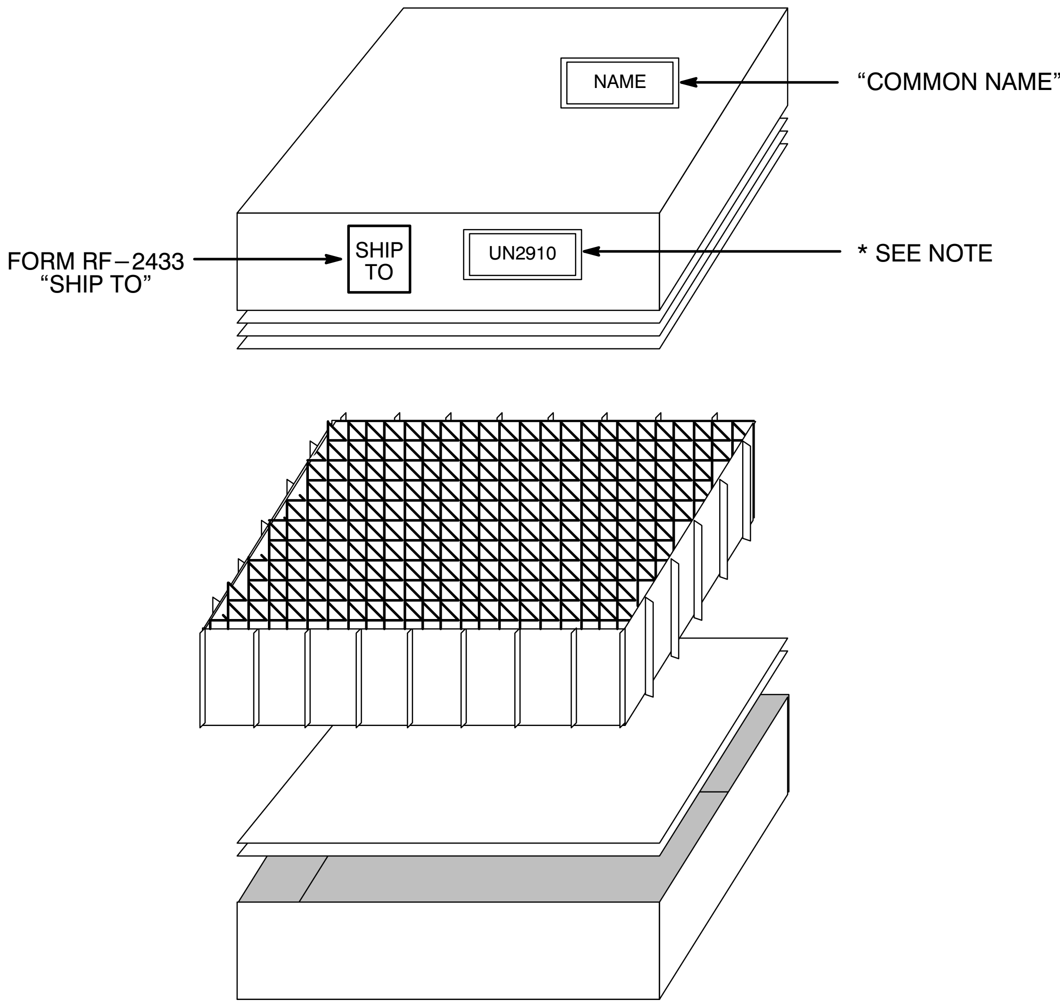
Steps	Procedures
1	Wear rubber gloves during the clean up.
2	Pick up the broken tube pieces with rigid pieces of paper and place them in the center of a suitably sized **damp** rag.
3	Fold and place the rigid pieces of paper on top of the broken parts.
4	Tie each pair of diagonal ends of the rag securely to form a compact bundle.
5	Clean the affected area with a second large damp cloth
6	Use the cloth to wrap any remaining debris after wiping the area.
7	Bundle the cloth and place it in a suitable sized plastic bag
8	Seal the plastic bag with pressure sensitive tape.
9	Pack the bag in a suitable sized container designed for radioactive material. (The container normally used to transport cathode tubes after COE removal is preferred.)

10.7 Technicians − After cleaning and packaging is completed, the technicians should wash their hands thoroughly with soap and water, rinse hands thoroughly and repeat wash/rinse procedure at least three times to ensure proper decontamination.

Technicians who cut themselves in the process of handling broken parts of cold cathode tubes should immediately wash the cuts in cool or warm water with mild soap, rinse thoroughly, repeat the wash and rinse procedure three times, and report the injury to your supervisor, who will arrange an immediate appointment with a local physician.

10.8 Packing and Storage Cold Cathode Tubes − Radioactive cold cathode tubes shall be separated and packaged by type. Krypton and Radium tubes are **not** to be packaged together. When preparing small quantities (10 or less) of tubes for shipping, each tube must be wrapped with paper or another suitable cushioning material to prevent breakage. When preparing larger quantities of radioactive tube for shipping, they should be packaged in approved cardboard cartons with “egg crate” insulation sheets to prevent damage and/or breakage. Care should be taken to prevent the packing and/or storage of radioactive tubes with other non−radioactive pieces of equipment or parts, as this could result in breakage and contamination of equipment.

10.9 Shipping − Marking, labeling, placarding and shipping instructions and materials can be obtained from the Material Services − Hazardous Materials/Miscellaneous Services group, or from HMD. Below is an illustration of Radioactive Tube Container Markings/Labels (incoming MDC shipments). Shipping documents and procedures are described in Paragraph 17 of this document.

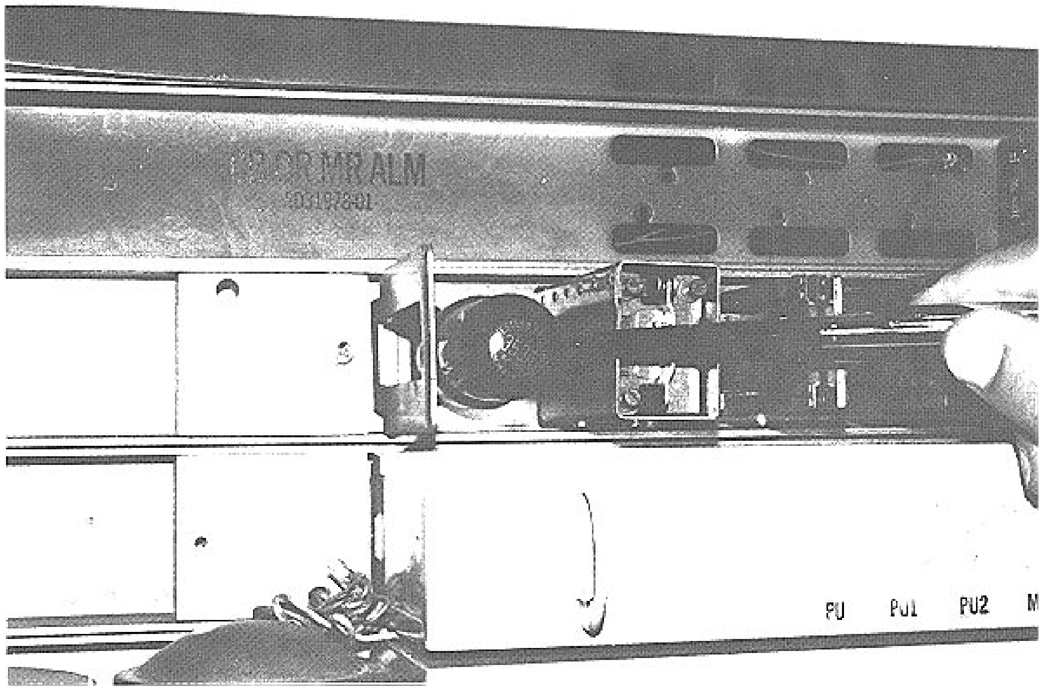


* RADIOACTIVE MATERIAL PACKAGES SHOULD HAVE THE FOLLOWING MARKING:

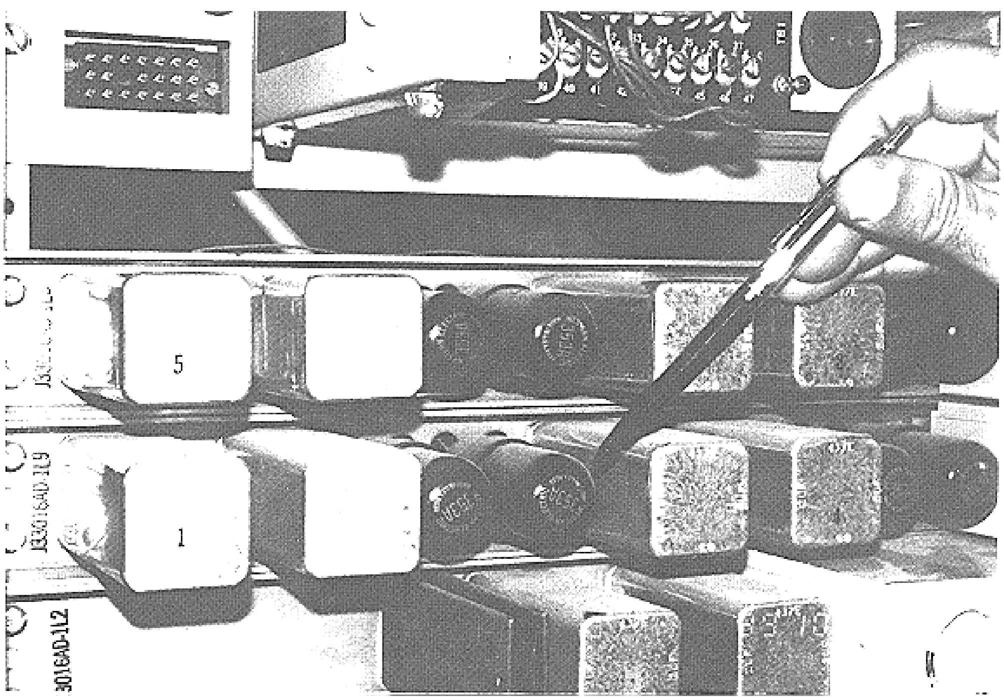
"THIS PACKAGE CONFORMS TO THE CONDITIONS AND LIMITATIONS SPECIFIED IN 49 CFR 173. 422 FOR RADIOACTIVE MATERIAL, EXCEPTED PACKAGE − INSTRUMENTS OR ARTICLES, UN2910."

10.10 Documentation − The reporting requirements for radioactive devices is more stringent than other types of equipment and varies from state to state. Generally, if Krypton 85 tubes, with an accumulated microcuries value of 100 or more, or Radium Bromide tubes with a value of one microcurie or more are removed from a location, a report by local management must be made to the Environmental Control Manager for that area. The activity report must include the types and quantities of tubes removed and the location they were removed from. Exhibit 5 is a Cold Cathode Tube Conversion Chart.

10.11 Cold Cathode Tube Illustrations – The illustrations below are views of the cold cathode tube:



VIEW A



VIEW B

11. Disposition Of Mercury Relays And Switches

11.1 General − Mercury relays are wetted, contact−type switches that are hermetically sealed under pressure in a gas−filled, glass envelope. The entire assembly is sealed with a smooth metal casing. The liquid mercury in the relay becomes a safety handling problem should the casing break or leak. Liquid mercury is poisonous and should not be allowed to come in contact with the skin or eyes nor ingested. Below are illustrations of mercury relays:

11.2 **Relay Code –** Mercury relays and switches vary in size and shape and are classified according to relay code. Most, but not all, mercury relays have the following warning printed on the casing.

DANGER HIGH PRESSURE – DO NOT OPEN

More recently manufactured small relays are stamped with an arrow:

$\boxed{\longrightarrow}$

or

DO NOT OPEN

Relays and switches manufactured by most companies will be marked/labeled indicating the presence of mercury, such as "Mercury Wetted Contact Relay".

11.3 **Precautions and Handling –** Although mercury relays are airtight and are highly resistant to damage, caution should be taken to prevent physical damage and potential leakage. Large quantities of securely packaged mercury relays present no danger to personnel. The only condition of concern is when a mercury relay(s) breaks in a manner which causes liquid mercury leakage. All loose mercury shall be cleaned up immediately.

11.4 **Cleaning Up A Mercury Spill –** Anyone involved in cleaning up a mercury spill should wear safety eyeglasses, or chemical safety goggles when a mercury relay(s) is leaking from above eye level. Acid resistant gloves should be worn to prevent mercury contact with the hands.

Any skin area, particularly open cuts, sores, or abrasions that are exposed to liquid mercury, must be washed and rinsed in warm water and a mild soap several times. The local supervisor should be notified. For situations where liquid mercury has come in contact with open cuts, sores, or abrasions, a physician must be consulted.

Loose liquid mercury shall only be picked up by scooping with pieces of rigid paper or by using an aspirator. Any liquid mercury that is retrieved must be placed in a sealable plastic container or metal flask. All materials used to clean a mercury spill should be disposed of with the waste mercury in accordance with GU−BTEN−001BT, Chapter 4, Hazardous Material/Waste Management. Mercury spill kits are commercially available.

NOTE: **Do not attempt to use vacuum cleaners, brooms, or rags to pick up spilled mercury as these tend to atomize the liquid and disperse it into the air, where it can be inhaled.**

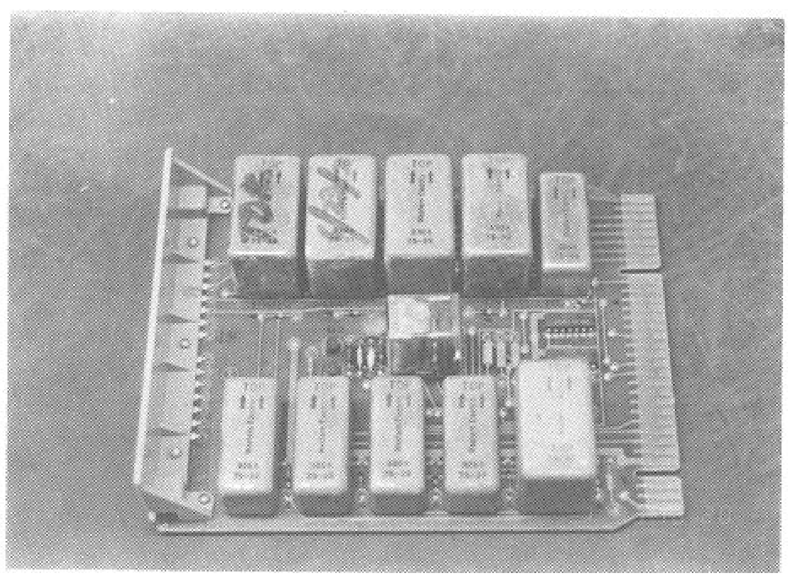
11.5 **Disposing of Mercury or Mercury Containing Equipment −** Mercury or mercury containing equipment shall never be disposed of through common rubbish removal services. (**Do not** throw it into the trash can − it is a hazardous waste or material and must be handled in accordance with GU−BTEN−001BT, Chapter 4, Hazardous Material/Waste Management.)

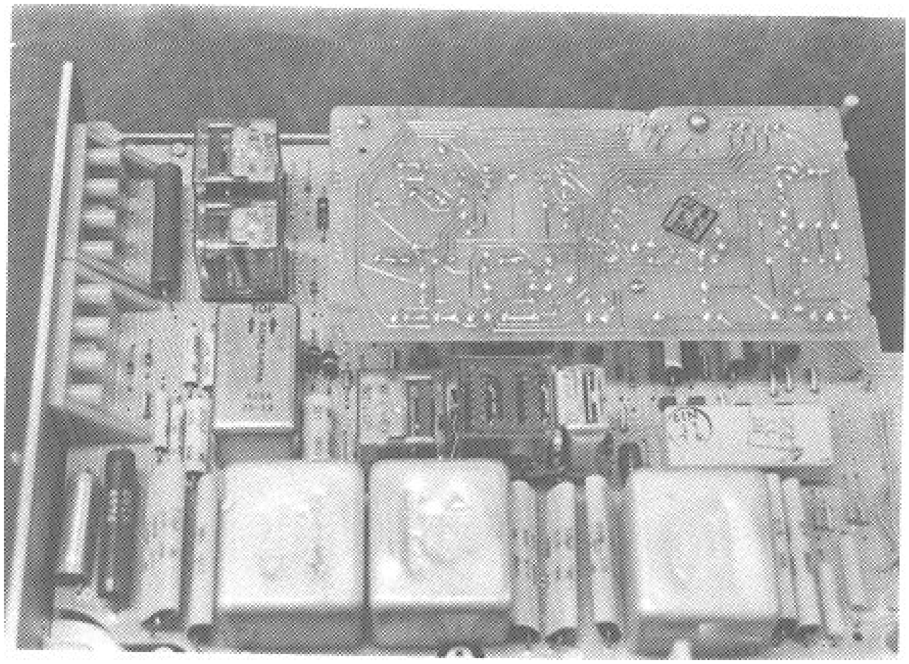
11.6 **Identification of Mercury Relays and Switches −** There are two basic configurations of mercury relays, i.e., circular base and rectangular base. Round and square can relays are designed to plug into sockets, fasten onto mounting plates and/or be wired onto Printed Wire Boards (PWB) circuits. They are usually easily identifiable.

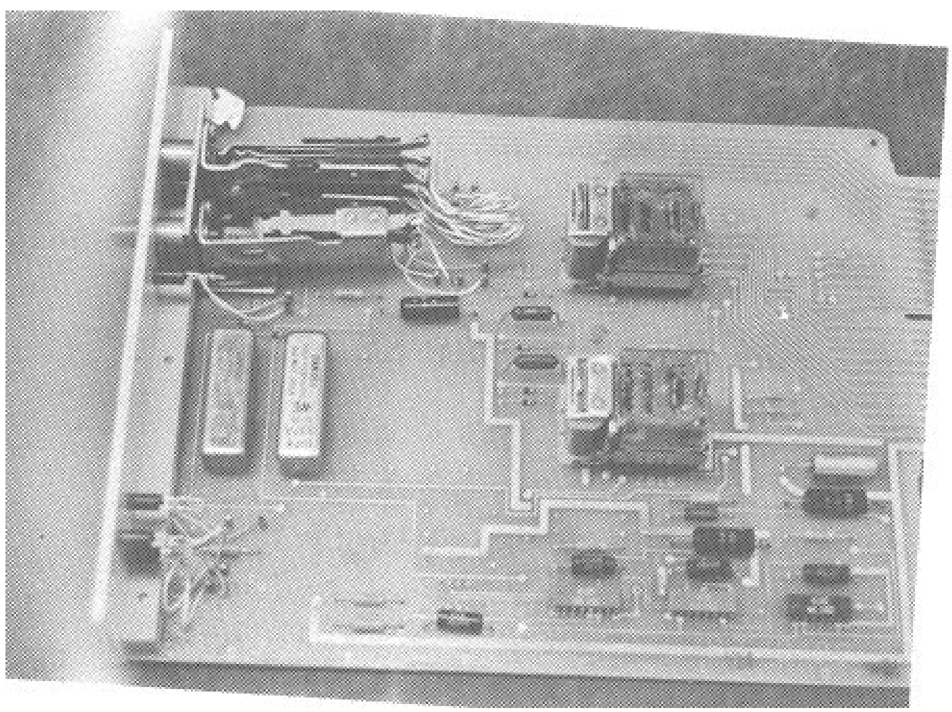
Large PWB or Circuit Pack (CP) relays are permanently mounted by clinching and soldering the terminals. These relays are relatively large but when mounted on PWBs are not easily located from the front of equipment. Removal of the PWB from the equipment is sometimes necessary for identification.

Small PWBs or CP relays associated with PWBs are not easily visible because of their size and location. Removal of small PWBs from the equipment is necessary for identification purposes.

The size of round or square can relays can range from 1” to 6” in height/length, and they are usually a bronze gold or silver gray color. Below are illustrations of mercury relays on Printed Circuit Boards:







11.7 Equipment Intended for Reuse or Resale − Equipment intended for reuse internally or resale should not have any relays or switches removed. Shipments of reuse/resale equipment containing mercury relays and/or switches must be manifested on the Bill of Lading Form, RF−1800.

11.8 Equipment Containing Mercury to be Scrapped − When mercury containing equipment is scrapped, all mercury relays and switches shall be located and removed from the equipment prior to its sale or disposal. <u>Under normal conditions, COE racks and equipment will not be purged of mercury switches and relays until after they have been shipped to the Material Disposition Center (MDC).</u>

PWB and CP which contain mercury relays and switches may be removed from equipment and shipped intact to the MDC for scrap metal recovery, or to Surplus Sales for resale. Removal of mercury relays and switches from PWBs or CPs may be performed at the actual removal site, but not recommended. <u>Mercury relays and switches purged are classified as hazardous waste and must be manifested and shipped directly to an approved Treatment/Storage/Disposal Facility (TSDF).</u>

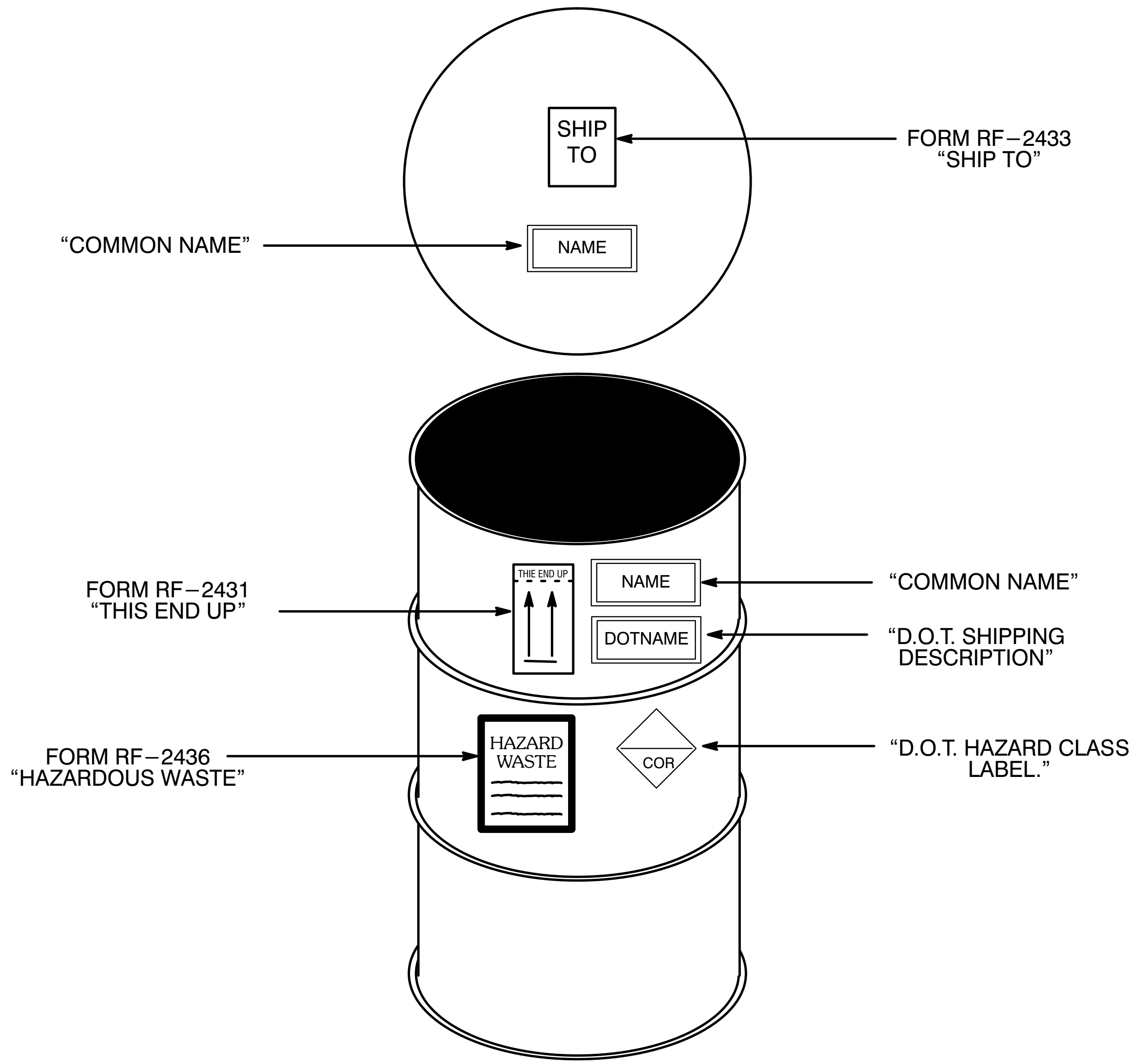
11.9 Packaging Mercury to be Transported − When mercury is to be transported via any form other than by air, a container that meets DOT Packing Group III (PG III) or higher specifications must be used. Fiberboard or cardboard boxes that comply with "PGIII" specifications are suitable containers for PWBs and CPs being transported to MDCs or the Surplus Sales warehouse.

11.10 Purged Mercury Relays and Switches − All purged mercury relays and switches (those removed from equipment, PWBs or CPs) will require DOT 1A2 containers (steel drum). The size of the steel drums will be determined by the quantity of relays and switches involved, however, the smallest drum that will do the job should be used. <u>All used, defective or outdated relays are to be purged from storage cabinets while shipping containers are available</u>.

NOTE: **All containers being loaded with hazardous wastes are required, by federal regulation, to be closed and sealed when not under the direct supervision of the worker filling it. The weight of the waste added to the container must be recorded daily in the Hazardous Material/Waste Storage area log. All containers receiving hazardous waste shall be marked and labeled per DOT requirements.**

11.11 Metal Flasks Containing Spilled Mercury − Metal flasks and/or plastic bottles containing spilled mercury are to be packed on top of a drum containing mercury relays or switches. Ensure that all drums are properly sealed before shipping. For proper marking and labeling instructions for Mercury Relays/Switch Markings/Labels (Bethlehem Apparatus) see the illustration below:

NOTE: **Do not mix hazardous <u>materials</u> with hazardous <u>wastes</u>, as this will make the contents of the entire container a hazardous waste. (Loose mercury relays are a waste, when put in the same container as PWB (a hazardous material), the entire container has to be classified as hazardous waste, and cannot be shipped on a company vehicle or to company facilities).**



11.12 Shipping − Marking, labeling and placarding instructions and materials can be obtained from the Material Services − Hazardous Materials/Miscellaneous Services group, or from HMD. Refer to the illustration in paragraph 11.11 for marking and labeling. Shipping documents and procedures are discussed in Paragraph 17 of this document.

12. Disposition Of Small Capacitors And Ballasts Containing Polychlorinated Biphenyls (PCBs)

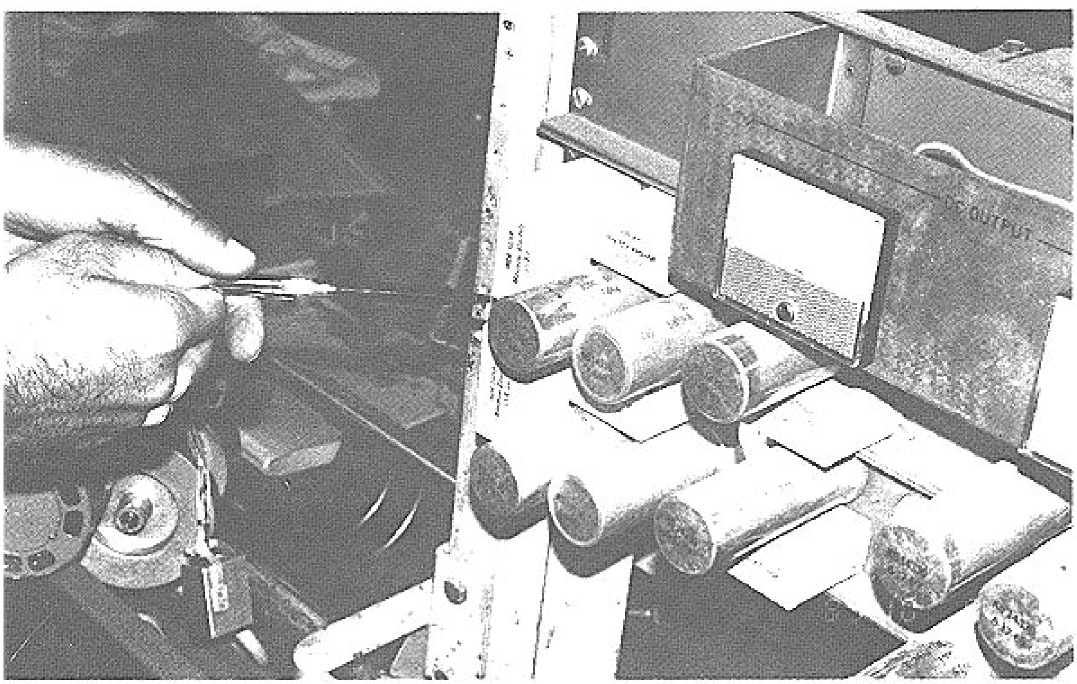
12.1 General − The Environmental Protection Agency defines a "small" Low Voltage PCB capacitor as any capacitor containing less than three pounds of PCB dielectric fluid and which operates at less than 2,000 volts. Since manufacturers of PCB capacitors don't label the quantity of PCBs present, the most common method of identifying a PCB capacitor is by looking at the equipment application, the physical characteristics of the capacitor and the date of manufacture.

Capacitors manufactured prior to 1981 are assumed to contain PCBs. Capacitors manufactured after 1981 and/or marked “ELECTROLYTIC” do not contain PCBs. When a capacitor is suspected of containing PCBs but cannot be positively identified as such, it should be assumed to contain PCBs.

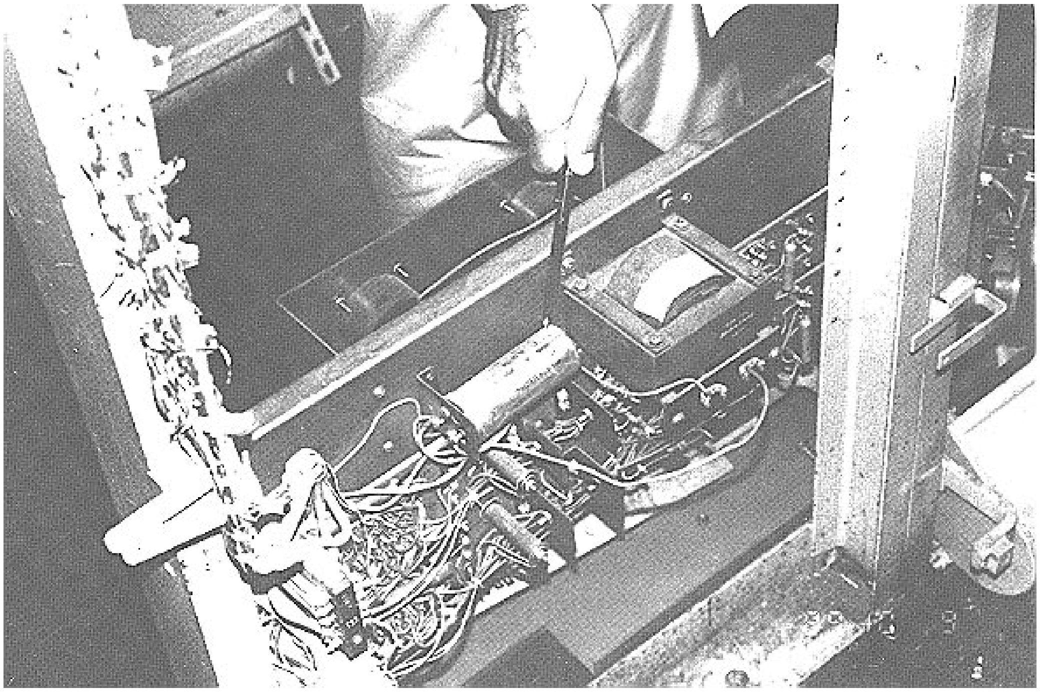
12.2 PCB Capacitors − PCB capacitors are most commonly used in high voltage (above 110V AC) circuits, such as power supply equipment, test cabinets and rectifiers. PCB capacitors may be identified by their physical characteristics which include:

- sealed metal can (cover) in various colors (usually silver or gray),
- square, rectangle or oval shaped,
- small sealed hole at the top of the capacitor (this hole was used when injecting the dielectric fluid and is sealed by solder or a rubber plug), and
- heavy insulated terminal posts, such as insulated with porcelain, “Bakelite”, hard rubber, and/or covered with a rubber boot.

Below are illustrations of PCB Capacitors:



PCB Capacitor Illustrations Continued:



A lighting fixture ballast is another form of a capacitor. It is found in fluorescent lighting fixtures. Ballasts, like other capacitors, may or may not contain PCBs. PCB ballasts may be identified by the date of manufacture (1980 or older), or by a manufacture's trade name. Many of the new lighting fixture ballasts are labeled "NO PCBs".

12.3 **Precautions and Handling −** PCB capacitors and ballasts are highly resistant to damage because of their construction, but caution should be taken to prevent physical damage and/or leakage.

Capacitors may contain a residual electric charge. Before handling any capacitor, make sure that it is fully discharged. A capacitor may be discharged by using an insulated tool, such as a screwdriver, to short−circuit each terminal post to ground.

12.4 **Selecting Equipment to be Worn When Working With Apparatus Containing PCBs −** Protective equipment should be worn when working with apparatus containing PCBs. The protective equipment to be worn depends upon the individual circumstances. When a capacitor or ballast is to be removed from scrap equipment, safety glasses shall be worn. If a leaking PCB capacitor or ballast is identified, during the removal process, personnel must wear chemical safety goggles and acid resistant gloves when handling the component, and cleaning up spills and leaks.

12.5 **Breathing PCB Fumes −** Small spills from capacitors or ballasts seldom cause respiratory problems. However, when PCBs are heated, they vaporize and release vapors which may cause possible respiratory problems. Every effort should be made to avoid breathing PCB fumes, and confined spaces must be well ventilated while work is being performed.

12.6 Cleaning Up PCB Spills − PCB spills must be cleaned up immediately. Use rags or other absorbent material to pick up the bulk of the spilled fluid. An oil absorbing compound, such as oil−dry, speedy−dry, sorbitol, safe−n−dry, etc., are also acceptable cleanup agents. Due to the disposal restrictions, **do not** use dirt, sand or sawdust to absorb PCBs.

Company policy requires all PCBs purged from our equipment be incinerated as the only acceptable means of disposal. This also holds true for clean up materials.

All residual PCBs shall be picked up by wiping the affected area with a petroleum solvent, such as, APCO−467, USURPER, SLOTROL 170, etc.

CAUTION: **Petroleum solvents are highly flammable. Keep away from heat, flames and sparks. Avoid prolonged breathing or repeated contact with the skin.**

12.7 Disposal of Contaminated Materials − All contaminated rags, gloves, absorbent material, etc., must be placed in plastic bags and packaged with the scrap PCB capacitors/ballasts. The containers should be labeled, placed in the Hazardous Material/Waste Storage area and logged in the Storage Log.

12.8 Packing PCB Capacitors/Ballasts − There are no DOT specifications for packing small PBC capacitors. However, PCB capacitors/ballasts must be packaged in a manner that will prevent damage or leakage during storage and shipment. PCB capacitors and ballasts may be packaged in the same container.

NOTE: **Facilities, other than Material Control Centers with new ballasts and capacitors in stock, should never accumulate more than 99.4 pounds, or 50 small capacitors on site at any one time − due to regulatory requirements.**

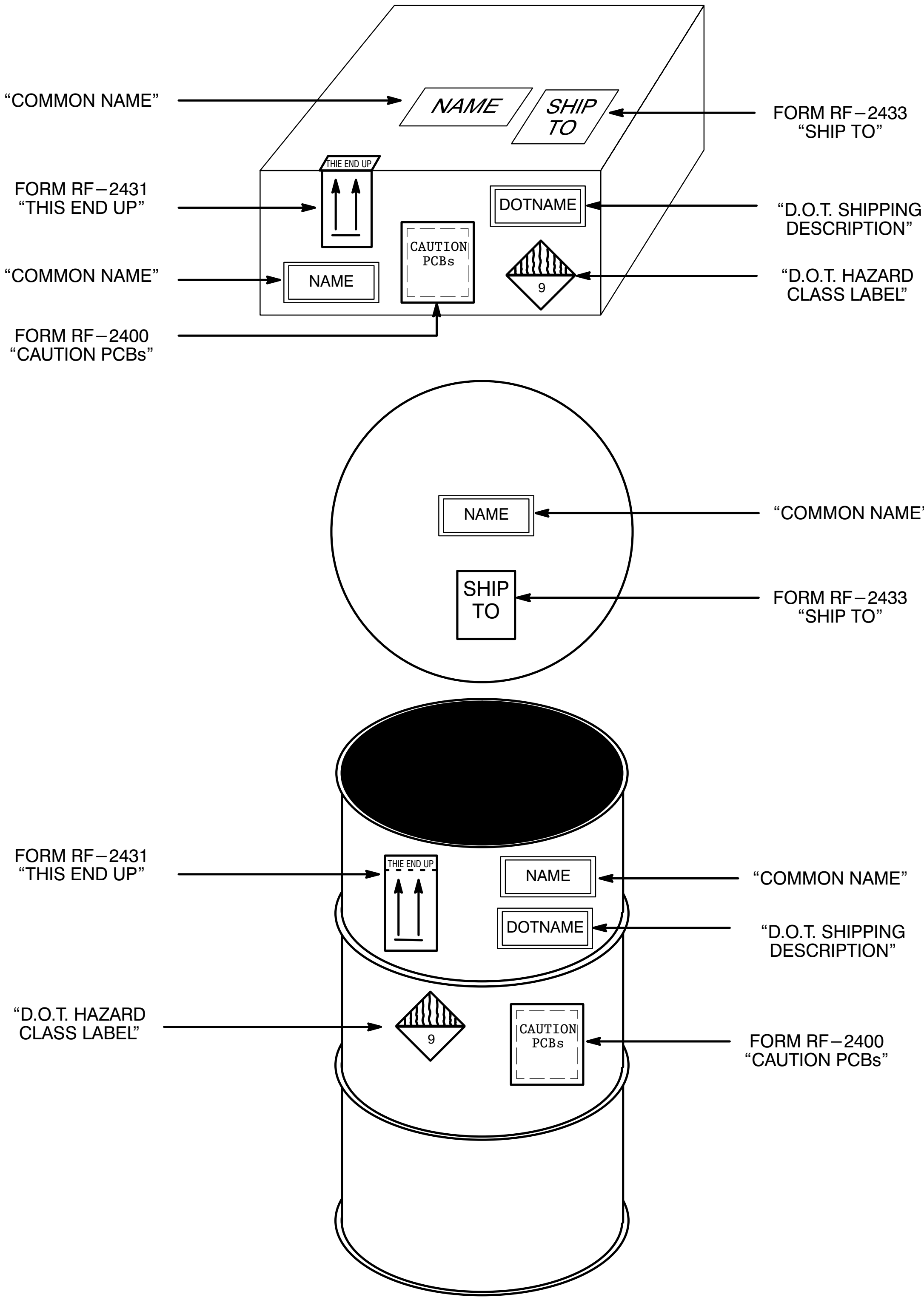
PCB capacitors and ballasts are to be packaged in an appropriately sized, strong, sturdy fiberboard or steel drum that meets Packing Group II (PG II) standards. If large quantities of capacitors are to be transported, it is recommended to use 55 gallon 1A2 open head steel drums. Sufficient cushioning material should be placed in each container to prevent damage to the contents.

12.9 Sealing PCB Capacitors/Ballasts − All scrap PCB capacitors or ballasts must be sealed in a strong plastic bag before shipping. This may be accomplished by using a drum liner or packing one or more PCB items in bags before placing them into the shipping container.

NOTE: **To prevent contamination, each leaking capacitor or ballast shall be individually packed in a sealable plastic bag (a ZIPLOCK type bag) and a small quantity of absorbent material should be added to the bag before sealing.**

12.10 Shipping Medium to Large Capacitors and Transformers Containing PCBs − PCB capacitors larger than “small” and transformers containing PCBs, are not to be shipped to MDC/MCC locations. MDC/MCC locations are not approved receivers of these types of PCBs containing materials because of location and architectural restrictions. If transformers or medium to large capacitors require shipping, contact the HMD group to arrange disposition. The shipment of all PCB capacitors, transformers and ballasts must be accompanied by a Form RF−1800, Bill of Lading. Refer to Section 12 of this document for more information.

12.11 Shipping − Shipping, marking and placarding instructions and materials can be obtained from the Material Services − Hazardous Materials/Miscellaneous Services group, or from HMD. Below is an illustration of PCB capacitors/ballasts markings/labels:



13. Refrigerants

13.1 Clean Air Act − Class I Chlorofluorocarbons (CFCs) and/or Class II Hydrochlorofluorocarbons (HCFCs) are prohibited from being vented from appliances per Section 608 of the Clean Air Act (CAA).

Class I or II substances must be recovered from appliances before they are repaired, disassembled or discarded. The recovery of the refrigerant must be conducted according to specific requirements established in the regulation.

13.2 Refrigeration Systems − Some air dryers (dehumidifiers), all window air conditioning units, and water coolers in BST have refrigeration systems that contain Chlorofluorocarbons or Hydrochlorofluorocarbons, which have been identified as being ozone depleting substances. Under the CAA regulations, air dryers, window air conditioning units and water coolers qualify as small appliances since they contain less than five pounds of refrigerant hermetically sealed in the unit.

13.3 Certified to Recover Class I or II Substances − Anyone recovering Class I or II substances from appliances or servicing such equipment must be certified to perform such work, must use approved service/recovery equipment, and meet EPA notification requirements when engaging in this activity.

13.4 Junking Small Appliances − Air dryers, water coolers and window air conditioning units that have been junked and are to be discarded must be disposed of properly. Most scrap metal recyclers and land fill operators will not accept small appliances until they are purged of all refrigerants. Documentation may be required by the recycler or landfill operator certifying that the refrigerant has been removed.

13.5 Servicing Refrigeration Systems − Unqualified and uncertified personnel within BST must not attempt to service refrigeration systems of any kind. A refrigeration company with certified technicians must be contacted to make repairs to, or purge, refrigeration units.

13.6 Freon − Using "Freon" to locate leaks in pressurized cable is prohibited. The CAA considers the use of Freon in this manner to be intentional venting of CFCs to the atmosphere.

All remaining quantities of Freon purchased for cable pressurization purposes must be disposed of properly by sending it to Fleet Management for their use or by returning it to the vendor/manufacturer.

14. Solvents − Used/Spent

14.1 General − Solvents, such as KS21466, KS7860, Safety Kleen, or ZEP, must be captured and contained while being used. After use, spent solvents and their sludges must be disposed of as hazardous wastes in accordance with GU−BTEN−001BT, Chapter 4, Hazardous Material/ Waste Management..

14.2 Spent Solvents − Spent solvents identified as hazardous wastes, awaiting shipment from an aggregation point, should be properly segregated (don't mix them with other solvents or substances), placed in a designated (clearly marked) storage area, stored off the ground/floor on pallets and protected from the elements (if outside). Solvents must be stored at least 25 feet from batteries and other materials that have the potential for igniting flammable materials. If stored outside, they should be no closer than 50 feet from an outside boundary fence.

14.3 Solvents Ready For Disposal – When a solvent is no longer useful, the solvent should be placed in an approved, spill–proof container that has been properly marked and labeled (DOT 1A1 steel drum) and is ready for disposal, a call to the BSC should be made to arrange for pick up and disposition. The caller must provide the name (ordering description if known) and the quantity of the solvent to be picked up. If the exact contents of the container is not known, the BSC will make arrangements with HMD to have the contents sampled and tested for proper disposition.

14.4 Material Safety Data Sheet – Local management will provide Material Safety Data Sheets (MSDS) information to the BST Safety for solvents that have not been approved for use, but were purchased and/or used within BST. MSDS sheets can be obtained from the solvent manufacturer.

When vendors, such as Safety Kleen and ZEP, are used to deliver and pick up solvents, the BSC procedure does not apply.

15. Used Oil And Oil Filters

15.1 Regulated Oil Wastes – Used motor and hydraulic oils are regulated hazardous wastes that are exempt from hazardous waste reporting requirements as long as they are being recycled (other than when being used as an energy source such as a fuel in a furnace or boiler). Whenever possible, all used oil should be recycled.

15.2 Motor Oil Mixed With Solvents – If motor oils are mixed with solvents that have hazardous waste characteristics, the entire contents of the container becomes a hazardous waste. To avoid contaminating used oil a clean container (or at least one that previously held uncontaminated used oil) should be used for storage.

15.3 Containers Holding Used Oil – Containers holding used oil must be kept tightly closed at all times to prevent possible contamination. The drum must be in good condition and clearly label as containing “Used Oil” for recycling.

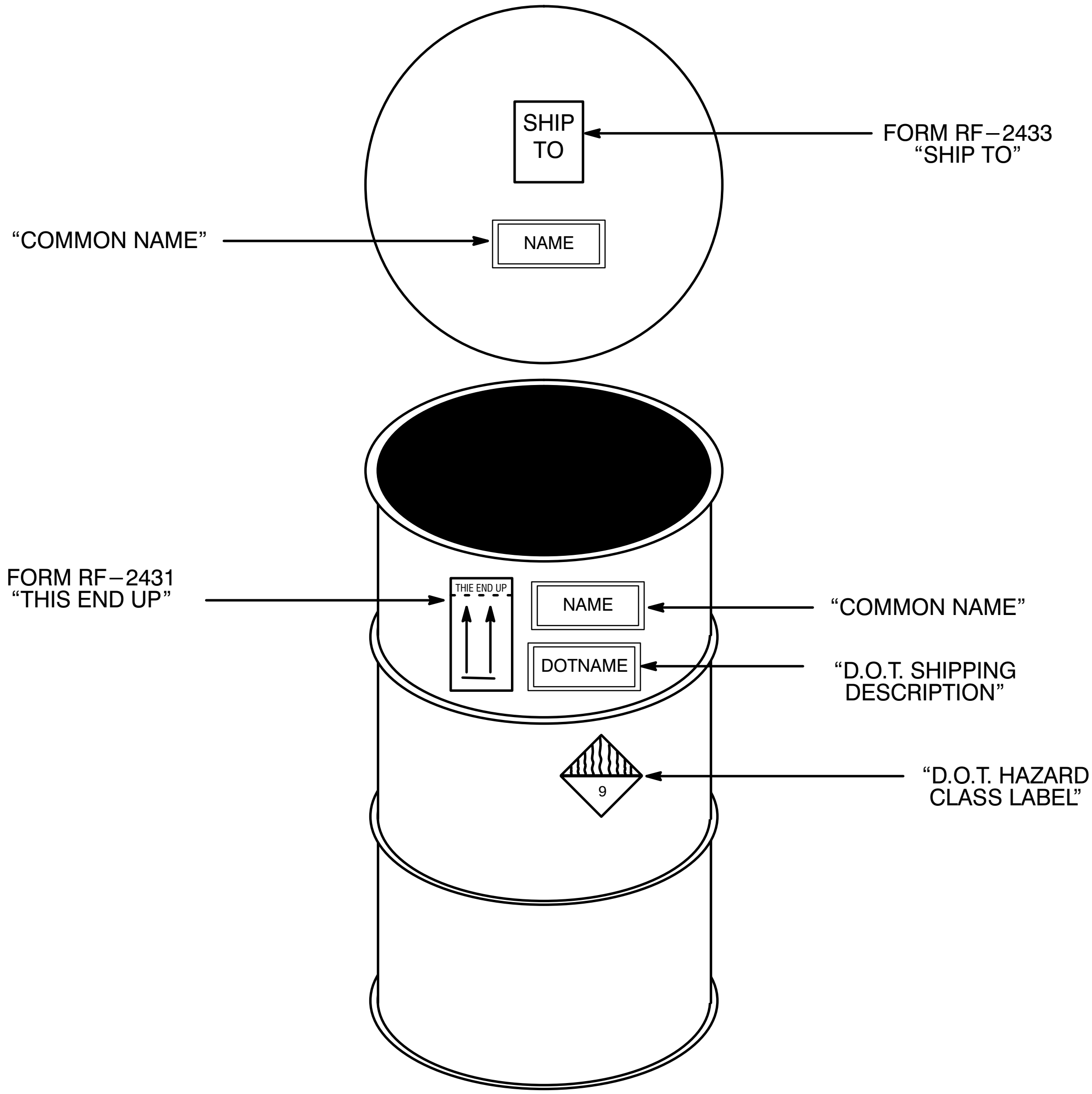
15.4 Transporting Used Motor Oil on Company Vehicles – Up to 55 gallons of used motor oil can be transported on company vehicles without any special provisions being taken. Quantities above 55 gallons require the following conditions be met:

- driver of the truck has a Commercial Drivers License with a hazardous materials endorsement,
- the truck is properly placarded,
- driver has a prepared uniform hazardous waste manifest for the load being carried, and
- driver has received proper training.

15.5 Used Oil Filters – Used oil filters must be drained of all residual oils (this may require that back flow preventers are punctured to allow trapped oils to escape). Drained filters are to be stored in properly labeled DOT approved shipping drums (DOT 1A2), and then recycled. Some heavy–duty filters manufactured with lead and tin alloys (terne–plated) are classified as a hazardous waste after use. It is recommended that terne–plated filters not be used unless there is no suitable substitute.

16. Used Antifreeze

16.1 Coolants/Antifreeze − Used coolants/antifreeze are generally 50/50% solutions of water and antifreeze that have been contaminated by by−products of engine combustion. Used coolants/antifreeze should be stored in uncontaminated DOT approved drums (1A1 steel) that have been labeled as containing “Used Antifreeze For Recycling”. Below is an illustration of use antifreeze markings/labels.



16.2 Recycling Antifreeze − All used antifreeze should be recycled, whenever possible. If recycling of antifreeze is not possible within your geographic area, the BSC should be contacted for proper disposition. Under no circumstances are antifreeze mixtures to be dumped down drains or onto the ground.

17. Shipping Papers

17.1 **Form RF−1021, Work Order,** − Form RF−1021 is used to notify and authorize a contractor/shipper to perform specified services, record actual services performed, and serve as supporting documentation for invoice purposes. The use of this form is in addition to any other required shipping documents, e.g., Scrap Disposition Record, Straight Bill of Lading, Uniform Hazardous Waste Manifest, etc..

Instructions for completing and distributing Form RF−1021 are found on the back of the last sheet of the form. Exhibit 1 is a copy of Form RF−1021 and the instructions.

17.2 **Form RF−1020−B, Scrap Disposition Record,** − Form RF−1020−B is a multipurpose form designed to document shipments of Network Engineering scrap material and hazardous material. This form must be completed with the required information and accompany each shipment of material to:

- the Material Disposition Center (MDC),
- direct to a vendor from central office contract removal sites, or,
- direct shipments of hazardous material to an approved disposal facility.

Instructions for completing and distributing Form RF−1020−B are found on the back of the last sheet of this form. BSP 748−400−002BT contains a copy of the form and the instructions for completing it. See Exhibit 3 for a copy of Form RF−1020−B.

17.3 **Form RF−1800, Straight Bill of Lading,** − Form RF−1800 is used to list all hazardous and non−hazardous materials being shipped via motor carrier, as required by DOT regulations. BSP 744−200−001BT, Issue B, specifies document preparation requirements and instructions for this document. Instructions for completing Form RF−1800 can be found on the back of the last sheet of the form. Exhibit 2 is a copy of Form RF−1800.

17.4 **Uniform Hazardous Waste Manifest** − The Uniform Hazardous Waste Manifest form is used to comply with DOT and RCRA requirements for generators and transporters of hazardous waste to identify all hazardous wastes being transported. BSP 744−200−001BT, Issue B, specifies document preparation requirements and instructions for this document. Instructions for completing the Uniform Hazardous Waste Manifest form can be found on the back of the last sheet of the form. Exhibit 4 is a copy of the Uniform Hazardous Waste Manifest form.

BELLSOUTH
TELECOMMUNICATIONS

Work Order

RF-1021
(1-92)

WO No.

(A) Ship From	**(B) Ship To**	
Company	Company	
Address	Address	
City/State/ZIP	City/State/ZIP	
Contact	Contact	
Telephone No. ( )	Telephone No. ( )	
Contact	**(C) Service Interval**	
Telephone No. ( )	Start Date	Completion Date
(D) Prepared By	**(G) Tracking**	
Telephone No. ( )	Local #	Local #
(E) Submitted To Company	CO #	CO #
(F) Bill To Company	DOT #	DOT #

(H) Services Requested

(I) Services Performed	**(J) Accounting**
Were services performed exactly as stated above? ☐ Yes ☐ No If no, explain in detail.	Location
	CLLI
	ACCT/JFC
	ACCT/JFC
	ACCT/JFC
	RCC
	GLC
	Auth. #

(K) Requested By:		Telephone No. ( )	Order #
			Vendor #
Authorized By:	Date	Telephone No. ( )	Other

Note: See reverse side of copy 4 for instructions.

Copy 1 - Contractor/Supplier   Copy 2 - Contractor/Supplier   Copy 3 - Originator   Copy 4 - Originator

Exhibit 1 − RF−1021
Page 1 of 2

Instructions for Completing Work Order

RF 1021
(1-92)
Reverse

I. General

The purpose of this form is to notify and authorize a contractor/supplier to perform specified services, record actual services performed, and serve as supporting documentation for invoice purposes.

The use of this form is in addition to any other required shipping documents, e.g., Scrap Disposition Record, Straight Bill of Lading, Uniform Hazardous Waste Manifest, etc.

II. Form Completion

Block A

Line 1 - Enter name of location shipped from
Line 2 - Enter complete street address
Line 3 - Enter city and state
Line 4 - Enter primary contact name
Line 5 - Enter primary contact telephone number
Line 6 - Enter secondary contact name
Line 7 - Enter secondary contact telephone number

Block B

Line 1 - Enter name of location shipped to
Line 2 - Enter complete street address
Line 3 - Enter city and state
Line 4 - Enter contact name
Line 5 - Enter contact telephone number

Block C

Enter actual start date and completion date of services identified in Block H

Block D

Line 1 - Enter name of person preparing form
Line 2 - Enter preparer's telephone number

Block E

Enter name of contractor/supplier where Work Order is submitted

Block F

Enter name of BellSouth company/location where contractor/supplier should submit invoices , e.g., BSS/B'ham

Block G

Complete all applicable tracking information
Line 1 - Enter local tracking number(s) (Optional)
Line 2 - Enter tracking number(s) (preprinted or assigned) associated with Company required shipping documents. For clarity, specify document name, i.e., Scrap Disposition Record (SDR - 123456).
Line 3 - Enter tracking number(s) (preprinted or assigned) associated with Department of Transportation required shipping documents. For clarity, specify document name, i.e., Straight Bill of Lading (B/L -12345).

Block H

Specify details of all work operation(s) requested.
The following items are suggested:

a. Number/Description of material
b. Estimated weight
c. Location within building
d. Obstacles, e.g., steps, ramps, etc.
e. Suggested entrance and/or exit route

Note: If more space is required, attach additional sheets

Block I

To be completed by contractor/supplier

Block J

Complete all applicable accounting information
Line 1 - Enter common location name
Line 2 - Enter Common Language Location Identifier Code (CLLI)
Line 3-5 - Enter Account Code or Job Function Code/Environmental Code. NOTE: If more than one Account Code, indicate percentages, e.g., 37 × 70%; 47 × 30%
Line 6 - Enter Responsibility Code Charged
Line 7 - Enter Geographic Location Code (Area Number)
Line 8 - Enter Authorization Number
Line 9 - Enter Telco Order Number/Project Number
Line 10 - Enter tracking number issued by Vendor
Line 11 - Enter miscellaneous accounting information

Block K

Line 1 - Enter name and telephone number of person requesting services
Line 2 - Signature and telephone number of person authorizing services and date form is forwarded to contractor/supplier

III. Distribution Of Copies

Copy 1 & 2 - Contractor/supplier copies. Copy 1 will be returned with invoice.

Copy 3 - Retained by Originator

Copy 4 - Extra (use optional)

Exhibit 1 − RF−1021 (Reverse)
Page 2 of 2

RF-1800
(4-92)
Front

Straight Bill Of Lading – Short Form
Original – Not Negotiable

(1) Name of Carrier

Page of

Shipper No.: (Must Be Entered On Carrier Freight Bill)

Carrier's No.:

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of the issue of this Bill of Lading.

At

Date:

From: BellSouth Telecommunications, Inc.

The property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classifications in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

(2) Consigned To

Address State Zip Delivery Address*

(*To be filled in only when shipper desires and governing tariffs provide for delivery thereat)

Route

Delivering Carrier

Car or Vehicle Initials No.

Check Service Required: ☐ Door to Door ☐ Door to Depot ☐ Depot to Depot ☐ Depot to Door

Billing Indicator | Billing Authority | EXTC/FC or FRC

RC-O | RC-C | Geo. Loc. | Auth. No.

(4) No. Shipping Units	HM	Kind of Package, Description of Articles, Special Marks, and Exceptions. **(If Hazardous Materials — Use Proper Shipping Name)**	Hazard Class	Weight (Sub. to Cor.)	Class Or Rate

Description	Weight (Sub. to Cor.)	Class or Rate	No. Shipping Units	Description
Cable				Telephone Equipment/Repair
Cable Reels, Empty				Telephone Parts
Central Office, Re-use				Stationery
PICS				

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight".

(3) RMN or REQ (For Internal Use Only: Do Not List On The Freight Bill)

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of Consignor)

If charges are to be prepaid, write or stamp here "To be Prepaid"

To Be Prepaid

Rec'd $ ____________ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per ____________
(The Signature here acknowledges only the amount prepaid)

Charges advanced:

$ ____________

(5) **Note:** Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be **not** exceeding

$ per

(6) This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department Of Transportation

per

(7) Special Instructions:

(8) **Placards Tendered:** ☐ Yes ☐ No

(9) Shipper

Per

Carrier

Per Date

(11) **Bill To:**

(10) Materials Received in Proper Condition? ☐ Yes ☐ No

If No - Specify:

Permanent Post Office Address of Shipper: **675 W. Peachtree St., NE, 31A49, Atlanta, GA 30375**

Exhibit 2 – RF–1800

Page 1 of 2

RF-1800
(4-92)
Reverse

Straight Bill Of Lading - Short Form

Instructions

The following instructions were designed to aid in the correct completion of this bill of lading. In addition, this form meets all Department of Transportation (DOT) requirements for shipping both hazardous and non-hazardous material. The RF-1800 form should be used when shipping any material via common carrier. This bill of lading must be legible, written in ink, indelible pencil or preferably typed, in English.

Section 1:

Name of Carrier	- Enter contracted transporting company's name
Page X of X	- Enter page # and total pages of the entire order.
Shipper No.	- Enter the MCC code in front of the preprinted number.
Carrier's No.	- Provided and entered by transporting company.
At	- Enter address where material is being shipped from, along with the date of shipment.

Section 2:

Consigned to	- Enter individual or company name where shipment is being delivered.
Address	- Enter address where shipment is being delivered.
Route	The routing information must be obtained from Headquarters Transportation & Materials Distribution Routing Guide.
Delivering Carrier	- Enter name of freight line that's transporting material.
Car or Vehicle Initials	- Enter transporting vehicle I.D. initials.
No.	- Enter transporting vehicle I.D. number(s)
Check Service Required	- Enter check mark in appropriate box.
Billing Indicator:	- Enter the appropriate billing indicator code.
Billing Authority	- Enter the appropriate billing authority number.
EXTC/FC or FRC	- Enter the appropriate FAS Code.
RC-O	- Enter the appropriate Responsibility Code Originator.
RC-C	- Enter the appropriate Responsibility Code charged **only** if different from RC-O.
Geo. Loc.	- Enter Geographical location code where material is being shipped from.
Auth. No.	- Enter Authorization number of personnel authorizing shipment.

Section 3:

Space provided to list requisition or internal document numbers.

Please read all information in this section and sign or complete as appropriate. NOTE: "TO BE PREPAID" must be marked through if material is being shipped collect.

Section 4:

No. Shipping Units	- Enter the number of items being shipped.
HM	- Place an "X" mark in this column if Hazardous Material. Enter HM items first if both HM and non-HM are being shipped.
Description	- Give complete and exact description of all materials being shipped, if not already pre-printed. If shipping hazardous material, use proper shipping name.
Hazard Class	- Contact T&MD and enter provided information on this line.
Weight	- Enter actual weight of shipment.
Class or Rate	- Class or Rate information can be obtained from the Headquarters Transportation & Materials Distribution Routing Guide.

Section 5:	- Provide the value of the material being shipped and sign statement if appropriate.
Section 6:	- This certification statement must be signed by shipper if shipping hazardous material.
Section 7:	- Special Instruction, i.e. freezables, transit privileges, dunnage used etc., should be stated on this line.
Section 8:	- This section must be completed by carrier's agent. It must be signed and dated.
Section 9:	- This section must be signed by shipper.
Section 10:	- This section must be completed by carrier agent.
Section 11:	- Enter the bill to address.

Warning: **Failure to package and ship hazardous materials/waste in accordance with guidelines and regulations may result in a violation in which fines and/or civil and criminal penalties may be levied against not only the corporation, but the individuals responsible for the violations.**

Warning: **Section 11904 (a)(1) of The Interstate Commerce Act and The Elkins Act provide heavy penalties for intentionally misdescribing shipments to obtain lower freight rates and charges.**

Exhibit 2 − RF−1800 (Reverse)
Page 2 of 2

BELLSOUTH
TELECOMMUNICATIONS

Scrap Disposition Record

RF-1020-B
(2-92)

A. Shipped To

MDC Or Vendor

Street Address

City And State

Person Shipping ( ) Tel: No. Date

B. Shipped From

Street Address

City And State

Form Prepared By ( ) Tel. No.

Packed By

SDR No.

C.
Telco Order No. ______
Vendor Order No. ______
State Code ___ ___ ___ ___

Page ___ of ___

D. Central Office Scrap Contracts

Contract No. ______

______ Last Shipment This Contract No.

______ Shipped To MDC

______ Maximum Segregation

CLLI Code ______

E. Carrier Information

Carrier ______

Trailer No. ______

Seal No. ______

Bill Of Lading No. ______

Gross Weight ______

F. Accounting Classifications

Estimate/Job Auth. No. ______

Geo. Loc. ______

RCO ______

RCC ______

Prorate Transportation & Scrap Credit As Follows:

Credit Type (Select One)

____"C" ____"X" ____"M"

Account (FRC/FC)	Percent
TOTAL	100%

G. Packing Description (Indicate No. Of Each, If Applicable)

____ Bags ____ Baskets ____ Boxes ____ Bundles ____ Coils ____ Crates

____ Drums ____ Pallets ____ Loose (See Items Listed Below)

H. Originator			I. For MDC/"On-Site" Rep. Use Only						J. Hdqrs. Use Only	
1	2	3	1	2	3	4	5	6	7	8
Description	Qty.	Estimated Weight	Line No.	Date Shipped/ Received	Scrap Material Class	Gross Weight	Net Weight	Lot Number	Vendor Type	Misc. Sales Amount
			1							
			2							
			3							
			4							
			5							
			6							
			7							
			8							
			9							
			10							
			11							
			12							
Total					Total					

Comptrollers	Hdqrs. Materials Mgmt.
Audited By:	Audited By:
Date:	Date:

Received By ______

Note: See reverse side of last sheet for instructions.

Exhibit 3 – RF–1020–B
Page 1 of 2

Instructions For Completing Form RF-1020-B

RF-1020-B
(2-92)
Reverse

Form RF-1020-B is a multi-purpose form designed to document shipments of Network Engineering scrap material and hazardous material. This form, completed with the required information, must accompany each shipment of material to the Materials Disposition Center (MDC), direct to a vendor from central office contract removal sites or direct shipments of hazardous material to an approved disposal facility.

The Accounting classifications, section F, must be completed accurately to insure proper proration of scrap credit and transportation charges, if applicable.

NOTE: Please refer to the appropriate BellSouth practices listed below for established procedures pertaining to handling scrap or hazardous material:

748-400-002SV	Handling Scrap Material - Field Locations
790-100-560SV	Scrap Disposition Procedures
748-300-002SV	Scrap Disposition Procedures Central Office Equipment

Packaging, labeling and shipping of hazardous material must be in compliance with federal, state and local laws and regulations.

I. General Requirements

On **ALL** shipments of scrap material, Blocks A, B, C (as applicable), E (if shipped by common carrier), F, G and H will be filled in. Listed below are additional instructions for blocks C, E, and G:

Block	Line	Instruction
C	State Code	**For the location receiving scrap credit** enter the common 2-digit abbreviation for the State/Area preceded by SB (Southern Bell) or SC (South Central Bell); i.e. SCAL (Al.) SBNF (North Fl.), SBSF (South Fl.)
E	Bill of Lading No.	If shipment is to a scrap vendor, enter Lot No. For common carrier shipments to the MDC, enter the red pre-printed SDR number.
F	RCO	Enter RCO of person initiating the form.
	RCC	Enter the RCC from the Telco Specification or from the Form RF-5433, as appropriate.
G	Packing Description	If more than one container is shipped per form, write the geographic location code on the containers to ensure that appropriate scrap credit will be received.

II. Scrap Shipments From Central Office Contract Removal Sites

Enter required information in Blocks A, B, C, E, F and G. Blocks D and I should be filled out according to the following instructions:

Block D - Central Office Scrap Contracts

1 - Enter appropriate contract number for material being shipped
2 - Check if last shipment to vendor on contract number entered on line 1
3 - Check if material is being shipped to MDC, per instructions from the Materials Management COE Disposition group
4 - Check if material shipped to MDC is maximum segregated
5 - Enter CLLI Code of Shipped From location

Block I - "On-Site" Representative

1 - Enter Date Shipped
2 - Enter Scrap Material Class
3 - Enter Gross Weight
4 - Enter Net Weight of scrap material
5 - Enter Lot Number of shipment

III. Distribution of Form RF-1020-B

Originator is responsible for distribution as follows:

Shipments to MDC

Copy 1 - Retained by the originator.
Copy 2-4 - Forward Copies 2-4 with the material to the MDC. (Forms should b placed in plastic envelope and attached to scrap.)
Copy 5 - Forward Copy 5 to the Equipment Engineer.
Copy 6 - Retained by the shipper if different from the originator.
Copy 7 - Mail To: Assistant Staff Manager - Disposition Support
BellSouth Telecommunications
Room 5H1
3700 Colonnade Parkway
Birmingham, AL 35243

Shipments To Vendor

Copy 1 - Retained by the originator.
Copy 2-3 - Mail, along with last copy (4th Copy) of Straight Bill of Lading Form RF-1800-SB or SCB to the following address:
BellSouth Telecommunications
Tracking and Payments
3700 Colonnade Parkway, Room 5H1
Birmingham, AL 35243
Copy 4 - Place in plastic packing envelope (along with Carrier Copy of Straight Bill of Lading, Form RF-1800-SB or SCB) and attach securely to rear, righthand inside wall of trailer. Exception: When shipping hazardous material, give to driver.
Copy 5 - Forward Copy 5 to the Equipment Engineer.
Copy 6 - Retained by the shipper if different from the originator.
Copy 7 - Mail To: Assistant Staff Manager - Disposition Support
(See address above.)

Emergency Contact Telephone Number

Please print or type
(Form designed for use on elite 12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039. Expires 9-30-94

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of	Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address		A. State Manifest Document Number
4. Generator's Phone ( )		B. State Generator's ID
5. Transporter 1 Company Name	6. US EPA ID Number	C. State Transporter's ID
		D. Transporter's Phone
7. Transporter 2 Company Name	8. US EPA ID Number	E. State Transporter's ID
		F. Transporter's Phone
9. Designated Facility Name and Site Address	10. US EPA ID Number	G. State Facility's ID
		H. Facility's Phone

11. US DOT Description *(Including Proper Shipping Name, Hazard Class, and ID Number)*	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.					
b.					
c.					
d.					

J. Additional Descriptions for Materials Listed Above	K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimized the present and future threat to human health and the environment; **OR,** if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	*Month*	*Day*	*Year*

GENERATOR

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	*Month*	*Day*	*Year*

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	*Month*	*Day*	*Year*

TRANSPORTER

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	*Month*	*Day*	*Year*

FACILITY

EPA Form 8700-22 (Rev. 9-92) Previous edition obsolete.

ORIGINAL-RETURN TO GENERATOR

7-BLS-C6
(Rev. 12/92)

Exhibit 4 − Uniform Hazardous Waste Manifest Form
Page 1 of 2

UNIFORM HAZARDOUS WASTE MANIFEST AND INSTRUCTIONS EPA FORM 8700-22

U.S. EPA Form 8700-22

Read all instructions before completing this form.

This form has been designed for use on a 12-pitch (elite) typewriter; a firm point pen may also be used — press down hard.

Federal regulations require generators and transporters of hazardous waste and owners or operators of hazardous waste treatment, storage, and disposal facilities to use this form (8700-22) and, if necessary, the continuation sheet (Form 8700-22A) for both inter- and intrastate transportation.

Federal regulations also require generators and transporters of hazardous waste and owners or operators of hazardous waste treatment, storage and disposal facilities to complete the following information.

GENERATORS

Item 1. Generator's U.S. EPA ID Number — Manifest Document Number

Enter the generator's U.S. EPA twelve digit identification number and the unique five digit number assigned to this Manifest (e.g., 00001) by the generator.

Item 2. Page 1 of —

Enter the total number of pages used to complete this Manifest, i.e., the first page (EPA Form 8700-22) plus the number of Continuation Sheets (EPA Form 8700-22A), if any.

Item 3. Generator's Name and Mailing Address

Enter the name and mailing address of the generator. The address should be the location that will manage the returned Manifest forms.

Item 4. Generator's Phone Number

Enter a telephone number where an authorized agent of the generator may be reached in the event of an emergency.

Item 5. Transporter 1 Company Name

Enter the company name of the first transporter who will transport the waste.

Item 6. U.S. EPA ID Number

Enter the U.S. EPA twelve digit identification number of the first transporter identified in item 5.

Item 7. Transporter 2 Company Name

If applicable, enter the company name of the second transporter who will transport the waste. If more than two transporters are used to transport the waste, use a Continuation Sheet(s) (EPA Form 8700-22A) and list the transporters in the order they will be transporting the waste.

Item 8. U.S. EPA ID Number

If applicable, enter the U.S. EPA twelve digit identification number of the second transporter identified in item 7.

Note.—If more than two transporters are used, enter each additional transporter's company name and U.S. EPA twelve digit identification number in items 24-27 on the Continuation Sheet (EPA Form 8700-22A). Each Continuation Sheet has space to record two additional transporters. Every transporter used between the generator and the designated facility must be listed.

Item 9. Designated Facility Name and Site Address

Enter the company name and site address of the facility designated to receive the waste listed on this Manifest. The address must be the site address, which may differ from the company mailing address.

Item 10. U.S. EPA ID Number

Enter the U.S. EPA twelve digit identification number of the designated facility identified in item 9.

Item 11. U.S. DOT Description [Including Proper Shipping Name, Hazard Class, and ID Number (UN/NA)]

Enter the U.S. DOT Proper Shipping Name, Hazard Class, and ID Number (UN/NA) for each waste as identified in 49 CFR 171 through 177.

Note.—If additional space is needed for waste descriptions, enter these additional descriptions in item 28 on the Continuation Sheet (EPA Form 8700-22A).

Item 12. Containers (No. and Type)

Enter the number of containers for each waste and the appropriate abbreviation from Table I (below) for the type of container.

Table I — Types of Containers

DM = Metal drums, barrels, kegs	CY = Cylinders
DW = Wooden drums, barrels, kegs	CM = Metal boxes, cartons, cases (including roll-offs)
DF = Fiberboard or plastic drums, barrels, kegs	CW = Wooden boxes, cartons, cases
TP = Tanks portable	CF = Fiber or plastic boxes, cartons, cases
TT = Cargo tanks (tank trucks)	BA = Burlap, cloth, paper or plastic bags
TC = Tank cars	
DT = Dump truck	

Item 13. Total Quantity

Enter the total quantity of waste described on each line.

Item 14. Unit (Wt./Vol.)

Enter the appropriate abbreviation from Table II (below) for the unit of measure.

Table II — Units of Measure

G = Gallons (liquids only)	L = Liters (liquids only)
P = Pounds	K = Kilograms
T = Tons (2000 lbs)	M = Metric tons (1000 kg)
Y = Cubic yards	N = Cubic meters

Item 15. Special Handling Instructions and Additional Information

Generators may use this space to indicate special transportation, treatment, storage, or disposal information or Bill of Lading information. States may not require additional, new, or different information in this space. For international shipments, generators must enter in this space the point of departure (City and State) for those shipments destined for treatment, storage, or disposal outside the jurisdiction of the United States.

Item 16. Generator's Certification

The generator must read, sign (by hand), and date the certification statement. If a mode *other than* highway is used, the word "highway" should be lined out and the appropriate mode (rail, water, or air) inserted in the space below. If another mode *in addition to* the highway mode is used, enter the appropriate additional mode (e.g., *and rail*) in the space below.

Primary exporters shipping hazardous wastes to a facility located outside of the United States must add to the end of the first sentence of the certification the following words "and conforms to the terms of the EPA Acknowledgment of Consent to the shipment."

In signing the waste minimization certification statement, those generators who have not been exempted by statute or regulation from the duty to make a waste minimization certification under section 3002(b) of RCRA are also certifying that they have complied with the waste minimization requirements.

Generators may preprint the words, "On behalf of" in the signature block or may hand write this statement on the signature block prior to signing the generator certifications.

Note.—All of the above information *except* the handwritten signature required in item 16 may be preprinted.

TRANSPORTERS

Item 17. Transporter 1 Acknowledgement of Receipt of Materials

Enter the name of the person accepting the waste on behalf of the first transporter. That person must acknowledge acceptance of the waste described on the Manifest by signing and entering the date of receipt.

Item 18. Transporter 2 Acknowledgement of Receipt of Materials

Enter, if applicable, the name of the person accepting the waste on behalf of the second transporter. That person must acknowledge acceptance of the waste described on the Manifest by signing and entering the date of receipt.

Note.—International Shipments — Transporter Responsibilities.

Exports—Transporters must sign and enter the date the waste left the United States in item 15 of Form 8700-22.

Imports—Shipments of hazardous waste regulated by RCRA and transported into the United States from another country must upon entry be accompanied by the U.S. EPA Uniform Hazardous Waste Manifest. Transporters who transport hazardous waste into the United States from another country are responsible for completing the Manifest (40 CFR 263.10(c)(1)).

OWNERS AND OPERATORS OF TREATMENT, STORAGE, OR DISPOSAL FACILITIES

Item 19. Discrepancy Indication Space

The authorized representative of the designated (or alternate) facility's owner or operator must note in this space any significant discrepancy between the waste described on the Manifest and the waste actually received at the facility.

Owners and operators of facilities located in unauthorized States (i.e., the U.S. EPA administers the hazardous waste management program) who cannot resolve significant discrepancies within 15 days of receiving the waste must submit to their Regional Administrator (see list below) a letter with a copy of the Manifest at issue describing the discrepancy and attempts to reconcile it (40 CFR 264.72 and 265.72).

Owners and operators of facilities located in authorized States (i.e., those States that have received authorization from the U.S. EPA to administer the hazardous waste program) should contact their State agency for information on State Discrepancy Report requirements.

EPA Regional Administrators

Regional Administrator, U.S. EPA Region I, J.F. Kennedy Fed. Bldg., Boston, MA 02203

Regional Administrator, U.S. EPA Region II, 26 Federal Plaza, New York, NY 10278

Regional Administrator, U.S. EPA Region III, 6th and Walnut Sts., Philadelphia, PA 19106

Regional Administrator, U.S. EPA Region IV, 345 Courtland St., NE., Atlanta, GA 30365

Regional Administrator, U.S. EPA Region V, 230 S. Dearborn St., Chicago, IL 60604

Regional Administrator, U.S. EPA Region VI, 1201 Elm Street, Dallas, TX 75270

Regional Administrator, U.S. EPA Region VII, 324 East 11th Street, Kansas City, MO 64106

Regional Administrator, U.S. EPA Region VIII, 1860 Lincoln Street, Denver, CO 80295

Regional Administrator, U.S. EPA Region IX, 215 Freemont Street, San Francisco, CA 94105

Regional Administrator, U.S. EPA Region X, 1200 Sixth Avenue, Seattle, WA 98101

Item 20. Facility Owner or Operator: Certification of Receipt of Hazardous Materials Covered by This Manifest Except as Noted in Item 19

Print or type the name of the person accepting the waste on behalf of the owner or operator of the facility. That person must acknowledge acceptance of the waste described on the Manifest by signing and entering the date of receipt.

Items A-K are not required by Federal regulations for intra- or interstate transportation. However, States may require generators and owners or operators of treatment, storage, or disposal facilities to complete some or all of items A-K as part of State manifest reporting requirements. Generators and owners and operators of treatment, storage, or disposal facilities are advised to contact State officials for guidance on completing the shaded areas of the Manifest.

Public reporting burden for this collection of information is estimated to average: 37 minutes for generators, 15 minutes for transporters, and 10 minutes for treatment, storage and disposal facilities. This includes time for reviewing instructions, gathering data, and completing and reviewing the form. Send comments regarding the burden estimate, including suggestions for reducing this burden, to: Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office Management and Budget, Washington, DC 20503.

Exhibit 4 – Uniform Hazardous Waste Manifest Form (Reverse)
Page 2 of 2

TUBE CODE	RADIUM BROMIDE TUBES — RADIUM 226 CONTENTS — MICROCURIES	MILLICURIES	DATE CONVERTED TO KR−85	KRYPTON TUBES — KRYPTON 85 CONTENT — MICROCURIES	MILLICURIES	CODE M.D. REPLACED BY
313A	0.10	0.0001	–	–	–	313C
313B	0.10	0.0001	–	–	–	313CA
313C	0.01	0.00001	6026	0.50	0.0005	–
313AA	0.10	0.0001	–	–	–	313CA
313CA	0.01	0.00001	6026	0.50	0.0005	–
313CB	0.01	0.00001	6026	0.50	0.0005	–
313CC	0.01	0.00001	6026	0.50	0.0005	–
313CD	0.01	0.00001	6026	0.50	0.0005	–
333A	0.01	0.00001	–	–	–	426A
346A	0.10	0.0001	–	–	–	346B
*346B	1.00	0.001	–	–	–	346C
346C	–	–	5952	4.50	0.0045	–
353A	0.01	0.00001	6026	0.50	0.0005	–
358A	–	–	6026	0.05	0.00005	–
359A	0.01	0.00001	6013	1.20	0.0012	–
372A	0.01	0.00001	–	–	–	426A
376A	0.10	0.0001	–	–	–	376B
*376B	1.00	0.001	–	–	–	376C
376C	–	–	5952	4.00	0.004	–
395A	0.01	0.00001	6039	1.60	0.0016	–
411A	0.01	0.00001	–	–	–	425A
*413A	1.00	0.001	–	–	–	413B
*413B	–	–	5952	4.40	0.0044	–
423A	0.01	0.00001	–	–	–	423C
*423B	0.50	0.0005	–	–	–	423C
423C	–	–	6052	4.50	0.0045	–
425A	0.01	0.00001	6026	2.10	0.0021	–
426A	0.01	0.00001	6013	2.00	0.002	–
427A	0.10	0.0001	6039	4.00	0.004	–
*430A	0.50	0.0005	–	–	–	430B
430B	–	–	5952	4.50	0.0045	430C
430C	–	–	7226	15.00	0.015	–
432A	0.01	0.00001	–	–	–	432B
432B	0.01	0.00001	6052	4.50	0.0045	–
439A	0.01	0.00001	6139	3.00	0.003	–
443A	0.01	0.00001	6013	2.00	0.002	–
446A	0.10	0.0001	6026	0.10	0.0001	–
447A	0.01	0.00001	6026	0.10	0.0001	–
451A	0.01	0.00001	6026	2.10	0.0021	–
453A	0.01	0.00001	6026	0.30	0.0003	–
*5589	1.00	0.001	–	–	–	None
6140	0.01	0.00001	6052	4.50	0.0045	–
6141	0.10	0.0001	6039	4.00	0.004	–
6167	0.01	0.00001	6139	3.00	0.003	–
6388	0.01	0.00001	6013	2.00	0.002	–

* RaBr tubes may be marked with 3 bladed magenta radiation symbol. No Krg5 tubes are marked with this symbol.

Exhibit 5 − Cold Cathode Tube Conversion Chart

CABLING AND WIRING − INSTALLATION PROCEDURES

CONTENTS

CABLING AND WIRING – INSTALLATION PROCEDURES

1. Introduction

1.1 This section provides general and workmanship requirements pertaining to cable repair, installation, protection, securing, routing, placement and support of switchboard cable and wire, shielded cable and wire and fiber optic cable.

1.2 The workmanship requirements in this section are general guidelines and not meant to be all inclusive or an exhaustive treatment of the subject.

1.3 For the purpose of this section, the word “cable” refers to cable and wire products. The word “wire” is only used where a distinction from cable is required.

1.4 For the purpose of this section the term “fiber optic jumper” refers to single or multiple fiber optic jumpers which are used to cable from one equipment frame to another or from one unit of equipment to another within an equipment frame.

1.5 For the purpose of this section the term “fiber optic cable” refers to the fiber optic cables which inter−connect one Central Office to another.

General

1.6 The Specific Installation Instructions and CO Base Drawings shall provide the installer a current cabling plan indicating the cable rack, cable hole, cable rack class and route information. The cable running list will provide the size, type and cable route to use. No changes shall be made in the routing of cables as indicated in the cable specification without the approval of the engineer who provided the specific installation instructions.

1.7 Cable pileup shall not exceed the length of the vertical bars (horns) that contain the cable on cable racks. Horizontal and vertical power cable runs shall not exceed an ultimate pileup of 7 inches which is approximately equivalent to five layers of 750MCM cable. For switch board cable pile up the maximum is 12 inches. See Section 8 for more details. When a cable rack congestion is encountered, the installer shall mark the affected job cable plan drawing to indicate the location of the cable run/hole that is blocked. If there are any overhead obstructions, show the clearance between the top of the pileup and the obstruction. The installer shall forward this marked drawing to the engineer when the job is completed.

1.8 Unless otherwise specified, manufacture tags (i.e., cable part numbers, hazardous voltages labels, etc.) that are part of the cable assembly shall be left in place.

1.9 The Installation Supplier shall adhere to the wiring color codes as specified in the job documentation. In the event that the color wire is “manufacture discontinued” a substitute color may be utilize, however type insulation and gauge must be of the type originally specified.

1.10 The tools used for the preparation of wire ends, termination, stripping and butting shall be of the type (or equivalent type) specified by the cable manufacturer.

1.11 Cable shall be dressed in such a manner so as to avoid congestion, to insure accessibility and to maintain proper clearances between wiring terminals.

1.12 Cable shall be dressed so as to avoid contact with heat producing devices.

1.13 In no case shall cable be pulled tightly across any edges whether they are protected or not. Cable shall not be twisted or bent so as to injure the cable sheath.

1.14 All cable shall be the type and gauge specified in the job documentation.

1.15 The installation of “standard length” fiber optic jumpers has a tendency of creating excess slack. The Installation Supplier shall place the shortest appropriate “standard length” jumper to prevent excessive slack.

2. Cable Openings

2.1 The Installation Supplier shall minimize the number of cable holes opened during the installation activity. Inter−floor cable holes, slots and sleeves must be properly closed and firestopped to control possible fire and smoke propagation.

2.2 Refer to the appropriate section of this document for information on opening, closing and fire stopping cable holes, slots and sleeves.

3. Damaged Cables

3.1 Damaged outer jackets of polyvinyl chloride (PVC) covered cables shall be repaired with electrical tape. The tape shall be applied in two half lapped layers with the final two wraps applied without tension and over lapping. The tape shall extend a minimum of 2 inches past the damaged section.

3.2 Seriously damaged sections of outer jackets of PVC covered cables should be repaired by removing the damaged section and replacing it with the covering from a similar cable. Apply a single half lapped layer of electrical tape over the new section to secure it in place.

3.3 Damaged outer jackets of power cable shall be repaired by wrapping with a minimum of two half lapped layers of rubber tape then two half lapped layers of electrical tape. The tape shall extend a minimum of 2 inches past the damaged section.

3.4 A run of cable shall be replaced if the conductor(s) has been nicked, cut or damage. (Additional splicing requirements are specified in Section 23, Sub−Section 11)

4. Installation

4.1 The Installation Supplier shall utilize cable installation tools of an appropriate type and size to safely complete all cable installation activities.

4.2 Cable dispensing devices (i.e., cable reel stands, lazy susans, etc.), when in use, shall be located far enough away from working equipment to avoid any possibility of the cable or cable dispensing device contacting the equipment.

4.3 When multiple cable runs are being pulled up onto a cable rack, sheet fiber protection (or an equivalent) shall be placed, so as to protect existing cable and/or the new cable, at the point where the new cables are being pulled over the edge of the cable rack and/or existing cable.

4.4 Cable guides (rings) shall be placed at turns, and along the cable runs at frequent enough intervals to prevent the cables from rubbing on the framework, cable racks, threaded rods and other cables as they are being installed.

4.5 When running cable in working offices, cable guides shall be placed, where possible, over non−working equipment since dirt is most likely to fall from cables where they pass through the guides. If the rings must be placed over working equipment the equipment shall be adequately protected.

4.6 During installation, cables shall be temporarily secured at corners. Also, adequate slack shall be placed in the corners so that the cables can be evenly distributed on the cable rack upon completion of the cabling activity.

4.7 Cables installed on a multi−floor cable run shall be adequately secured, as required, during unattended periods and installation activities, to avoid the possibility of the cables breaking away and free falling to the floors below.

4.8 During installation, any cables left, hanging unterminated in equipment frameworks, shall be neatly coiled above the floor level and have their exposed ends insulated. Under no circumstances shall the cables be left on the floor.

4.9 Unless otherwise specified or requested with written approval, all installer cable tags shall be removed prior to the equipment being turned over to BST.

4.10 Tags that must or that are requested to be left on cable ends must be of fire retardant material and should fit snugly around the circumference of the cable.

4.11 During cable running operations the exposed ends of power cables shall be insulated to prevent accidental contact with live circuits.

4.12 All cabling in bays shall be placed and dressed to a minimum of 2 inches above the floor, except the cabling for AC receptacles at the bottom of the bay or as specified by the equipment manufacturer.

5. Cable Protection

A. General

5.1 All cables shall be protected where it bends around or comes in contact with edges or corners of supports, auxiliary framing, cable rack stringer, threaded rods, or other metal edges that can cause damage to the cable.

5.2 Cable connected to, or adjacent to, movable parts or equipment (e.g., hinged or retractable parts) shall be protected where the cable may come in contact with surfaces such as those mentioned above.

5.3 Where cables or wire pass through metal openings protection shall be appropriately applied to either the cable, wire and/or the metal edge.

5.4 Sheet fiber, PVC,and electrical tape shall be used for protection at the appropriate locations.

5.5 Protection can be placed initially when it is obvious that the subsequent addition of cables or other activity in the immediate area may force the cables into contact with the metal edges.

B. Polyvinyl Chloride

5.6 3/4” rigid PVC tubing shall be placed on threaded rods where cables turn off the cable rack adjacent to the hanger rods. If practical, the tubes should be of uniform length and be long enough to adequately protect the cabling to the ultimate height of the cable build up.

5.7 PVC insulation shall be placed on cable rack retaining brackets to protect cables where cables bend sharply across the cable retaining brackets.

5.8 Semi rigid (1/64 inch) PVC tubing may be used for protection of cable forms, spare skinner lengths, spare leads etc.

5.9 Semi rigid (1/64 inch) PVC tubing may be slit lengthwise for installation purposes but it shall maintain a minimum of a 1/2 inch overlap along the lengthwise slit when in contact with hazardous surfaces. Slit PVC tubing shall be secured with lacing cord at two points.

5.10 PVC strips shall be placed, for cable protection, on the edges of unequal flange cable duct type framework.

5.11 Flexible PVC tubing shall not be used for protection where they might come in contact with a hot soldering iron or other heat producing devices.

C. Sheet Fiber (Flame Retardant)

5.12 Two layers of 1/64 inch or one layer of 1/32 inch thick sheet fiber insulation may be used in place of PVC protection. The sheet fiber where practical, shall be secured to the metalwork rather than the cable.

5.13 Sheet fiber shall be used instead of tape for cables that must be protected from contact with both the metalwork and twine. In this case the sheet fiber shall be wrapped and secured around the cable to prevent the twine from cutting into the cable.

5.14 Sheet fiber should be securely fastened so as to prevent displacement and to avoid projecting edges or corners when wrapped around metalwork or cables.

5.15 Sheet fiber protection shall be placed at all locations where cables turn off the cable rack across the stringer,including tubular cable rack, whether or not the cables are in physical contact with the stringers initially.

5.16 Sheet fiber protection shall be placed on the cable rack cross straps, excluding tubular type cable rack, where cables pass through the middle of the cable rack. When the exact area where cables are to be turned over the strap cannot be predetermined, sheet fiber may be placed across the entire length of the strap.

5.17 Where cables break off through the middle of a screened and bracketed cable rack to serve equipment directly below the rack, sheet fiber protection shall be applied on the cable rack cross strap at the break off point and around the cables where the sheet metal screen has been cut for the cables to pass through.

5.18 Sheet fiber protection shall be placed on the cable rack cross straps, including tubular cable rack, where the cable rack makes a turn up, down or 90 degree turns at the same level. In addition, on all cross straps in the turn that the cable exerts more than normal pressure.

5.19 Cable shall be protected with fiber at points of contact with the flange side of cable rack cross straps. This condition may be encountered where inverted cable racks are used, or where cable must be placed on the flange side of cable racks (see Figure 1).

5.20 When sheet fiber protection is required on cross straps it shall be secured with twine/cord.

5.21 Sheet fiber protection shall extend a minimum of 1/2 inch past the areas requiring protection.

5.22 All power cable not clearly identifiable as Textile Jacketed shall be protected from contact with cable brackets, cable racks, framework, nylon cable ties and sewing twine. Protection shall be accomplished by wrapping the cables with two layers of 1/64 inch sheet fiber or one layer of 1/32 inch sheet fiber.

D. Tape

5.23 Electrical tape shall not be used for protection where they might come in contact with a hot soldering iron or other heat producing devices, or where they might be subject to pressure, such as on wiring that is tied to framework.

5.24 Tape shall be kept as clean as possible during application to assure good adhesion and to prevent unraveling. Tape shall also be applied evenly in half lapped layers. Due to the tendency of plastic electrical tape to recede, the last two turns shall be overlapped and applied without any tension at a right angle to the cable form.

5.25 Metalwork shall be protected with PVC strips or sheet fiber.

6. Securing With Twine

6.1 The Installation Supplier shall utilize tools of the appropriate type when sewing with twine.

6.2 9 Ply Waxed polyester twine shall be used for sewing and banding of cable.

6.3 Unless otherwise specified, 2 strands of twine shall be used for sewing all cable on vertical and horizontal cable runs (refer to Table A for stitching requirements).

6.4 Refer to Figures 2 through 12 for examples of sewing methods.

6.5 Refer to Table A for the acceptable number of cables that may be placed under one stitch.

6.6 Cables shall be sewn at cable rack corner cross straps in the same manner in which they are sewn to cable rack cross straps (see Figure 8).

6.7 Lengths of twine shall not be left hanging from equipment, cable securing brackets, cable racks, etc.

7. Nylon Cable Ties

A. General

7.1 Nylon cable ties used for banding and securing of cable, fiber protection, PVC protection etc., shall be of an adequate size, type, strength, etc. for the particular application.

7.2 Tension and cutting of nylon cable ties shall be accomplished using a tension and cutting tool that will not constrict the cable in a manner that will cause damage to the cable or conductor insulation.

NOTE: Diagonal wire cutters or other similar cutting devices shall not be used for cutting the ends of nylon ties since this may result in exposing hazardously sharp ends.

7.3 The cut end of the tie must not protrude past the locking head.

7.4 Under no circumstances shall nylon cable ties have sharp or jagged cut ends protruding from the locking head. A nylon tie is considered to have sharp or jagged ends when it is sharp to the touch.

7.5 Nylon cable ties shall be tensioned around cable or wire forms tightly enough to hold the cables or wire together and/or properly positioned, but not so tightly or at such angles so as to cause possible damage to the insulation of the cable or wire. The nylon ties when placed around cable or wire form, should be flat and not twisted.

7.6 Nylon cable ties, banded around cables or wire, shall be capable of being rotated with slight to moderate pressure applied with the thumb to the head of the tie. If banded cables or wire, under and/or adjacent to the nylon tie, twist, or deform when pressure is applied to the head of the tie, then the tie has been applied too tightly.

7.7 Nylon cable ties shall not be placed over starting stitches or other knots of twine, or over other nylon ties.

7.8 The locking head of nylon cable ties shall be positioned so as not to interfere with the installation or removal or apparatus or equipment, or the superimposing of additional cable or wire forms.

7.9 When securing cables with nylon cable ties, the locking head of the tie must not appear between layers of cable, or directly over the heads of other cable ties (see Figure 13 and 14 for typical methods of securing cable to U and L type cable brackets using cable ties).

7.10 Where cable or wire forms are secured to cable securing brackets, the locking head of nylon cable ties shall be positioned on the side of the bracket opposite the side on which the cables or wire are run.

B. Use Of Nylon Ties

7.11 Nylon cable ties may be used in place of twine for:

(1) Securing cables to transverse arms of distributing frames and cable securing brackets on equipment frames (see note below) as indicated in Figures 15−18

NOTE: When securing cable to cable securing brackets on equipment frames only. After securing cables to the top bracket with twine cable ties can be used to form cables, secure to cable brackets, etc., within the confines of the bay.

(2) Banding of cable including flexible power cable (see item 3 below).

(3) All flexible power cable that is not identifiable as textile, jacketed or armored shall be protected from contact with nylon cable ties by wrapping the cable with two layers of 1/64th inch or one layer of 1/32 inch sheet fiber protection. Those flexible power cables requiring protection include, but are not limited to rubber, hypalon, plastic, thermoplastic, neoprene, propylene and synthetic polymer.

(4) Banding of coaxial cables or shielded cables, except those coaxial cable with soft dielectric (foam) centers. (BellSouth considers AT&T 735A and Comscope 5535 coaxial cables to be soft dielectic.)

NOTE: Where only a few coaxial cables are to be banded with other cable, the coaxial cable, where practical, should be embedded in the cable form so that the nylon cable ties will not come in contact with the coaxial cable.

(5) Banding together of cable installed in compartmentalized cable troughs/racks.

7.12 Nylon cable ties shall not be used for:

(1) Banding or securing cable on cable racks.

(2) Banding or securing fiber optic jumpers/cables.

(3) Securing cable to the top cable securing bracket on equipment frames.

(4) Securing vertical cables to horizontal cables, or at any location where wiring and/or cable intersect.

(5) Soft foam dielectric coaxial cable. (See paragraph 12.13 for examples.)

8. Cable And Wire Forms

8.1 When referred to in this section bracing is special wire sewed to cable or wire forms and fastened to the framework.

8.2 Cable and wire forms shall be placed so as to allow for maintenance and inspection of apparatus and equipment.

8.3 Cable form reinforcement and bracing shall be located and installed per the job documentation.

8.4 If cable form bracing is not provided in the job documentation, but is needed, a 16 gauge solid wire may be sewn for stiffening into the form.

8.5 In no case shall cable or wire forms be pulled tightly across any edges whether they are protected or not.

8.6 Stitches or ties used to superimpose one cable form to another cable form shall be placed at a maximum of 4 inch centers.

8.7 Stitches or ties shall be placed at each break out location on cable forms.

9. Routing And Placement

A. General

9.1 The routing of cables, critical cable lengths and classified cable segregation requirements shall be in accordance with job documentation.

9.2 Congestion on cable racks shall be avoided. When the job documentation does not specify cable routes for the installation of large quantities of cable the Installation Supplier shall use more than one route (when available) to avoid unnecessary cable pileup.

9.3 Any blocked cable runs encountered during a cabling operation shall follow the requirements outlined in paragraph 1.7 of this section.

9.4 Cable shall be dressed away from sharp corners or edges an/or heat producing devices, and shall not interfere with the addition of future equipment.

9.5 In central offices designated for earthquake bracing, interaction between different equipment assemblies may be subject to excessive stress caused by large out−of−phase vibrations of the connections. Provisions for slack in the cable runs will allow for motions caused by earthquakes. A minimum of six inches of slack should be allowed between these equipment assemblies.

9.6 In all cases the minimum bending radius of cable (i.e., power, switchboard, coaxial, fiber, armored, etc.) shall not be less than the cable manufacturer's specification. The following should be used as bending requirements for Cable and Wire:

A. MINIMUM BENDING RADIUS

Cable Type	Bending Radius
Switchboard	5 Times Cable Diameter
Lightguide	20 Times Cable Diameter
Shielded/Coaxial, Twin Conductor	5 Times Cable Diameter

IMPORTANT: Individual cable bending radius must be calculated within cable type because of the variability of diameters.

B. TYPICAL FIBER BENDING RADIUS

Lightguide Cable	Bending Radius
Single Fiber	1 1/2 inches
Dual Fiber * Quad	1 1/2 inches
Ribbon Fiber	9 inches

* Dependant on manufacturer's recommendation

AC POWER CABLE/WIRE

Wire Size	Bare Wire Diameter	Minimum Bending Rad.
14 Solid	0.064	0.77”
12 Solid	0.080	0.85”
10 Solid	0.102	0.96”
08 Solid	0.129	1.25”
14 Stranded	0.073”	0.82”
12 Stranded	0.092”	0.91”
10 Stranded	0.116”	1.03”
08 Stranded	0.146”	1.33”
06 Stranded	0.184”	1.52”
04 Stranded	0.232”	1.76”
02 Stranded	0.292”	2.06”
1/0 Stranded	0.373”	2.67”
2/0 Stranded	0.418”	2.89”
4/0 Stranded	0.528”	3.44”
350 Stranded	0.681”	4.36”
500 Stranded	0.813”	5.02”
750 Stranded	0.998”	6.09”

DC POWER CABLE
2−CONDUCTOR FLAT

Wire Size	Overall Diameter	Minimum Bending Rad.
14 Solid	.26 X .45	1.04”
12 Solid	.28 X .46	1.12”
10 Solid	.30 X .52	1.20”
08 (7) Strands	.35 X .67	1.40”
06 (7) Strands	.41 X .74	1.64”
04 (7) Strands	.46 X .86	1.84”
02 (7) Strands	.52 X .98	2.08”
1/0 (19) Strands	.63 X 1.2	2.52”
2/0 (19) Strands	.68 X 1.29	2.72”
4/0 (19) Strands	.79 X 1.51	3.16”

DC POWER CABLE
3−CONDUCTOR FLAT

Wire Size	Overall Diameter	Minimum Bending Rad.
14 Solid	.47	1.88”
12 Solid	.50	2.00”
10 Solid	.55	2.20”
08 (7) Strands	.71	2.84”
06 (7) Strands	.79	3.16”
04 (7) Strands	.90	3.60”
02 (7) Strands	1.03	5.15”
1/0 (19) Strands	1.27	6.35”
2/0 (19) Strands	1.37	6.84”
4/0 (19) Strands	1.62	8.10”

DC POWER CABLE

Wire Size	Bare Wire Diameter	Minimum Bending Rad.
14	0.064	0.95”
12	0.081	1.05”
10	0.102	1.20”
08	0.146	1.55”
06	0.184”	2.00”
04	0.232”	2.25”
02	0.292”	2.55”
1/0	0.373”	3.15”
2/0	0.418”	3.40”
4/0	0.528”	3.90”
350	0.681”	4.90”
500	0.814”	5.60”
750	0.998”	6.70”

9.7 If further information is needed on the minimum radius for a specific cable or wire type, refer to the manufacture specification.

9.8 Listed below are the only exceptions for storing excess cable on or in cable racks, compartments and ducts.

(1) When the excess cable is required for proper equipment operation the excess cable shall be distributed on or in cable racks, compartments or ducts so the pileup is not concentrated at a single location.

(2) When the excess cable is associated with equipment located in temporary locations and the excess cable will be used when the equipment is moved to its ultimate location, the excess cable shall be coiled banded, identified and secured to the cable rack above the equipment frame. This type of stored cable shall be repositioned on subsequent cabling operations to avoid burial.

(3) When cable is equipped with apparatus that cannot be disconnected and reterminated in the field.

(4) Placing standard length fiber jumpers has a tendency of excess slack. Excess slack shall be stored at the equipment end, not the lightguide frame or shelf end.

9.9 Cable pileup on vertical switchboard cable runs shall be limited so that it is not closer than 3 inches to the side of the cable hole. Cable pileup on vertical power cable runs shall be limited to 7 inches.

9.10 Table "C" at the end of this section shows cable types and electrical transmission distances.

9.11 All power cable not clearly identifiable as Textile Jacketed shall be protected from contact with cable brackets, cable racks, framework, nylon cable ties and sewing twine. Protection shall be accomplished by wrapping the cables with two layers of 1/64 inch sheet fiber or one layer of 1/32 inch sheet fiber.

B. Fiber Optic Cable

9.12 When routing fiber optic jumpers and cable they shall not be pulled, twisted or kinked. Fiber optic cables that have been kinked or damaged shall be replaced.

9.13 Fiber optic jumpers and cable shall be run segregated from all other types of cable and placed on or in dedicated rack, compartment or duct. No other types of cables shall be run on or in dedicated fiber optic cable racks, compartments or ducts.

Fiber optic jumpers pile−up shall not exceed 85% of the height of Fiber Pathway System.

9.14 If fiber optic jumpers and cable are to share a cable rack, compartment or duct, with another type of cable, they shall have a physical barrier to prevent other types of cable from being run in, over and/or around the fiber optic jumpers or cable. No other types of cable shall be run on, over or around fiber optic jumpers or cable.

9.15 When running fiber optic jumpers, the connector must be protected with a protective cover to prevent physical damage and contamination. Never allow a jumper connector to rotate inside the protector cover as this can deform or scratch the polished surface of the fiber. The cover shall remain with the connector until connected.

9.16 All normal fiber cable practices should be exercised during the installation procedure. Care should be taken not to exceed the fiber bend radius. The maximum pulling should not exceed 600 lbs. A Kellem grip can be utilized to assist in placing the cable if there is no pulling eye on the field end. Be sure to cut back on the cable after using the Kellem grip to be sure that the fibers are not damaged.

No excessive fiber cable is to be coiled up and stored on cable racks.

C. Shielded And Coaxial Cable

9.17 The shields of shielded cables shall be cut, positioned and bonded to ground as specified in the job documentation.

EXCEPTION: SHIELDED CABLES FOR TIMING SUPPLIES SHALL BE BONDED AND GROUNDED AT THE BITS(TIMING SOURCE). CURRENT EXCEPTIONS TO THIS REQUIREMENT ARE THE FT2000 AND DDM2000 DUE TO CABLE ASSEMBLY DESIGN AND THE PERMANENT EXCEPTION IS #5 ESS DUE TO THE ISOLATED GROUND PLANE.

9.18 The shields of shielded cable shall be located within 1−1/2 inches of cable leads termination point or as close as possible, unless otherwise specified.

9.19 Coaxial cable terminating at the rear of a panel (i.e., DSX3) shall be formed to allow easy access for maintenance or testing.

10. Supporting

A. General

10.1 All cable shall be placed and securely supported so that there is no appreciable sag or undue strain on connections, apparatus, etc.

10.2 Cable shall not be unsupported for a distance greater than 2 feet when measured along the shortest cable between the last point of support on a cable rack and the first point of support of a frame, cable rack or other equipment, except as follows:

(1) Where cable to a distributing frame passes through a floor opening immediately under the frame, an unsupported length of not more than 4 feet measured along the shortest cable is permissible.

(2) Cable entering a distributing frame from a cable rack at the top of the frame may be unsupported for distance of 3 feet.

(3) Vertical cables in floor openings do not require support within the opening.

10.3 At turns or junctions of horizontal cable racks, where the turn of the cable is such that proper support of the cable is not provided by the cable rack cross straps, a 1/8 inch by 1 inch flat bar (cable rack corner strap) shall be placed diagonally across the rack similar to the method shown in Figure 18.

10.4 Studded−Up cable support, shown in Figure 19, may be used to facilitate the addition of small amounts of cable where it is not practical to add cable rack. Studded−Up cable supports shall be located approximately every 12 inches along the cable run.

10.5 Inverted horizontal cable racks shall be equipped with supplemental cable support as shown in Figure 20. These supplemental supports shall clamp the cables firmly, but not so tight as to distort the cables. The supports shall be placed along the run at approximately 10 foot intervals for runs which can ultimately contain less than 100 square inches of cable and at approximately 6 foot intervals for larger runs of cable.

10.6 Vertical cable runs 15 inches and wider extending through more than two floors shall be equipped with supplemental supports as shown in Figure 21 or 22. Clamps shall be installed to accommodate the maximum pile up of cable. See 10.9 for power cable run exception.

(1) Where the runs are in exposed locations, one set of clamps shall be installed per floor. The clamps shall be located near the ceiling as shown in Figure 21 and the cable shall be sewn at each alternate cable strap.

(2) Where the runs are located in shafts or other enclosures, two sets of clamps shall be installed per floor, one just above the cable hole sheathing and the other about half the distance to the ceiling as shown in Figure 22. The upper clamp shall not be less than 7 feet from the floor. Cables shall be secured in an orderly manner immediately above each clamp.

(3) Clamps are not required if vertical cable runs are secured by sewing with twine at every cable rack cross strap.

B. Power Cable

10.7 Power cable No. 00 or larger turning from one horizontal rack to another, into a frame or bay, or terminating at battery cells or battery terminating details, may be unsupported at the turn for a distance up to 3 feet.

10.8 Power cable No. 00 and larger turning up from a horizontal to a vertical rack shall be installed on a rack having a 45 degree section at the turn. If the uninterrupted rise exceeds two floors, the cross straps in the horizontal portion of the run shall be covered with fiber insulators.

10.9 In addition to the regular sewing, vertical power cable runs from unsecured horizontal cable runs, shall be equipped with supplemental support per Figures 21 or 22 if the vertical run passes through one or more floors.

10.10 Uninterrupted vertical power cable runs should be limited to three floors. If a run is going to exceed three floors, a horizontal run of at least 20 feet in length shall be introduced at intervals not exceeding three floors.

C. Central Office Ground Cable

10.11 CO GRD cables shall be supported as shown in Figures 23 or 24. Supports shall be provided approximately every 12 inches with the maximum distance between supports not exceeding 18 inches.

10.12 Horizontal cable runs may be supported along the side or underneath runs of cable rack, by means of brackets, clips or similar devices that do not form a closed metallic ring around the cable.

10.13 Individual grounding cables 2/0 AWG and smaller may be strapped (using non−conductive ties) to the outside of the stringer.

11. Unsecured Cable

11.1 Cables on horizontal bar type cable racks and on ladder type cable racks equipped with screens and cable retaining brackets, including inclines up to 45 degrees, need not otherwise be secured, except where they exit the racks.

11.2 Where the cables turn off or exits the cable rack, the cables shall be secured by sewing with twine to other cables or to the cable rack so they are held securely in place.

11.3 Unsecured cable shall be placed in an orderly manner and lie reasonably flat on cable racks.

11.4 Unsecured cable shall be spread across the entire width of a cable rack and not installed in bundles or concentrated groupings, especially at cable rack turns and junctions.

11.5 Wire run on unsecured cable racks shall be banded with 2 strands of twine approximately every 6' to prevent curling, drooping or spreading and to allow wires to lay reasonably flat on the cable rack. Intermediate bands shall be applied where it appears the wire might have a tendency to not stay reasonably parallel to the cable with which they were run. In addition, bands shall also be applied at those points where wire changes direction, such as at turns or where they enter and leave the cable rack.

11.6 Where ladder type cable racks are to be used for unsecured cable runs, the cable racks shall be equipped with cable retaining brackets and screens.

12. Secured Cable

A. General

12.1 Wire shall be secured in the same manner as cable. It may be secured separately or under the same stitch with cable.

12.2 Wires shall be placed between cables, as far as practical, so that they will be protected by the cables with which they are secured.

12.3 Cables or wires shall not be secured to AC conduit, but can be secured to ironwork (i.e. threaded rod or auxiliary framing) when the application does not warrant a new section of cable rack. The number of cables or wires that can be secured to ironwork is limited to two.

B. Power Cable

12.4 Vertical power cable shall be sewn to cable racks at every cross strap.

12.5 Horizontal power cable shall be sewn to cable racks at alternate straps.

12.6 Vertical and inverted horizontal power cable runs shall be sewn at every cable rack cross strap except as covered in 10.6(2).

12.7 Table B provides the number of strands of twine to be used and the number of cables to be included under one stitch when sewing power cable. Varying sizes, smaller sizes may be bundled to approximate the size of larger cable and sewn as two of equal size, such as five No. 14 and one No. 0. However, requirements for pairing and separation shall be met.

C. Fiber Optic Cable

12.8 Single fiber jumpers shall be secured by wrapping two layers of 1/64 inch sheet fiber protection, then secured by sewing or banded with twine. Under no circumstance shall the sewing stitch be pulled so tightly as to deform the sheet fiber or jumper.

12.9 Nylon ties SHALL NOT be used for banding or securing fiber optic jumpers/cables.

12.10 On ladder type cable racks, optical fiber cables shall be secured (sewn) at all turns or junctions on horizontal runs, no bend shall be less than 5 times the radius of the cable. All cables are to be sewn with No. 9 cord (twine, waxed polyester, 9 ply). Vertical runs are to be sewn every strap, horizontal runs are to be sewn every third strap, except at turns where they shall be sewn at such intervals to insure the cable retain their proper position.

D. Coaxial And Shielded Cable

12.11 Unless otherwise specified, coaxial and shielded cable (i.e., twin conductor shielded, ABAM, multiple conductor shielded pair etc.) shall be secured to the same degree that is required for switchboard type cable.

12.12 When coaxial cable having a hard dielectric is secured by sewing or banding with twine, the stitches shall not be tightened so tight as to deform the cable.

12.13 When coaxial cable with a soft foam dielectric center is secured or banded by sewing with twine, it shall be first wrapped with two layers of 1/64 inch sheet fiber protection then sewn. (AT&T 735A and Comscope 5535 coaxial cables are considered to be soft foam.) The securing stitch shall not be pulled so tightly as to deform the sheet fiber or outer sheath of the cable.

E. Horizontal Cable Runs

12.14 All cable and wire run on horizontal cable racks without screens and cable retaining brackets, shall be secured by sewing with twine.

12.15 Cables on horizontal runs shall be sewn at every third strap.

12.16 On turns in the same plane, cables shall be sewn at cross straps adjacent to start and completion of the turn and at such intervals so as to ensure the cables retain their proper position.

12.17 Cable shall be secured by sewing with twine to corner cross straps.

F. Vertical Cable Runs

12.18 Cable on vertical cable runs shall be secured by sewing with twine.

12.19 Cables on vertical cable racks which do not pass through more than two floors shall be sewn to the rack at every strap.

12.20 Cable runs which extend through more than two floors, and are equipped with supplemental supports per 10.6, shall be sewn to the cable rack at alternate straps.

12.21 On existing vertical runs, where supplemental supports are not provided, the cables shall be secured to the cable rack at every strap.

G. Spirals

12.22 All cable on vertical spiral or 90 degree double turn cable racks shall be secured by sewing with twine at every strap. In addition, clamps per Figure 21 shall be placed as reinforcement at each spiral as follows:

(1) If the vertical run turns to a horizontal position near the ceiling of the floor below the one on which a spiral is located, the clamp shall be placed immediately above the spiral.

(2) If the vertical run turns to a horizontal immediately above the spiral, the clamp shall be placed below the spiral.

(3) If the spiral is in a straight vertical run, and the run continues the distance between two or more floor lines in both directions, a clamp shall be placed directly above the spiral.

(4) Supplementary clamps are not required on horizontal spirals or 90 degree double turn.

H. Cable Rack To Equipment Location

12.23 Cable entering equipment frames shall approach the framework in a manner that will not block access of future cable.

12.24 Cable entering duct type frameworks shall approach the ducts in a manner that will not block access of future cable to the duct it enters, or an adjacent frame.

12.25 Groups of cables shall be secured or banded as required between the cable rack and the first support when the distance between these points or the fan arrangement is such that the cables tend to spread apart and result in a poor appearance.

12.26 Cables leaving cable racks and entering frames, racks and other equipment shall be secured so that there will be no appreciable sag in the cabling.

12.27 All cables and wires shall be secured at the first cable support bracket of a frame or bay by sewing with twine. Unless otherwise specified, cables shall be secured to the remaining cable support brackets in the frame or bay by sewing with twine or nylon cable ties on twelve inch centers (maximum).

12.28 Sufficient slack shall be maintained where necessary to provide space for placing future cables in their proper location.

12.29 When securing additional cables to a bracket that already contains secured cables, the added cables shall be secured to the bracket or a new layer of cable shall be started. If it is not possible to start a new layer due to cable buildup, the added cables may be banded with twine to previously secured cables in the vicinity of the top cable bracket.

12.30 Where the cable butt location is between cable brackets, below the lowest bracket or above the uppermost bracket on a frame, the cables shall be secured to the other cables (when in place)passing the butting point thus providing additional support.

12.31 When the cable butt is located below the lowest cable bracket in a frame or bay, it is permissible to have a length of 10 inches between the butt and the bracket.

12.32 When cables are run on a frame or bay and the cable butt location is close to a bracket or support, the cables shall be butted 1/4” to 1/2” below the bracket or support. When the cable butts are located 2” or more from the last securing bracket or support, a stitch shall be placed approximately 1” above the butts to secure the butts together before fanning and forming.

12.33 Power cable leaving cable racks or supports and entering equipment frames shall not be unsupported for a distance greater than 2 feet for cables No. 0 AWG and smaller and 3 feet for cables No. 00 AWG and larger.

I. Distributing Frames

12.34 Cable termination at a distributing frame shall be routed to the distributing frame using the cross–aisle cable rack nearest the vertical on which the cable will terminate.

12.35 Cables shall be secured at all transverse arms on distributing frames having transverse arms on 13 inch (or greater) vertical centers.

12.36 On distributing frames having transverse arms on less than 13 inch vertical centers, secure at alternate arms, counting from the first arm. At other than alternate arms, secure only those cables which butt or turn off at these arms.

12.37 Cables which are run parallel to the transverse arms at the horizontal side of the distributing frame shall be secured as near to the turn of the cable as practical, a second tie midway between the butt and the turn, and a third tie uniformly close to the butt. Where fanning rings or distributing rings are not used, place the third tie at the butt of the cable.

12.38 At the horizontal side of the distributing frame where cables are run parallel to the transverse arms and where fanning rings or distributing rings are not used at the cable butts, a fiber detail or a piece of fiber of 1/64” thickness shall be placed between the cable butt and transverse arm to prevent the wires at the cable butts from coming in contact with the metalwork. The fiber detail shall be secured in place by sewing with twine.

12.39 Wire run with distributing frame cable shall be placed between the cable and the transverse arm.

13. Strapping Of Wiring Terminals

13.1 Strapping wire shall be of the proper gauge, color and type as specified in the job documentation.

13.2 Straps between wiring terminals shall be supported and protected as applicable to prevent sagging or congestion.

13.3 All straps between wiring terminals shall allow for access to wiring terminals.

13.4 Straps between wiring terminals shall be run so as not to obscure designations.

14. Splicing Switchboard Cable And Wire

14.1 For requirements on splicing switchboard cable and wire refer to Section 23, Paragraph 11.

15. Spare Conductors

General

Spare wires are the extra wire in cables available for use when some of the regular wires in the cable are defective. Unequipped wires are regular wires, other than spares, either formed for anticipated growth. Unequipped wires shall be treated as spare wires.

15.1 When one or more cables serve one terminal strip, pull the spare, unused and unequipped wires through the fanning strip hole farthest from the cable butt in a group used by the wires of a particular cable. Use the hole on the outside strip for this purpose. If a fanning strip is not available, fold wires back and forth and secure to existing wires or place in PVC tubing.

15.2 When a cable serves more than one terminal strip, place the spare, unused and unequipped wires in the form to the terminal strip farthest from the cable butt and through the farthest outside fanning hole served by the cable.

15.3 Bring spare, unused and unequipped wires through farthest outside fanning strip hole, away from cable butt. Cut wires approximately 1 1/2 inches beyond face terminal strip. Run wires back up fanning strip to a hole that will allow 1/2 inch to extend beyond rear of fanning strip, and bend down.

15.4 When wires are in excess of the number that can be fanned through one hole, they may be placed in PVC tubing and secured to the form.

15.5 If spare leads need to be identified for future use, an installer cable tag with wiring information (i.e., drawing, figures) can be snugly placed around the circumference of the leads and be placed in PVC tubing and secured to the form.

16. Cable And Conductor Verification

16.1 All leads terminated by the Installation Supplier shall be electrically verified for continuity and correct wiring prior to the equipment being turned over to BST.

16.2 All troubles and/or wiring errors found during lead verification shall be corrected prior to the equipment being turned over to BST.

16.3 Lead Verification shall include checking for opens, shorts, reversals, and incorrect wiring.

16.4 Any lead verification tests which have the potential for a service outage shall have the tests steps outlined in an approved MOP. Also coordination with BST may be required to insure equipment operation.

16.5 Lead verification test records shall indicate, the piece of equipment and/or equipment location, the circuit name and/or number, the trouble found and the corrective action taken on each trouble, and shall be turned over to BST upon completion of the job.

TABLE A

NUMBER OF GENERAL USE CABLES TO BE INCLUDED UNDER ONE STITCH

KIND OF CABLE	SIZE	TYPE OF CABLE RUN	
		HORIZONTAL	VERTICAL OR INVERTED
		NO. OF CABLES PER STITCH	
Round	Up to 1/2” Dia.	6	5
	Over 1/2” to 3/4” Dia.	5	2
	Over 3/4” to 1” in Dia.	3	1
	Over 1” in Dia.	2	
Oval on edge	All	6	3
Oval on flat	All	10	5

TABLE B
NUMBER OF POWER CABLES TO BE INCLUDED UNDER ONE STITCH

CABLE SIZE OR TYPE	HORIZONTAL RUNS		VERTICAL/INVERTED RUNS	
	STRANDS OF TWINE	CABLES PER STITCH	STRANDS OF TWINE	CABLES PER STITCH
800 MCM TO 400 MCM	4	2	4	1
350 MCM TO 300 MCM	2	2	4	1
No. 0000 TO No. 0	2	2	2	1
No. 2 TO No. 6	2	4	2	2
No. 6 TO No. 14	2	Any Number Up To 1” Dia.	2	Any Number Up To 1” Dia.
ARMORED CABLE				
No. 1−14 AWG	2	2	4	2
No. 0−500 MCM	4	4	4	2

TABLE C − CABLE TYPES AND ELECTRICAL TRANSMISSION DISTANCES

CABLE SELECTION	DISTANCE FROM TERMINAL EQUIPMENT TO CROSS CONNECT FRAME					
FIRST CHOICE	0' − 150'	151' − 250'	251' − 335'	336' − 400'	401' − 455'	+455'
	AT&T 735 A COMSCOPE 5535	AT&T 735 A COMSCOPE 5535	AT&T 734 D COMSCOPE 5568	AT&T 734 D COMSCOPE 5568	AT&T 734 D COMSCOPE 5568	AT&T 734 D COMSCOPE 5568 DS3 OFFICE REPEATER REQUIRED
SECOND CHOICE	AT&T 734 D COMSCOPE 5558	AT&T 734 D COMSCOPE 5558				

NOTES:

CROSS CONNECT CABLE LENGTHS SHOULD BE LIMITED TO A MAXIMUM OF 27' SIGNAL LOSS IN CORDS EXCEEDING 27' MAY BE EXCESSIVE, THEREFORE CAUTION SHOULD BE USED IN APPLICATIONS WHERE LONGER CORDS ARE REQUIRED.

THE RECOMMENDED CABLE TYPES FOR CROSS CONNECT CORDS ARE AT&T KS−19224. ADC TRAX (P/N:4−27008−0000). W. L. GORE CNX 1748.AT&T 735. AND COM/SCOPE 0232.

CABLE SELECTION IS BASED ON ECONOMIC COMPARISONS.

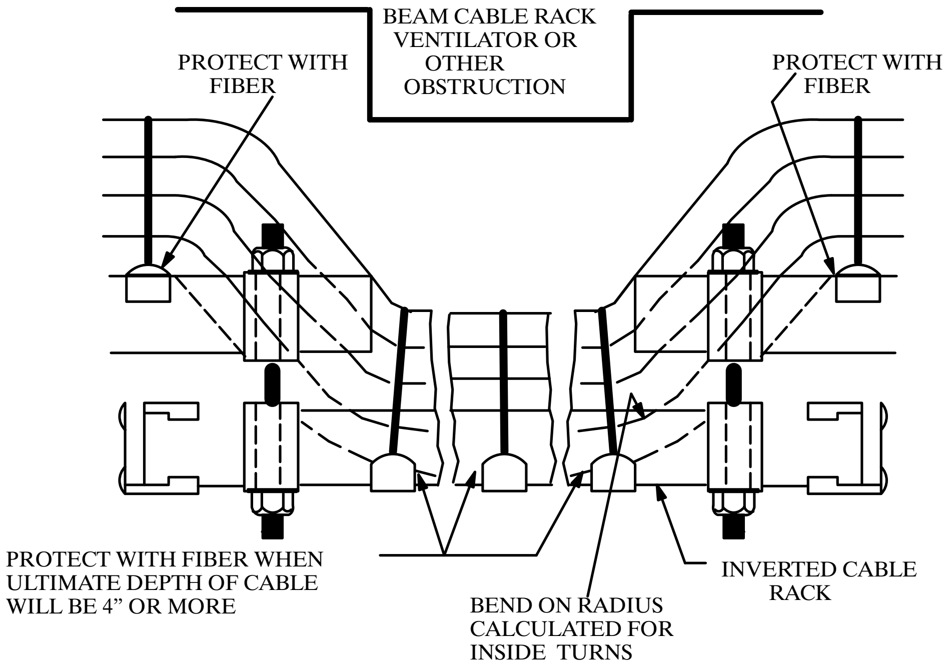


Figure 1 − Protection On Cross Straps Inverted Sections

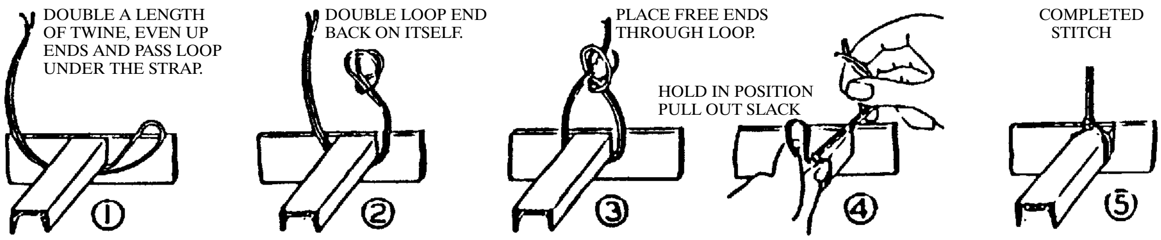


Figure 2 − Starting Stitch

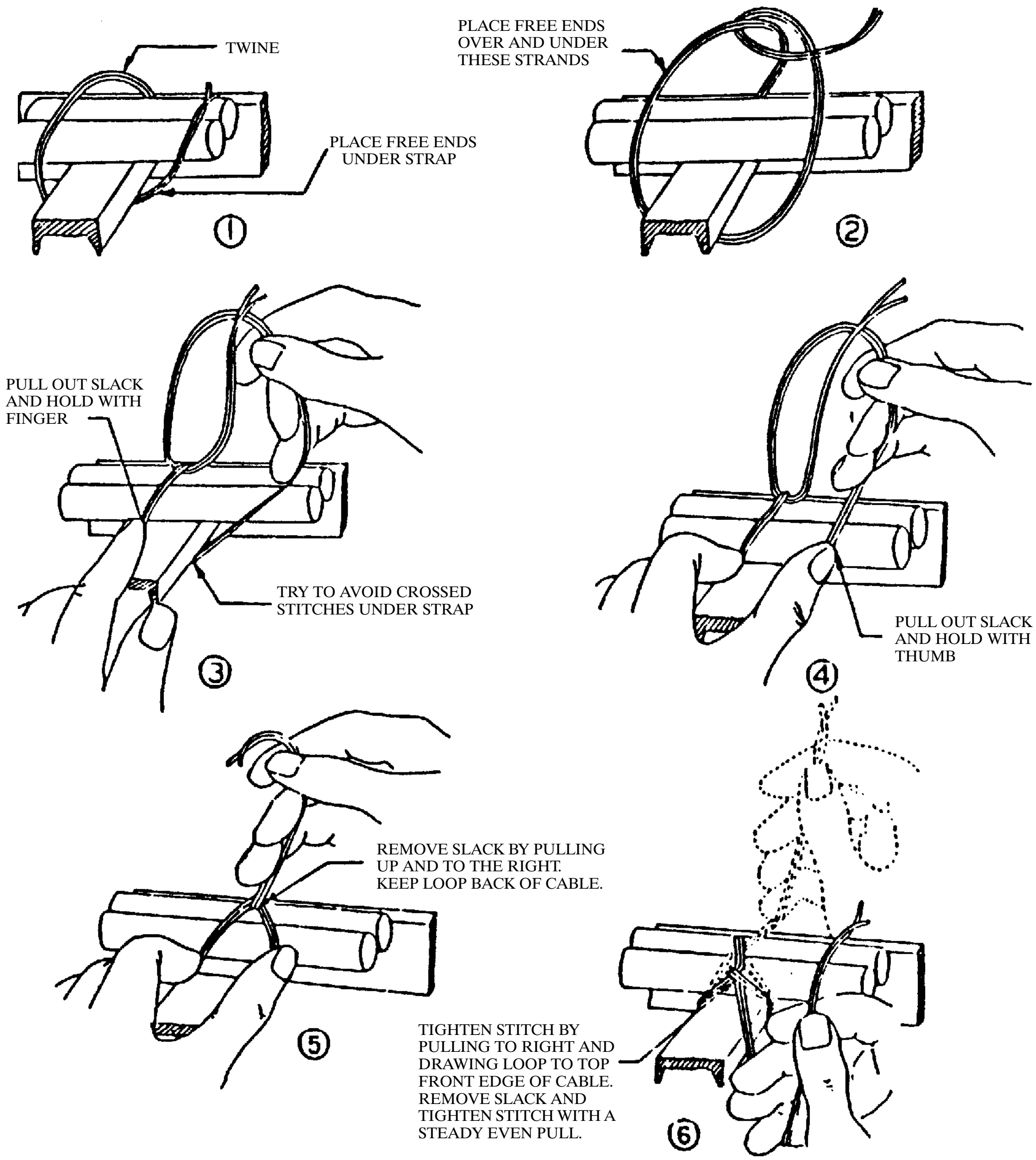


Figure 3 − Kansas City Stitch

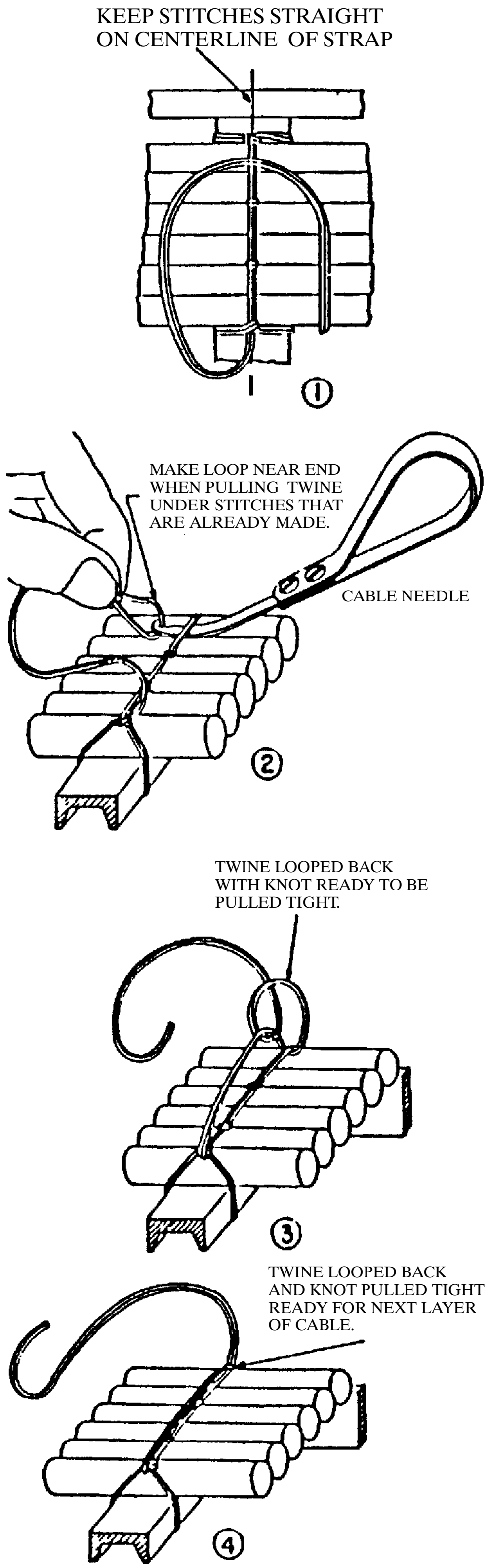


Figure 4 − First Layer

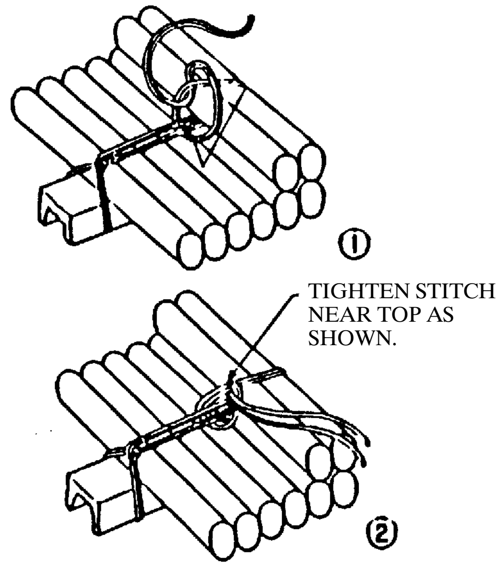


Figure 5 − Second Layer

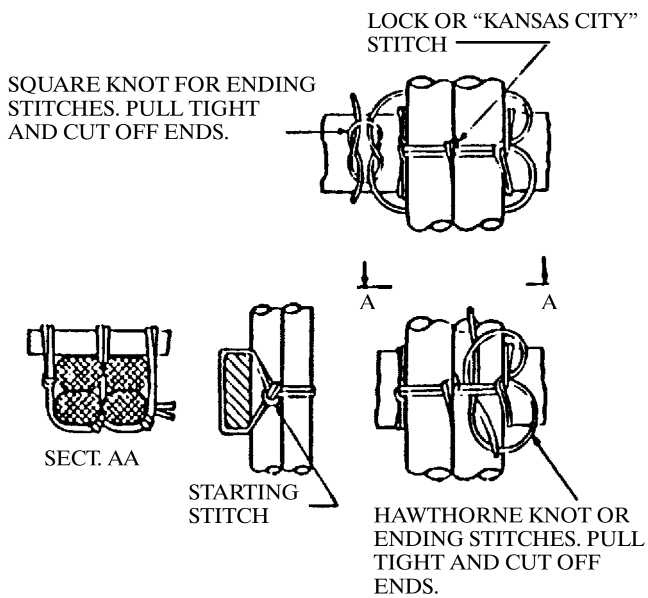


Figure 6 − Method Of Ending Stitches

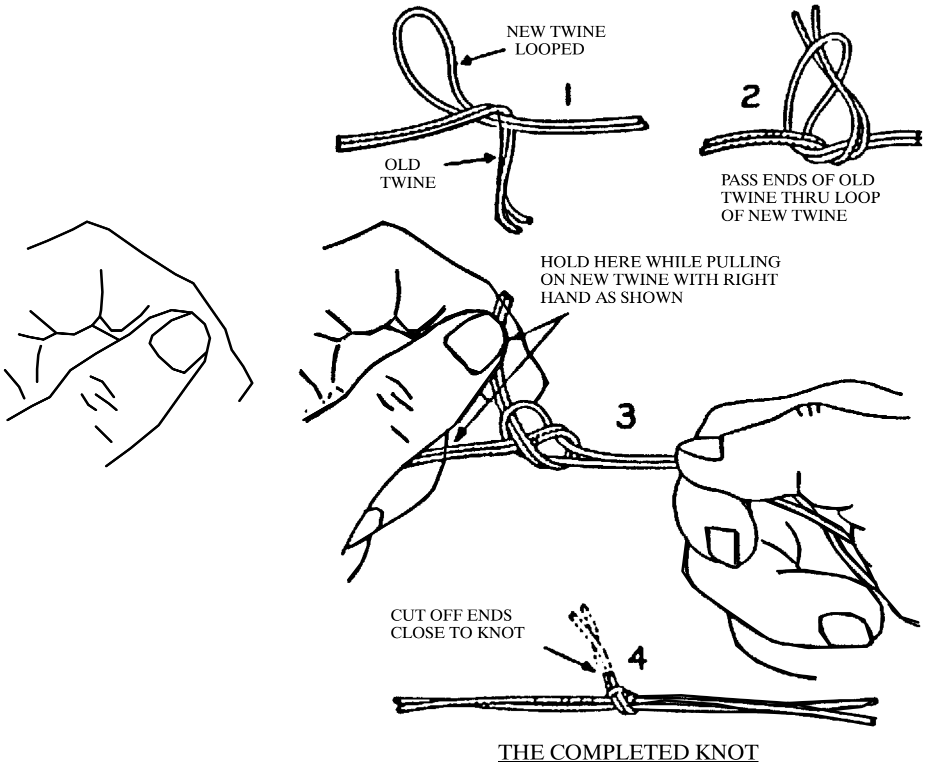


Figure 7 − Splicing Double Strands Of Twine

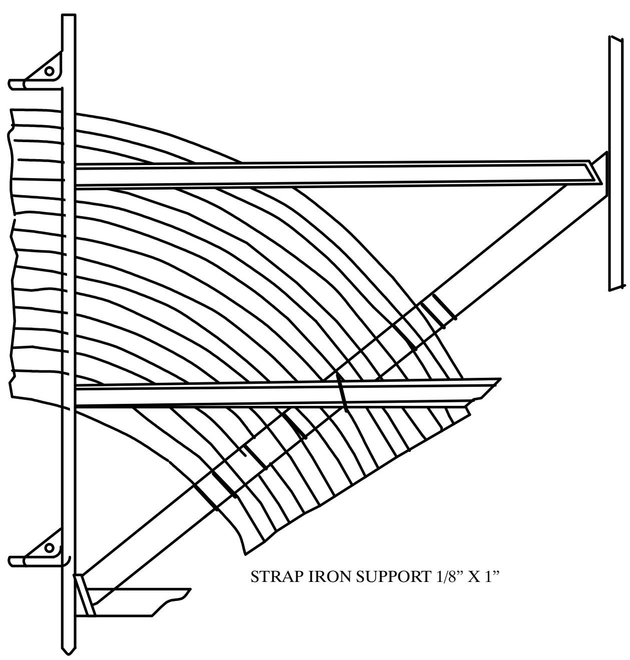


Figure 8 − Sewing Cable To Supports At Turns

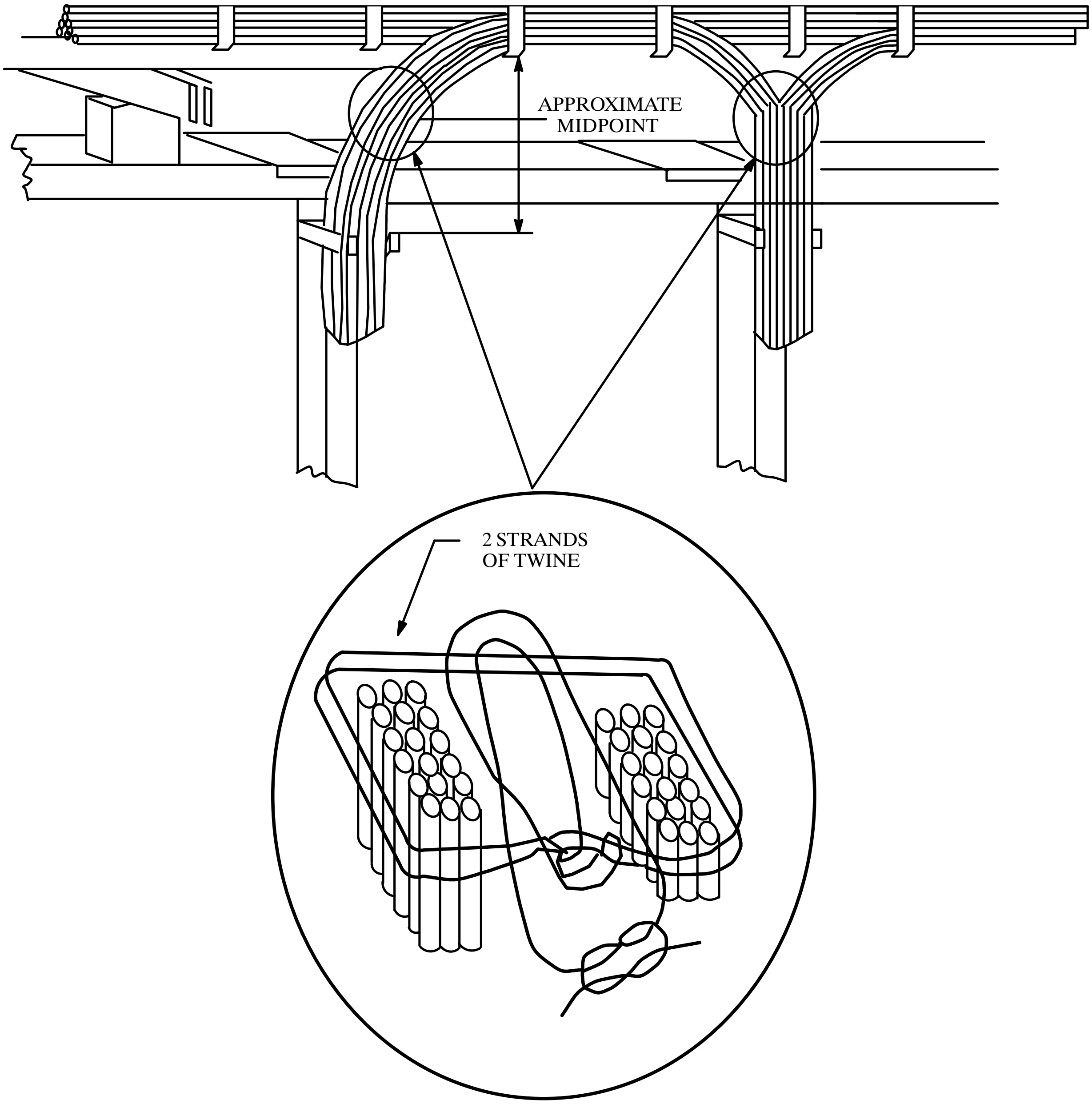


Figure 9 − Cables From Miscellaneous Run Secured Together Between Rack And First Support With A Modified Chicago Stitch

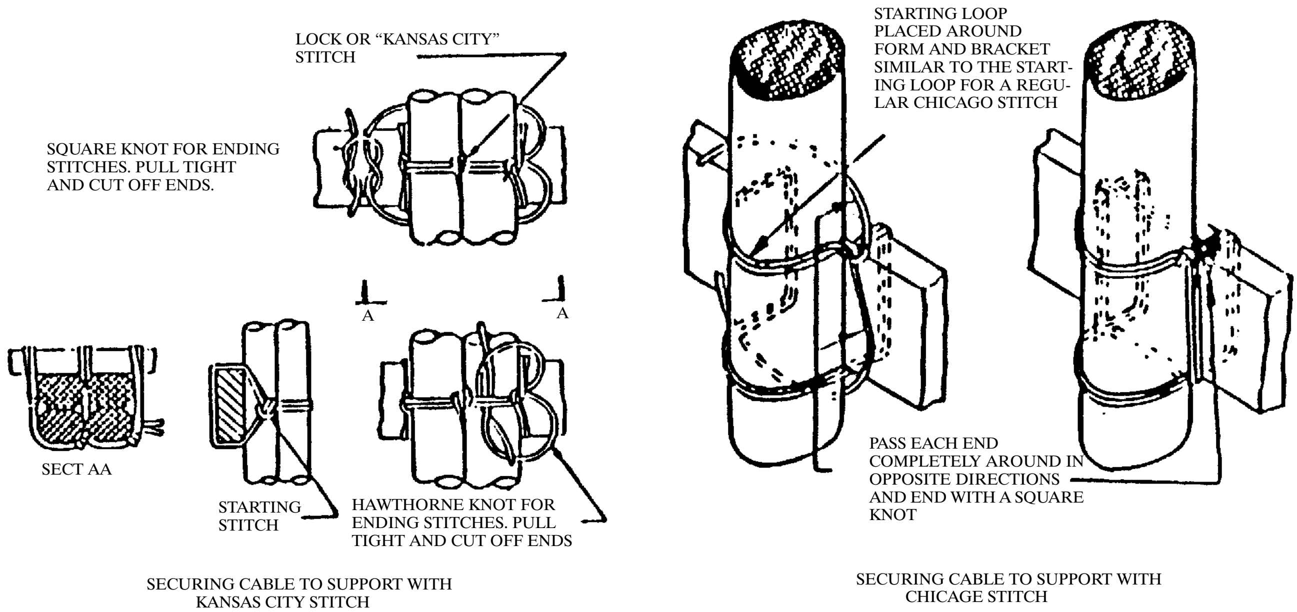


Figure 10 − Sewing Cables To Cable Brackets And Distributing Frame Transverse Arms

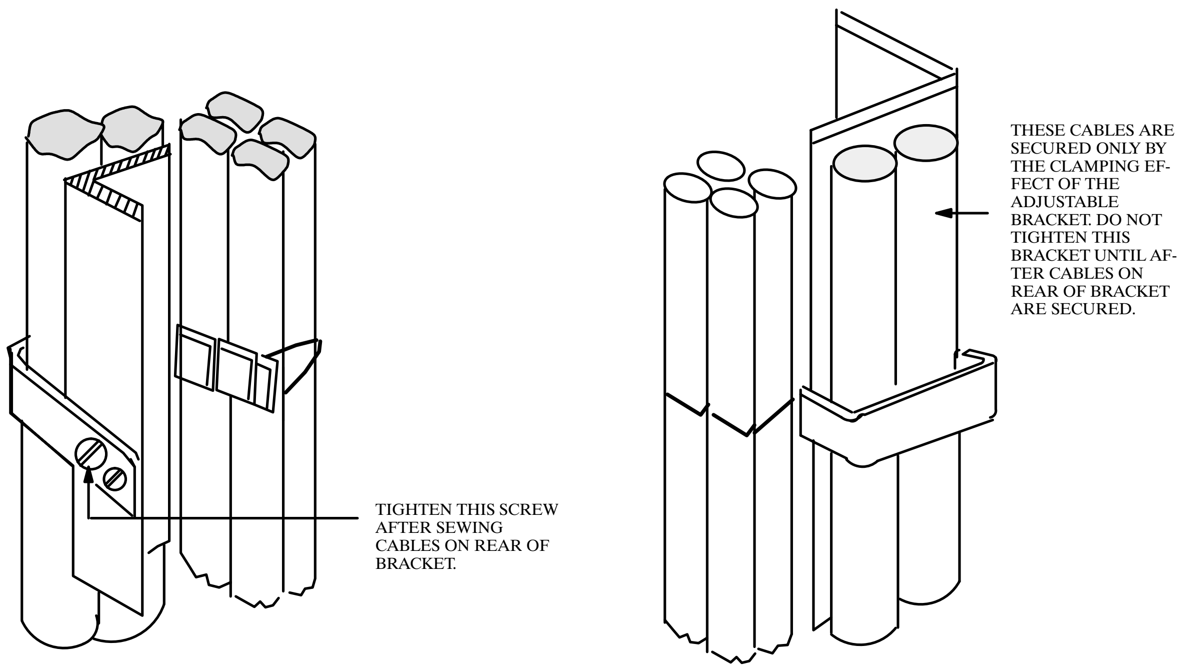


Figure 11 − Securing Cable To Brackets At Single Sided LDF And TRDF By Sewing

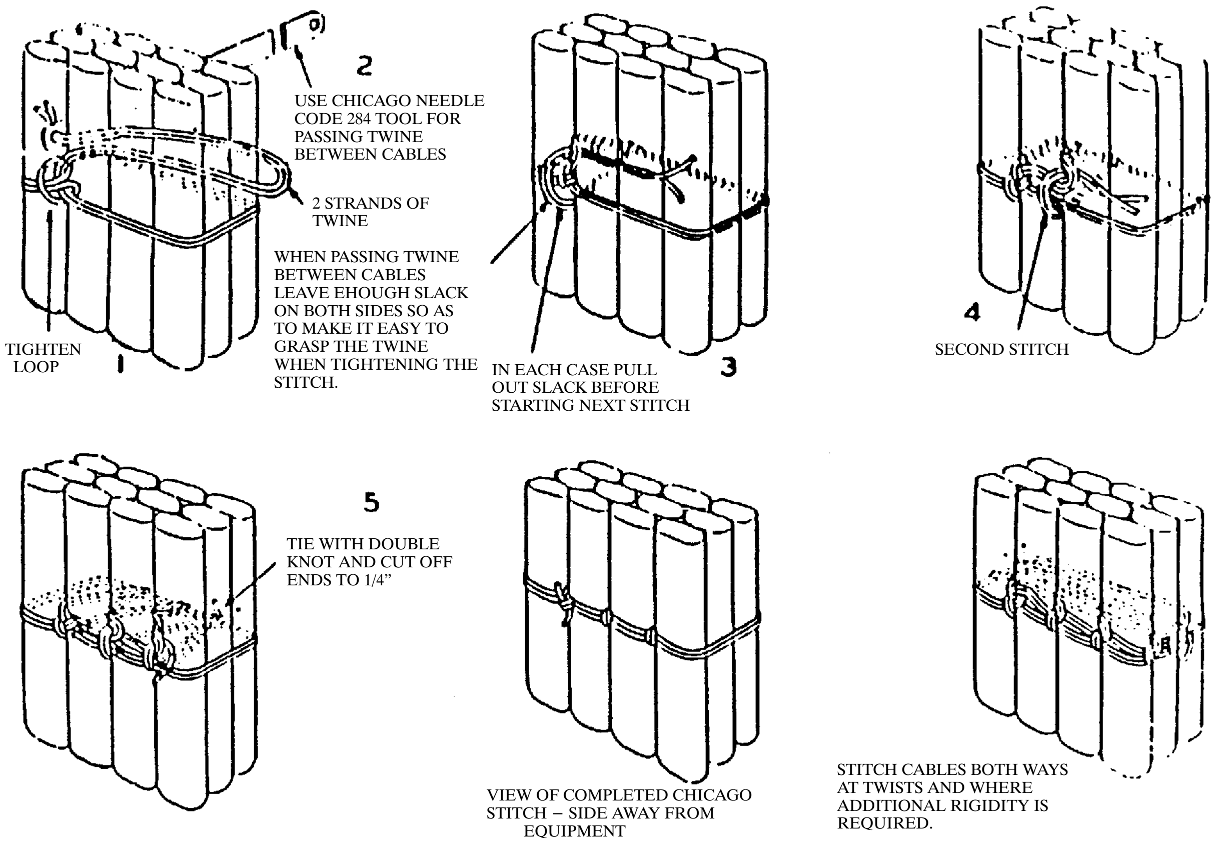


Figure 12 − Chicago Stitch Used To Sew Cables Together

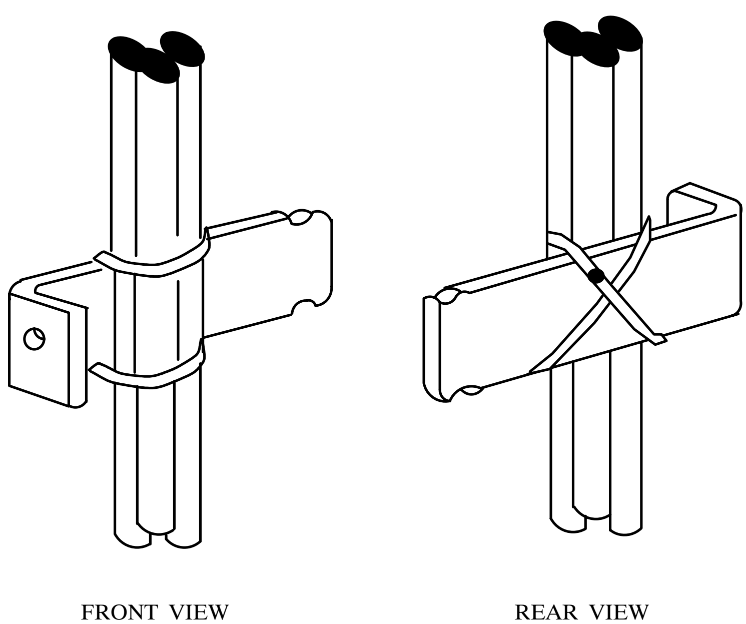


Figure 13 − Securing Cable To “L” Type Bracket

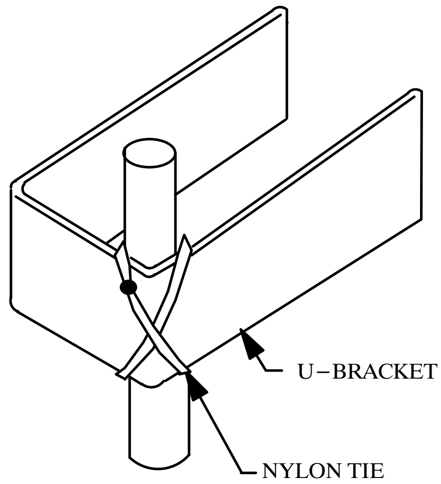
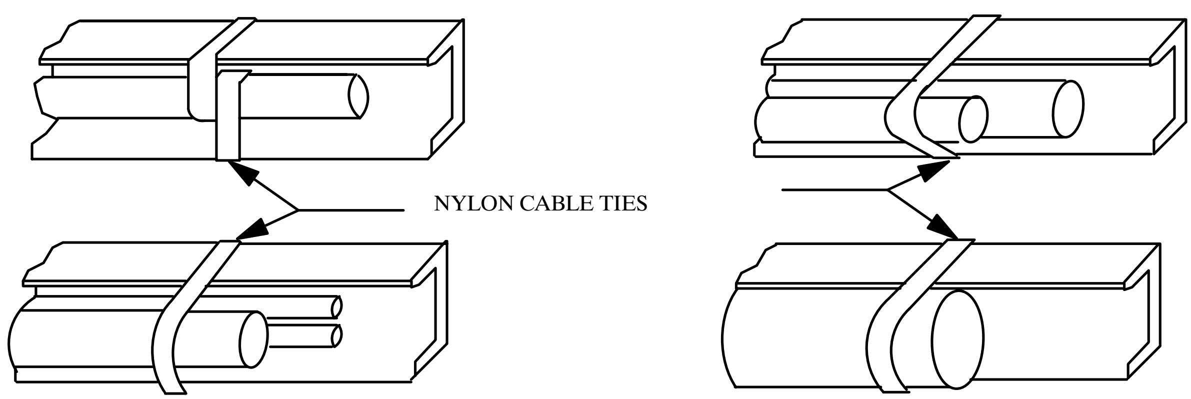


Figure 14 − Securing Cable To The Inside Of U Type Bracket



Note:
Heads of ties located on opposite side of transverse arm.

Figure 15 − Securing Horizontal Cable To Transverse Arms Of Distributing Frames Using Nylon Cable Ties

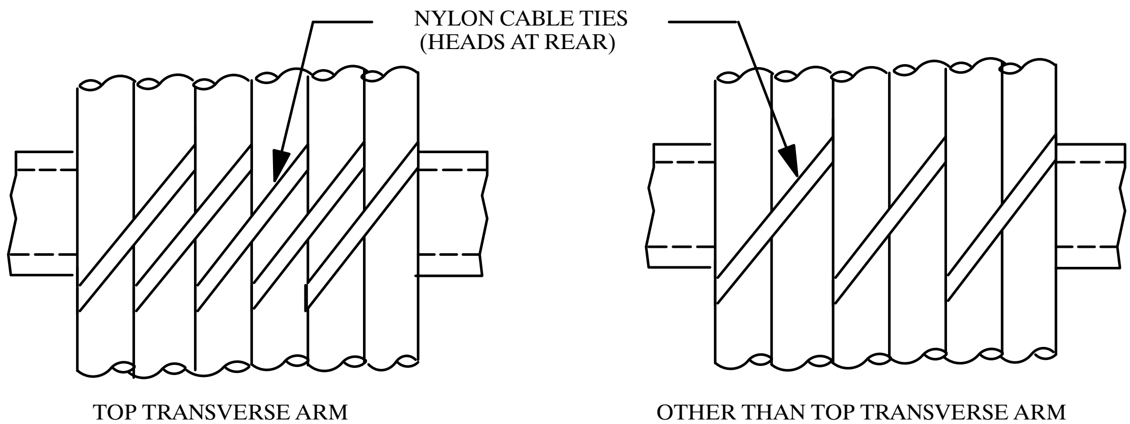


Figure 16 − Securing First Layer Of Cable On Vertical Side Of Distributing Frame Using Nylon Cable Ties

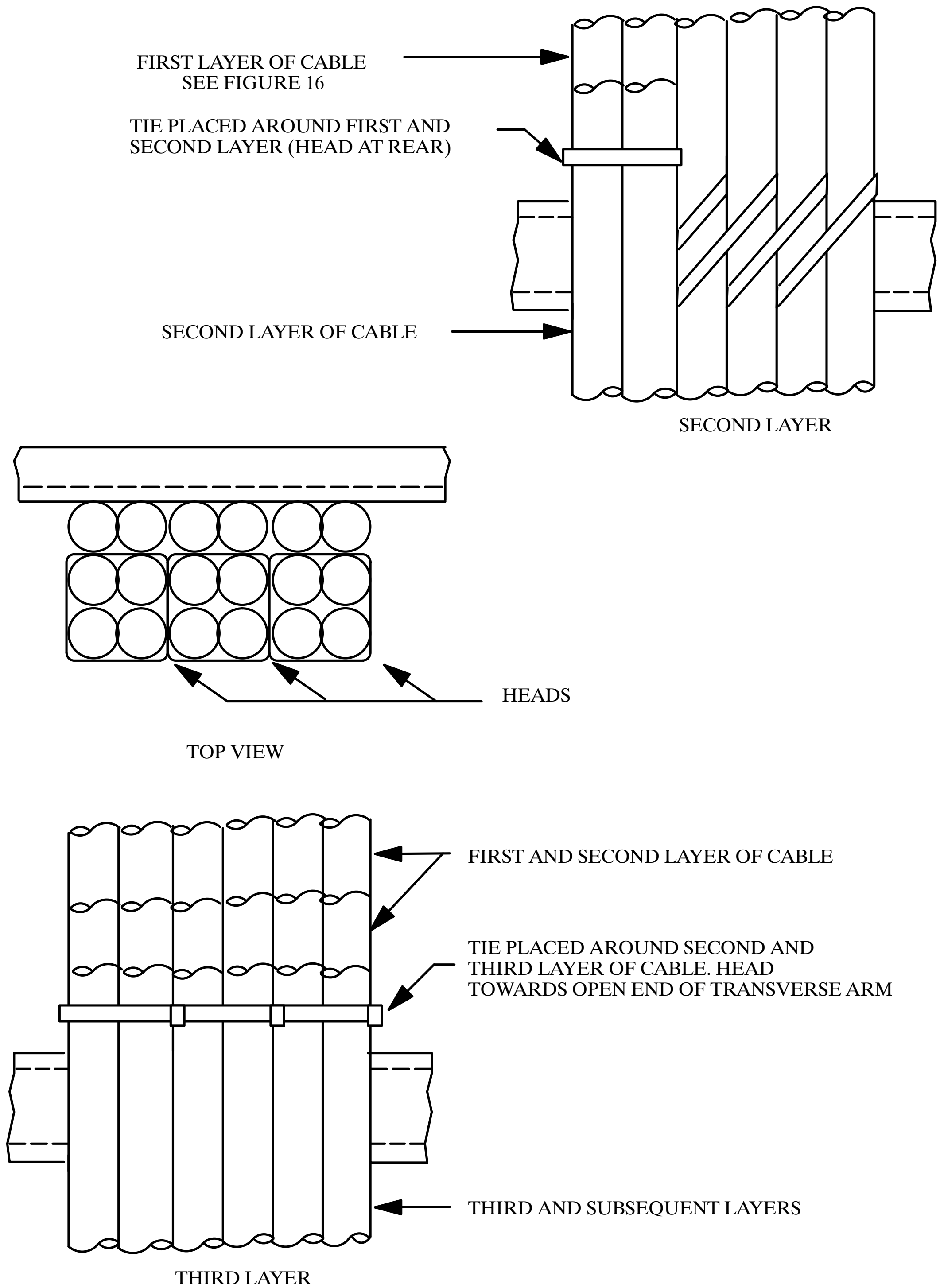
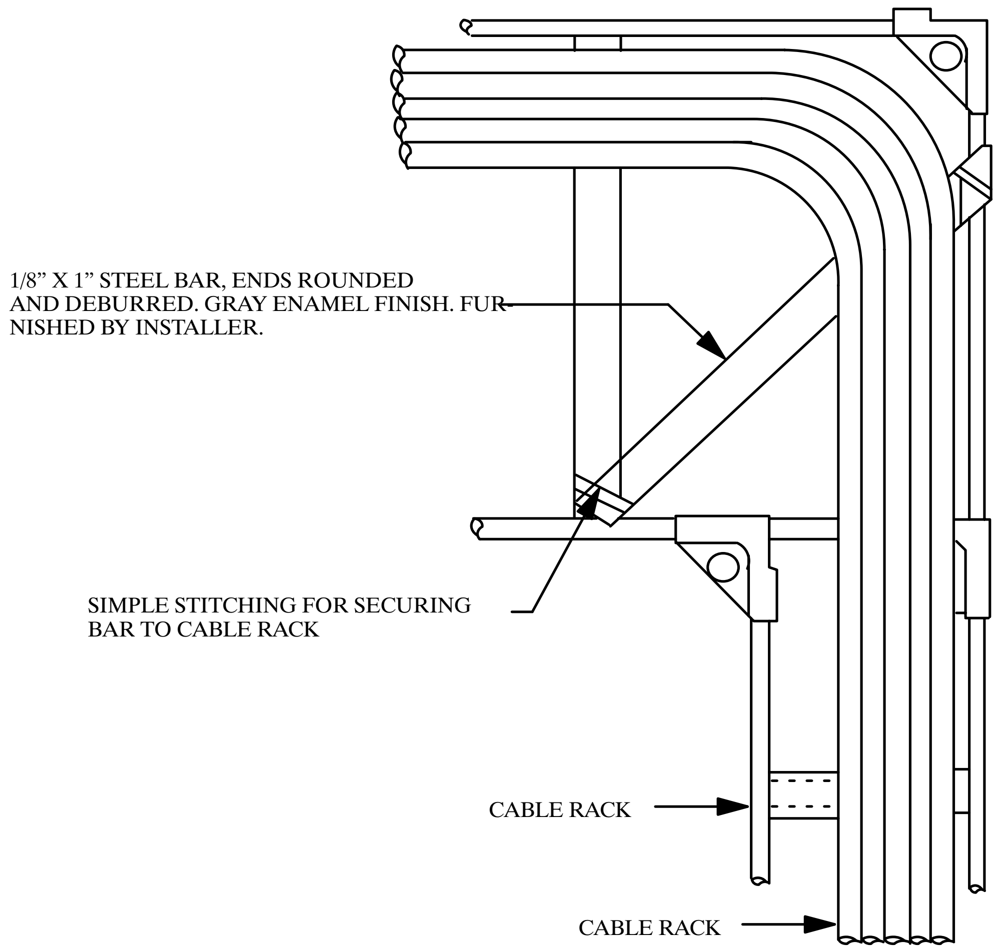


Figure 17 − Securing Second And Subsequent Layers Of Cable On Vertical Side Of Distributing Frame Using Nylon Cable Ties



NOTE: THIS FIGURE IS AN EXAMPLE OF ONE METHOD OF PREVENTING CABLE SAG. THICKNESS OF BAR IS “MINIMUM”. LOCATION OF BAR, TYPE OF TWINE OR CORD, AND TYPE OF STITCH IS DISCRETIONARY.

Figure 18 − Additional Cable Support − To Prevent Cable Sag

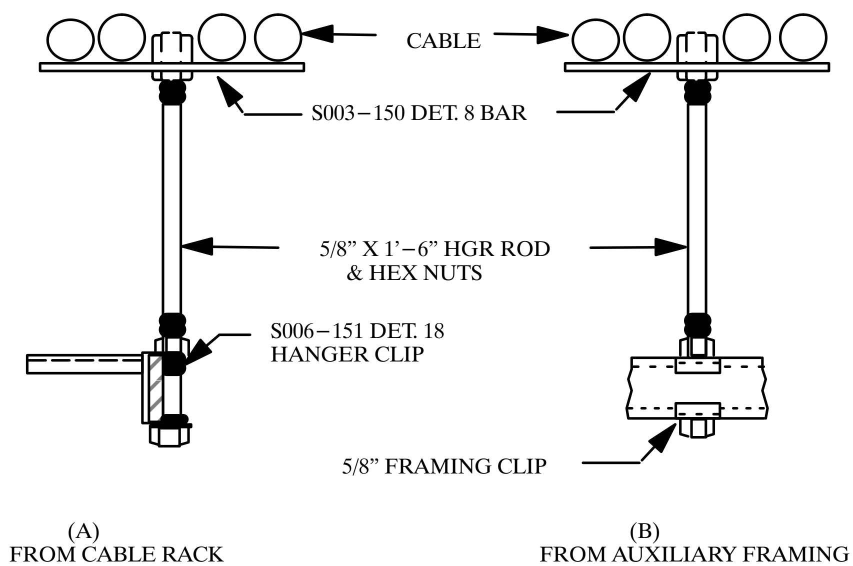
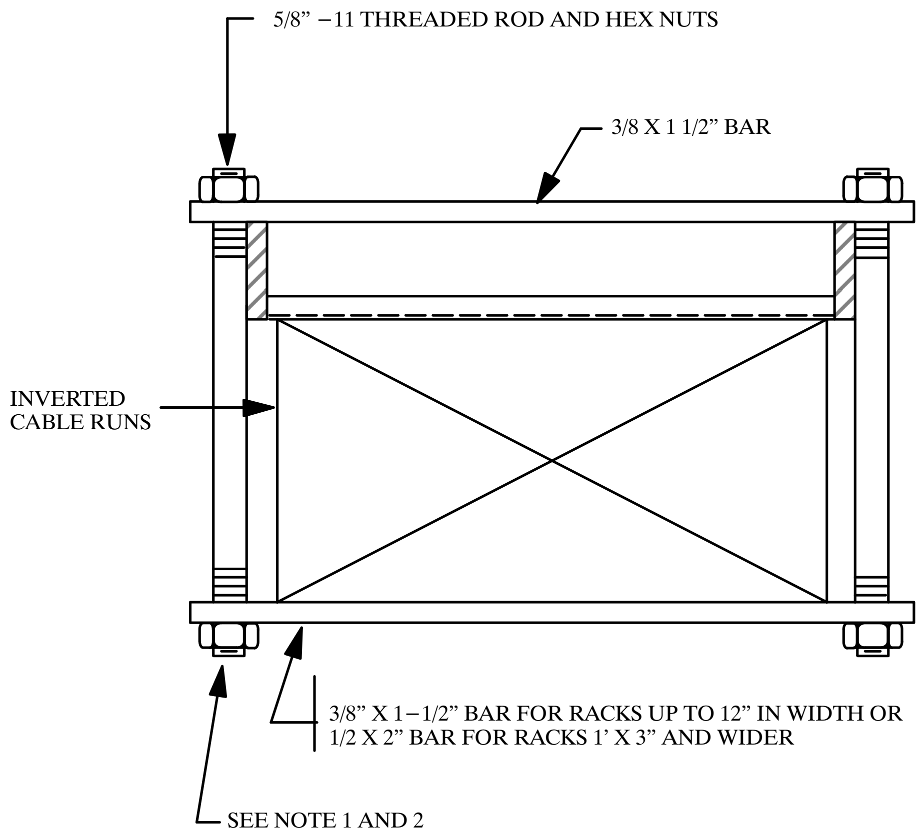


Figure 19 − Auxiliary Cable Supports From Cable Rack Or Auxiliary Framing



NOTES:

1. MAXIMUM OF TWO THREADS LEFT EXPOSED AFTER ASSEMBLY.
2. THREADED RODS SHALL BE REPLACED WITH LONGER RODS WHEN ADDITIONAL CABLE IS TO BE INSTALLED, OR RODS WHICH WILL ACCOMMODATE ULTIMATE CABLE PILE−UP MAY BE INSTALLED INITIALLY IF THEY ARE EQUIPPED WITH GUARDS.

Figure 20 − Auxiliary Support For Horizontal Inverted Cable Runs

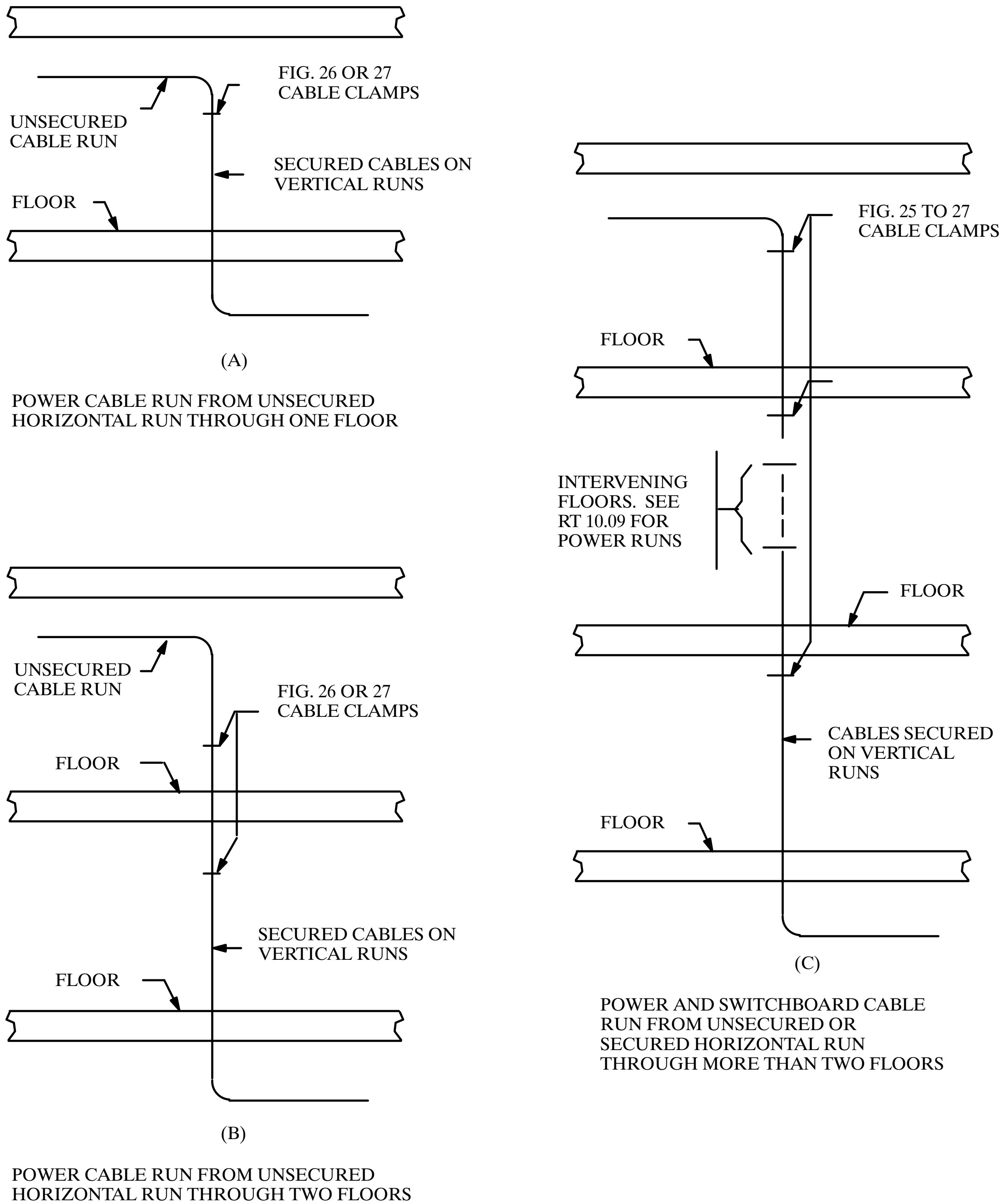
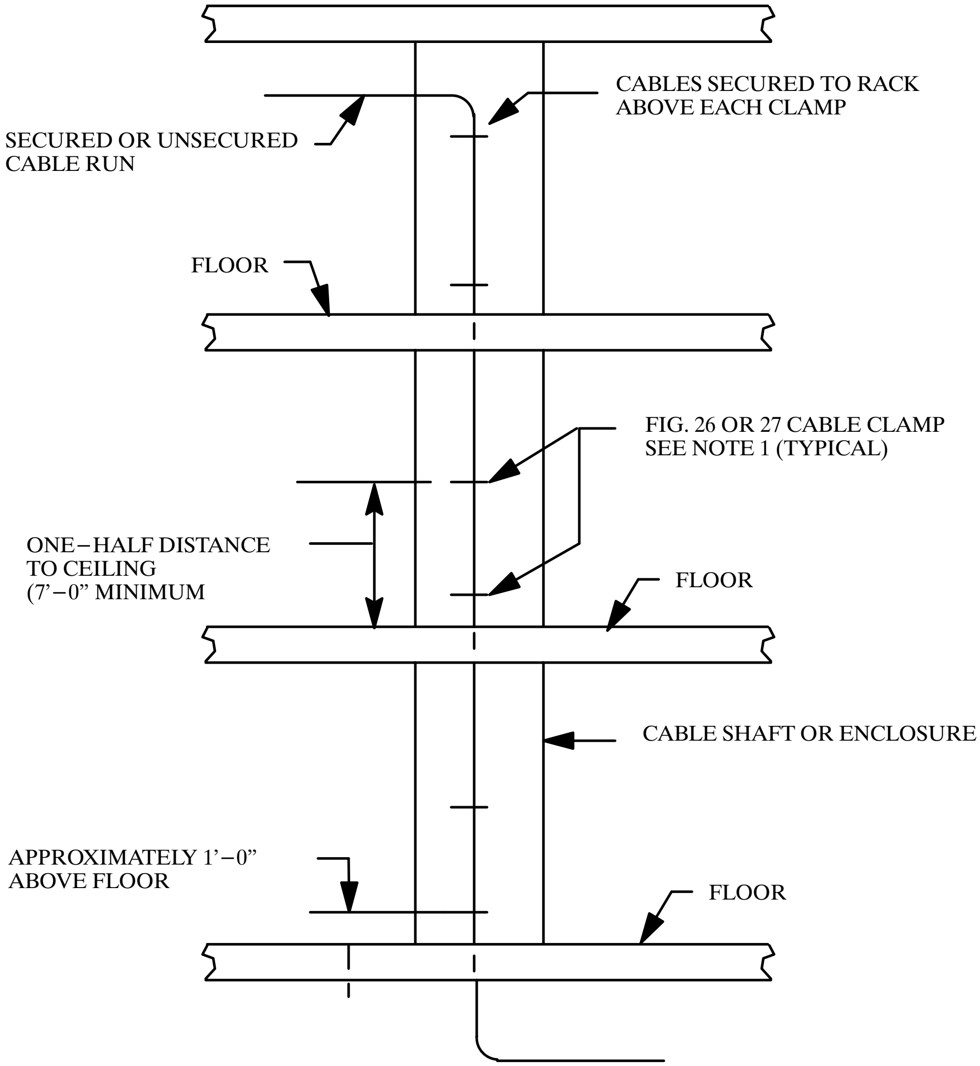


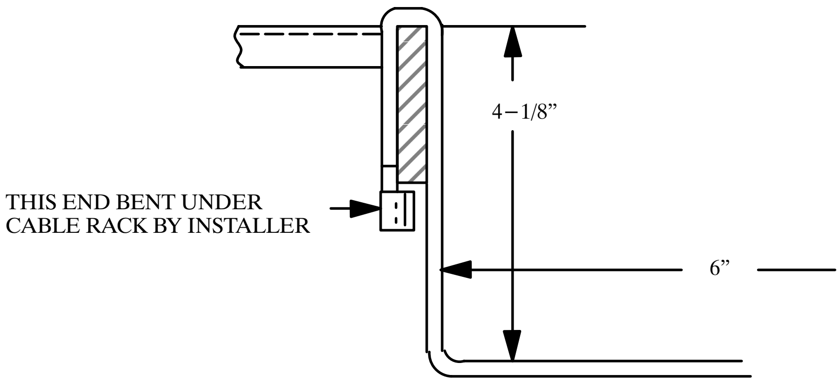
Figure 21 − Vertical Cable Runs In Exposed Locations



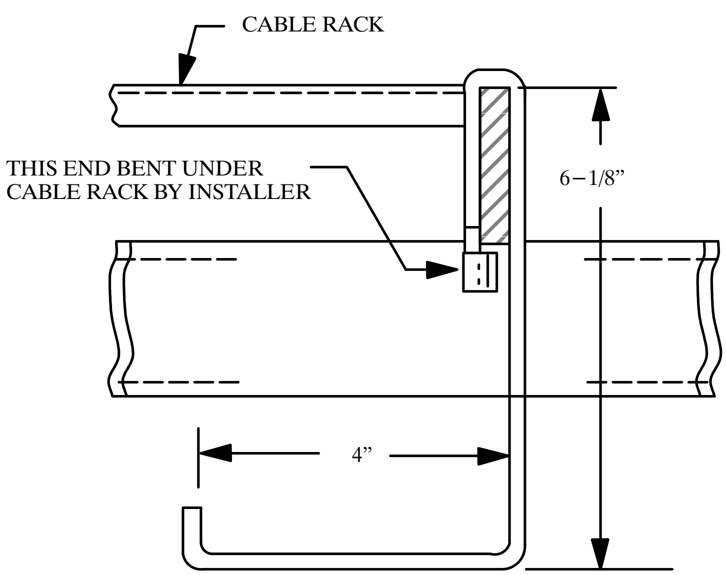
NOTES:

1. POWER TYPE CABLE CLAMPS SHALL BE USED IN SHAFTS OR ENCLOSURES.
2. CABLE CLAMPS ARE NOT REQUIRED ON VERTICAL RUNS WHICH ARE SECURED TO CABLE RACKS AT EVERY CROSS STRAP.

Figure 22 − Vertical Cable Runs In Cable Shafts Or Enclosures

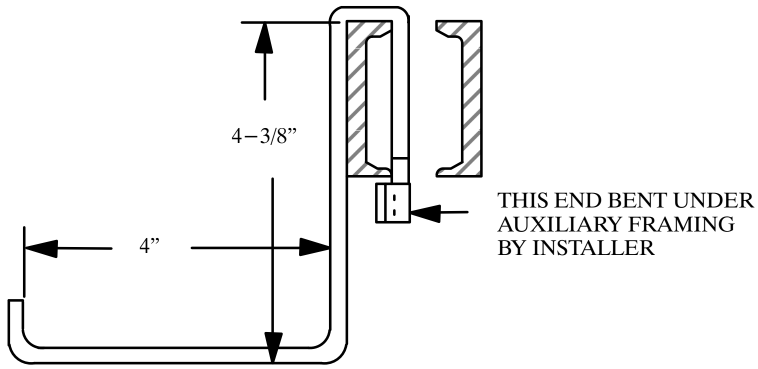


(A)

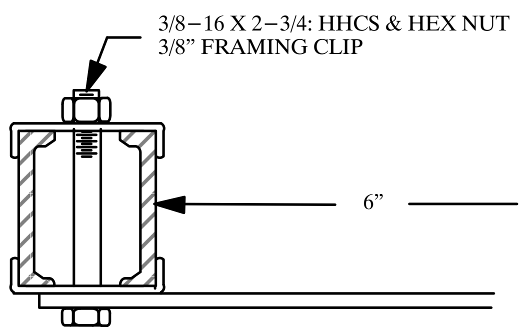


(B)

Figure 23 − Ground Cable Support From Cable Rack

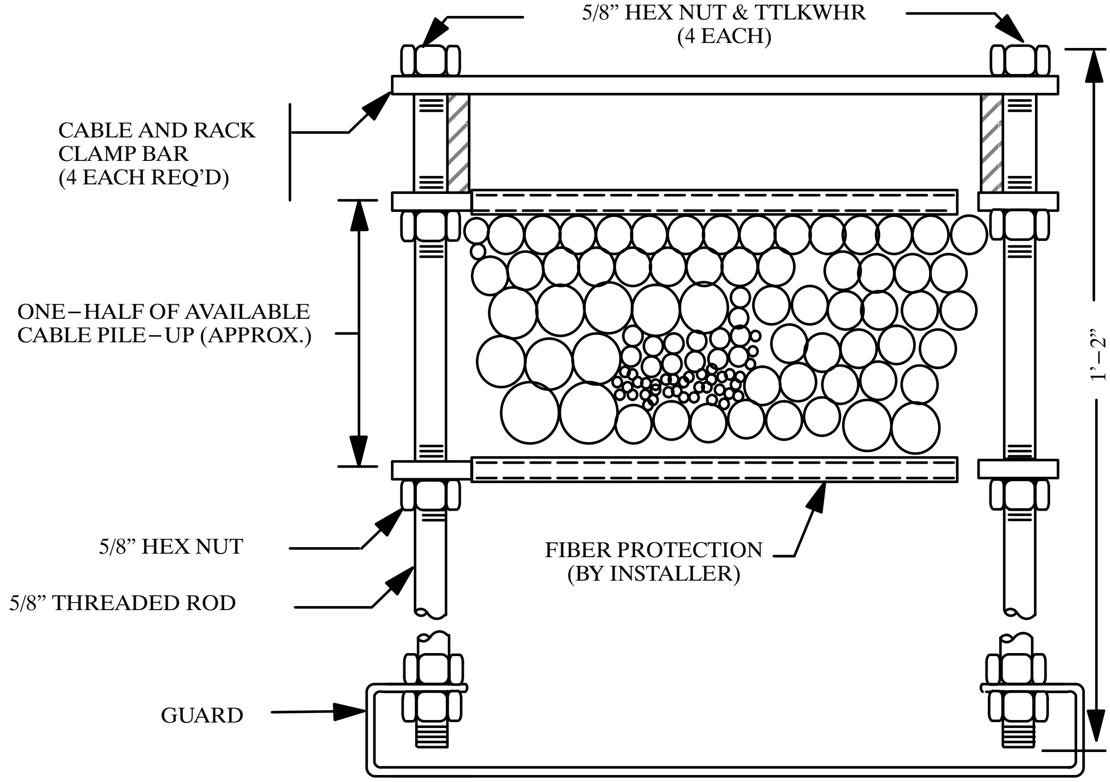


(A)

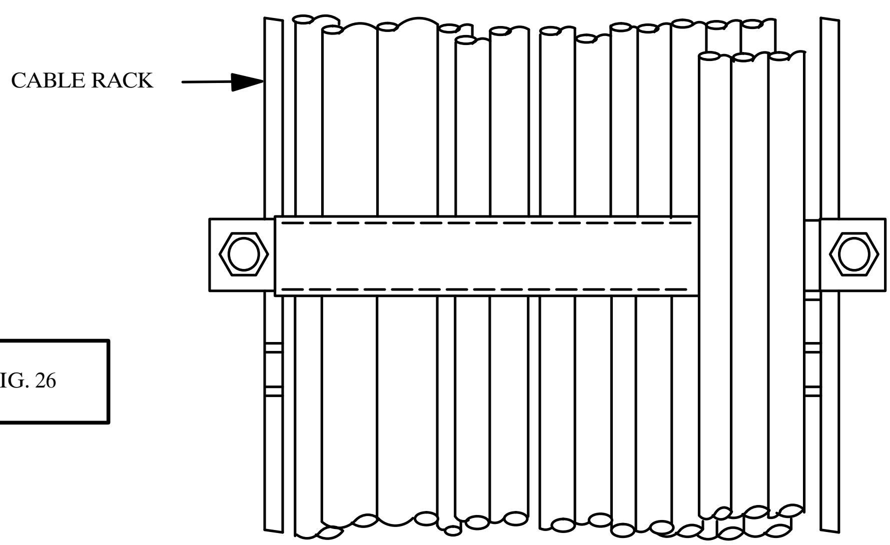


(B)

Figure 24 − Ground Cable Support From Auxiliary Framing



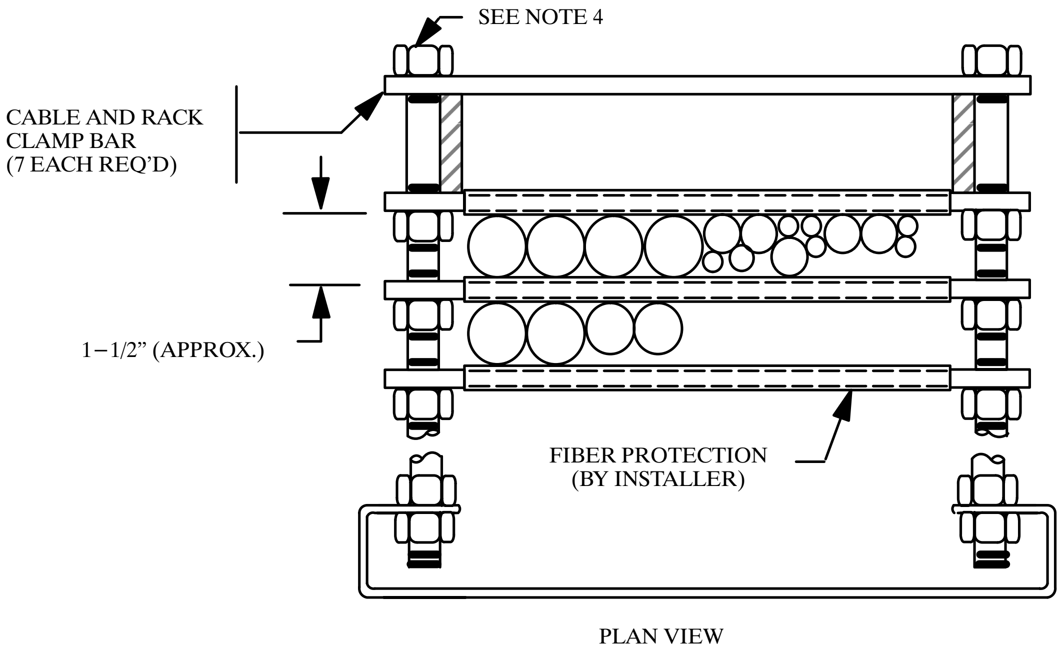
PLAN VIEW



SEE NOTES FIG. 26

FRONT VIEW (GUARD NOT SHOWN)

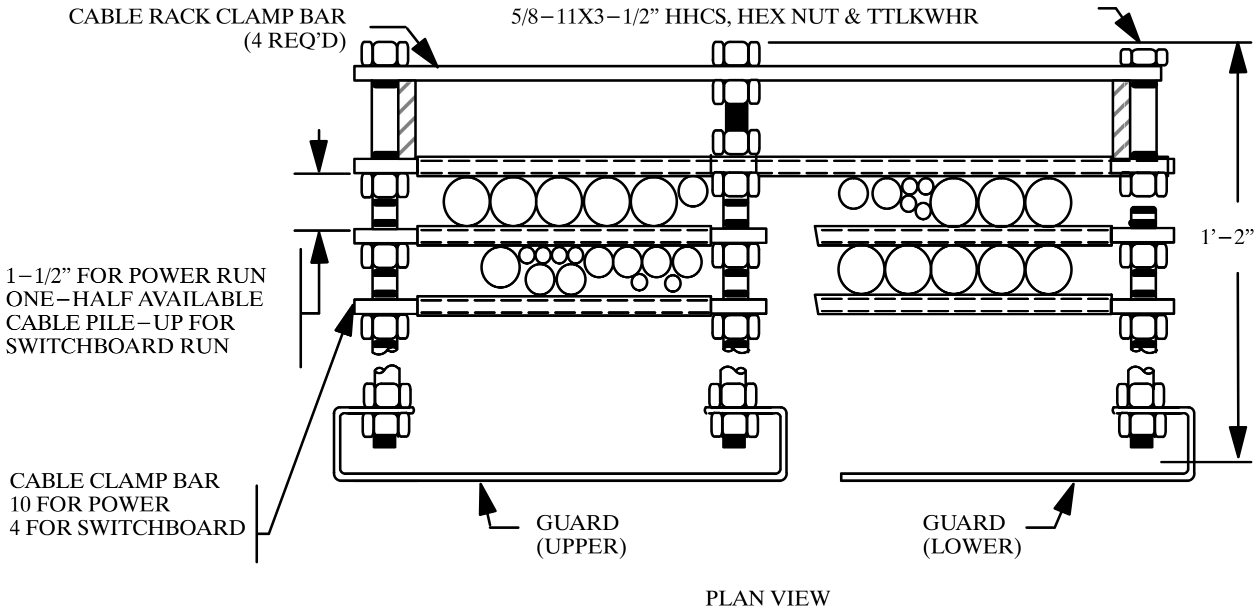
Figure 25 − Vertical Cable Clamp 1’=3” And 1’−8” Switchboard Cable Runs



NOTES:

1. UNUSED CLAMP BARS AND NUTS SHALL BE ASSEMBLED ON THREADED RODS FOR USE WITH FUTURE LAYERS.
2. FIBER PROTECTION SHALL BE APPLIED TO CABLES WHERE CONTACT WITH THREADED RODS OR NUTS IS UNAVOIDABLE.
3. LOCATE CLAMPS 1−INCH TO 1−1/2−INCH FROM CABLE RACK CROSS STRAP.
4. THREADED RODS TO BE CUT APPROXIMATELY FLUSH WITH HEX NUTS AT BACK SIDE OF CABLE RACK.
5. CLAMPS TO HOLD CABLE RUNS FIRMLY WITHOUT EXCESSIVE DEFORMATION OR INDENTING OF CABLES.

Figure 26 − Vertical Cable Clamp 1'=3" Power Cable Run



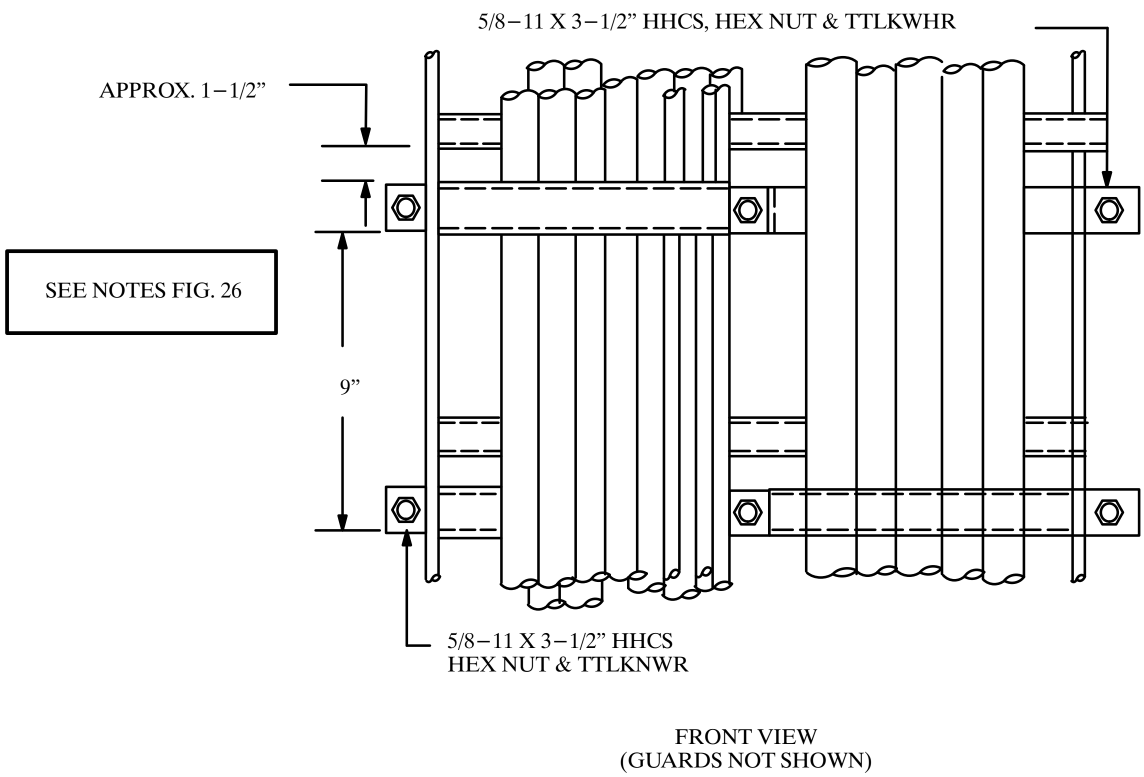


Figure 27 − Vertical Cable Clamp 1'−8" Power Cable Run And 2'−1" Switchboard Cable Run (Power Run Shown)

CONNECTIONS − INSTALLATION PROCEDURES

CONTENTS

CONNECTIONS − INSTALLATION PROCEDURES

1. Introduction

1.1 This section covers the general requirements for the connecting and soldering of individual wire and cable to equipment and apparatus. The majority of wire used in CO applications utilizes solid conductors. Stranded conductors may be specified such as where flexing or vibration may occur. The requirements covered in this section should be followed except as modified by the manufacturer's equipment drawings.

2. General

2.1 Connectors shall be of the type and size specified in the job documentation and connector manufacturer's documentation. Only connectors that are UL listed and/or approved for use in BellSouth shall be installed.

2.2 Connectors shall be assembled and installed per the job documentation and connector manufacturer's documentation.

2.3 Connections shall provide a secure metallic bond.

2.4 All connections shall be in such a manner to insure proper electrical operation of equipment.

NOTE: **ALL CONNECTIONS TO ADDED EQUIPMENT SHALL BE COMPLETED BEFORE THE CONNECTION TO LIVE EQUIPMENT IS MADE. THE LIVE CABLE LEAD TO WHICH A CONNECTION IS TO BE MADE MUST BE POSITIVELY IDENTIFIED.**

2.5 Only one lead shall be attached to a punching, lug, or connector that is designed to accommodate one lead.

2.6 Any connector drilled with two fastening holes shall be secured using both holes.

2.7 Only one connection shall be attached with the same mounting screw(s) or bolt(s). Double stacking lugs on return ground bar of BDFB is not allowed.

EXCEPTION: **Terminal connections for conductors #10 and smaller. See requirements outlined Paragraph 14.**

EXCEPTION: **Pre−terminated equipment by the manufacture.**

2.8 Requirements on the designation of fiber, power, grounding, etc. connections are specified in Section 29 (Equipment Designations).

3. Skinning

3.1 When skinning a wire, care shall be taken not to scrape or nick the metallic wire.

3.2 Skinning lengths for wire wrapped connections are:

Wire Gauge	Skinned Length	Terminal Type
24	1 1/2”	Embossed 0.009/0.010”
20−24	1 5/8”	Square, Rectangular, or Embossed
22−24	1 5/8”	Twisted, Coined or Serrated
26−30	2”	Square, Rectangular, or Embossed
26−30	1 1/8”	0.025 Square
26	1 5/8”	Embossed 0.009/0.010”

3.3 When a soldered connection is to be made on a wire wrapped terminal, the wire shall be skinned to a length of 3/4”.

3.4 Soldered connection should be skinned:

(a) Standard Terminals 3/4”

(b) Perforated Terminals 1 1/2”

3.5 An approved wire skinning tool shall be used. The specific tool that will be used depends on the installation and type terminal.

3.6 Shiner length between insulation and point of contact with the terminal shall not exceed 1/8th of an inch.

4. Wire−wrapped Connections

4.1 Wire wrapped connections shall be installed and removed with an approved tool. The quality of the connection is based on the proper number of turns, clearances, tolerances, and tension that the connection was made with: a turn shall begin at the point that the bare wire first contacts the connecting terminal.

4.2 Solderless wire wrapped connections must conform to Figures 1, 2 and 3. The connections shall consist of a minimum of successive non−overlapping turns of bare wire for various gauges as follows:

Wire Gauge	Minimum Number of Turns	Maximum Clearance
20	5	0.005
22	5	0.005
24	6	0.005
26	7	0.005
28	7	0.003
30	7	0.003

NOTE: 1. Insulation must be within 1/8” of terminal.

EXCEPTION: 28 and 30 gauge wire must have one full wrap of insulation before wire wrapping begins.

NOTE: 2.) Overlapped turns shall be discounted when determining the total number of turns on a connection, and there shall be no more than one bulged turn within the minimum successive turns of a connection.

4.3 When reconnecting a solderless wire wrapped connection, one of the following requirements will apply:

(a) If length of the lead permits, the lead shall be reskinned and the solderless wire wrapped.

(b) The wire shall be reskinned to provide 2 new wraps of non−previously connected wire and the connection soldered.

(c) If sufficient slack is not available, the wire shall be reconnected using existing helix and soldering.

NOTE: Connections shall not be made with previously used skinners.

4.4 Clearances between connections and adjacent metal work shall be 1/32nd of an inch minimum. The wire end projection shall not violate the minimum clearance.

4.5 Clearances between adjacent connections shall be 1/64th of an inch minimum. The wire end projection shall not violate the minimum clearance.

4.6 Exposed uninsulated wire shall not exceed 1/8”.

4.7 Soldering is not an approved repair method for 28 and 30 gauge wire−wraps.

4.8 If one connection on a terminal is soldered, ALL connections on that terminal shall be soldered. A terminal on which solder splashes are present shall be soldered.

4.9 Where only one connection is specified on any terminal designed for more than one connection, the connection shall be placed on the terminal far enough to permit at least one solderless wrapped connection.

4.10 The turns of any connection shall not overlap the turns on any existing connection on the same terminal.

4.11 Wrapped terminals should not be twisted more than 90 degrees. The terminal shall not be straightened to remove any twist that occurred during the wrapping. Terminals twisted more than 90 degrees are not acceptable and shall be soldered.

4.12 Connections made over previously−soldered terminals or on terminals with solder connections shall be soldered.

4.13 Wire wraps shall be made using the tool sized to the wire gauge. Bits and sleeves shall be inspected for excessive wear or other defects.

5. Soldered Connections

5.1 The most significant problem encountered in soldering is "cold soldering". Every effort must be made to avoid this condition. Proper soldering technique is the primary method of avoiding this condition. Soldering should provide a secure metallic connection between the parts soldered.

5.2 A soldered plier connection made in a hole, hook or notch of a terminal shall be connected so that the bare portion of the wire will have a large contact surface on the terminal.

5.3 Wire terminals with holes or notches, shall have those holes or notches filled with solder.

5.4 A minimum clearance of 1/32" shall be maintained between a soldered connection and adjacent metal work. A minimum clearance of 1/64" shall be maintained between soldered connections.

5.5 A soldered−wrapped connection is made with a wire wrapping tool requiring a minimum of 1 1/4 turns of bare wire.

5.6 When soldering/connecting to a No. 6 vertical bay ground lead on a frame or rack, the lead should be connected with two or three closely wound turns of bare wire. In addition either sewing twine or one wrap of insulated wire should be added to the ground lead wrap. (See Figure 4)

6. Compression Connections

6.1 Compression connections shall be made in conformance with the manufacturer's requirements and these requirements(e.g.,wire gauge, type of lug, crimp tool, crimp pressure, crimp sequence, etc.) shall be strictly adhered to.

6.2 All power connections/ground connections/splices shall be made with compression type (crimp) connectors.

6.3 Crimp tools must be of the type that provides an embossment symbol or die index number. For all power connections the crimping die must meet the TR requirements unless otherwise specified by the manufacturer's documentation or specifications. This will apply to H−taps also. The smallest size of compression connector requiring embossing is a #8.

6.4 Fractures, perforation, or major distortions are not permitted.

6.5 If a crimp connection is not properly made the connector shall be discarded and a new connector used. Recrimping of the same connector shall not be done.

6.6 Sharp edges or ridges caused from the crimp process are to be removed for safety reasons.

6.7 The bare conductor shall extend the full length of the connector groove.

6.8 Compression connectors shall have inspection windows to inspect the conductor for proper insertion.

EXCEPTION: **Compression connectors for batteries/cells shall have a closed barrel transition in order to protect the conductor end from moisture and other environmental conditions.**

6.9 Two hole crimp connectors shall be used for all #8 or larger grounding and power connections. For #10 and smaller, one hole crimp connectors may used. See Paragraph 14 (TERMINAL CONNECTIONS) for requirements pertaining to #10 wire and smaller.

6.10 Power connections should use a two hole crimp connector. If the equipment design is such that the use of a two hole lug is impractical, a one hole lug may be used. However, in these instances lock washers shall be used and the cable shall be secured in such a fashion that the connection will not loosen. (See Figure 5) The spring lock washers should be zinc plated and gold chromate. When connecting to a fuse position in a BDFB that has not been equipped with lock washers, the installer must add a lock washer.

EXCEPTION: **Due to the design of the CEV Bulk Power Plant 400 amp CSC lugs the lock washers as specified bt TR for one hole connections are not required.**

6.11 A & B leads of the same equipment cannot be placed back−to−back on the return battery feed.

6.12 Copper and aluminum crimp type and copper alloy solderless connectors shall be connected in accordance with the following:

(a) The contact surfaces of all current carrying connections shall be cleaned with abrasive paper or a wire brush and a coating of corrosion resistant compound applied.

(b) Silver or tin plated connectors shall not be cleaned with abrasive paper of wire brush. They shall be cleaned only with a cloth moistened with petroleum spirits.

(c) The crimp or crimps shall be made on the indicated markings on the connector when provided, and in all cases shall be located to provide full width of crimp or crimps on the inserted wire.

(d) Compression shall not extend onto the tang area of a connector.

(e) When more than one crimp is required, the area nearest the connector tang shall be crimped first.

(f) The maximum amount of exposed wire (shiner) between the connector body and wire insulation is 1/16 inch.

(g) Shiners exceeding the 1/16 inch requirement shall be cover with heat shrink tubing. If heat shrink tubing is used on compression connectors, it shall be flame retardant with an oxygen index of 28 or greater; only cover 1/4 inch of the barrel of a connector so that the crimp can be inspected. Transparent heat shrink is acceptable along entire length of crimp. Transparent heat shrink shall not extend unto the tang area.

(h) On flexible type cable (CK20921) heat shrink shall be used 100% of the time. Heat shrink shall cover 1/4" of the barrel and/or transparent heat shrink is acceptable along the entire length of the barrel. It is acceptable to use rubber tape to bridge the gap on shiners exceeding 1/16th of an inch before applying the heat shrink.

7. H Tap Connections/Parallel Compression Connectors

7.1 Connectors/covers shall be the type and size for the cables.

7.2 For battery and battery return connections (H−tap) apply two layers of one half lapped rubber tape to the entire body of the parallel tap connector before applying the insulating cover. For the grounding connection, the connector is not required to be covered.

7.3 Secure the insulating covers with one piece of cord between the two snaps on all covers that have only two snaps. Larger covers shall be secured with two pieces of cord.

7.4 H Tap connections/parallel compression connectors shall be directly over or under(raised floor applications) the equipment it serves. If an obstruction(i.e., lighting, cable rack, ladder track, etc.) prevents the connection to be made directly over/under the equipment, than it shall be made as close as possible to the equipment it serves.

7.5 Power cable connectors, taps etc., shall be located at the sides or on a top layer of cables. It shall always be possible to access connectors and taps by hand to feel their temperature or condition.

7.6 H Tap connections/parallel compression connectors made for a dedicated frame shall be made at the main feeders cable end, no pigtail. (See Figure 6)

7.7 H Tap connections/parallel compression connectors made on a main feeder engineered for future bays shall protect power cable ends with heat shrinkable rubber end caps.
(See Figure 7)

7.8 Under no circumstances shall mechanical “C” or “H” taps be installed for distribution circuits without written authorization from the Capacity Manager.

8. Bus Bar Connections

8.1 Bus bar and bus bar clamps shall be installed as specified in the section and the job documentation.

8.2 Bus bar clamp bolts shall be equipped with pal(locking) nuts. Verify that the regular nuts are torqued properly before applying a pal nut.

8.3 Sharp edges and burrs shall be removed from all surfaces.

8.4 Plated metal contact surfaces forming surface connections shall be cleaned (without using abrasives) and coated with a non−oxidizing agent.

8.5 Non−plated metal contact surfaces forming connections shall be cleaned with a fine abrasive paper then coated with a non−oxidizing agent. However, in the lineage power plants, if the bus bar and lugs are coated then the power plant manufacturer’s documentation should be followed and the protective coating should not be removed. If either metal is of dissimilar materials, then NO−OX−ID−A shall be applied.

8.6 A plated or unplated bus bar may be connected to copper bus bars.

8.7 Aluminum bus bars shall not be tapped for fastening terminal lugs or for fastening bars to bar. Use through bolts, clamp joints or threaded inserts.

9. Coaxial Connections

General

9.1 The following requirements pertaining to type wire, connectors, method of crimping and compression tools must be adhered to and can only be changed or modified by BST Headquarter's Staff. BST approved coaxial cables, connectors and tools are listed in Table 1.

9.2 The use of screw−type BNC/TNC connectors is prohibited.
The use of 90adapters shall not be used in lieu of 90° coaxial connectors.

9.3 Unless otherwise specified, all coaxial connections shall be crimped.

9.4 These requirements do not eliminate any additional tests required by the Installation Supplier or local BST.

9.5 The use of manual stripping devices (i.e., EXcelite) is prohibited except to restore service on an emergency basis.

9.6 A Method of Procedure (MOP) Detailed Step form, must be initiated prior to the start of the Pre−Installation Check. The following information must be provided on the Detailed Step form:

- locations of terminating connections
- date connections are to be made
- type connectors used
- type center pin crimper to be used
- last date crimper was calibrated
- name of installer performing BNC connections and transmission test.

A. Pre−installation Check

9.7 This test is performed to ensure that the tools used in the installation of the BNC are properly calibrated and meet the installation requirements.

9.8 Secure a section of coaxial cable furnished on the project. There are only six types of BST approved coaxial cable. Coaxial cable shall not be installed if it does not meet BST approval.

9.9 Using the approved motorized cable stripping device, prepare the cable ends per the manufacturer's chart that is supplied with the connector and test the section.

9.10 Following this test, inspect to ensure that the following has not occurred:

– Center conductor has not been nicked

– No evidence of outer braid being cut or stressed

If either has occurred then the stripping device needs to be adjusted.

9.11 Crimp the center pin to the center conductor with approved crimper. Inspect the nail head to ensure that it is not crushed or damaged. If this has occurred the crimper is of the incorrect type or it is out of calibration.

9.12 Check for center pin retention by securing the center pin and pulling the cable until the conductor breaks. Regardless of cable−type, the conductor should break before center pin slips. If center pin slips, the crimper is out of calibration.

9.13 After preparing a BNC connector, check the strength of the outer crimp using a tension meter device. The outer crimp of a BNC should withstand a minimum of 25lbs. of pressure on the smaller diameter coaxial (i.e., 735A and 5535) and 50lbs. of pressure on the larger diameters (i.e., 734D and 5568).

9.14 Ensure that the entire length of outer sleeve has been crimped and that the sleeve is embossed indicating the correct crimping die has been used.

B. Installation Requirements For Coaxial Connections

9.15 Place outer sleeve onto the cable with the ring to the field side of the connector body.

9.16 Prepare the cable as per the BNC's manufacturer's specification supplied with the connector.

9.17 Crimp the center pin to the center conductor. Never crimp twice.

9.18 Insert the cable with center pin intact into the connector(the foil under the shield shall fit smoothly into the connector, do not remove foil) until it snaps into place. Center pin must be properly seated in the connector.

9.19 Crimp the outer sleeve to the body of the connector. Never crimp twice.

9.20 Use a calibrated dial indicator to ensure that the center pin falls between the required measurements. On a small dial it should read between 1 and 2, on a large gauge it should read plus or minus 20.

C. Transmission Test

9.21 Each transmit and receive coaxial pair shall be tested, one pair at a time.

9.22 Loop back at the equipment end with a BNC coupler similar to AT&T ITE 6830.

9.23 At the DSX−3, insert a signal from a DS3 transmission test set on the OUT cable, plug the IN cable to the IN jack of test set. Set monitor for data bit errors.

9.24 Physically stress the cable at each connector by flexing the cable 15 to 20 degrees in all directions. Check monitor for bit errors recorded. Repeat test until all cables are tested.

9.25 When a cable fails the transmission test, locate the defective connection and replace.

D. Factory Formed Or Shop Made Cables

9.26 The installer is responsible for conducting test stated in paragraph 9.20 on all factory formed or shop made cables.

9.27 The installer is responsible for the transmission test stated in paragraphs 9.21 through 9.25 on all factory formed or shop made cables.

E. BNC Terminations

9.28 Coaxial cable terminations (i.e., DSX3 panel) shall be formed and secured to allow easy access for maintenance or testing. Insure all connectors are fully inserted and locked in place.

9.29 Inform local BST that work operation is complete, in the event additional testing is required.

Requirements For Alcatel BNC Connectors

9.30 Only certified Alcatel Network Systems installers are allowed to install Alcatel connectors.

9.31 Center conductors must be soldered to the center pin of Alcatel BNC connectors.

9.32 In addition to Alcatel Network Systems procedures on BNC connections, Alcatel installers are responsible for performing requirements outlined in paragraphs 9.20 through 9.25.

10. Quick−clip Connecting Slotted Beam Type

10.1 The success of a quick−clip termination depends upon the design of the terminal, the wire gauge and type of insulation, the use of the correct tool and technique used to insert the conductor into the slotted beams.

10.2 Only one wire shall be engaged in each terminal.

10.3 Textile insulated wire shall not be terminated in slotted beam terminals.

10.4 Conductors shall not be engaged in deformed terminals.

10.5 Previously terminated wire ends shall not be re−terminated.

10.6 Wire ends shall clear adjacent metallic parts by 1/32nd of an inch minimum.

10.7 Wire ends shall protrude a minimum of 1/16th of an inch beyond edge of terminals.

11. Splicing

11.1 A cable must be rerun if the conductor(s) has been nicked, cut or damaged. The requirements in paragraphs 11.2 through 11.6 are for restoring existing service on an emergency basis.

11.2 Figures 8 and 9 illustrate the two approved methods of splicing individual conductors.

11.3 PVC type cable conductors that are spliced shall be protected with heat shrinkable tubing.

11.4 Splices shall be located so as to be accessible for inspection/maintenance.

11.5 Splices shall not be made within conduits.

11.6 Unless otherwise specified, cable and wire spliced shall not be placed on cable racks or troughs.

11.7 If circumstances require a cable/wire splice to be placed on a cable rack (i.e., central office cut–over) all of the following shall be strictly adhered to:

- Capacity Manager responsible for project must provide written approval.
- Installation Supplier shall follow the splice manufacturer's specification for application and assembly.
- If manufacturer does not provide a means to secure the splice/connector (i.e., screws) then cord shall be used and placed at two points.
- Splices shall be electrically verified for continuity and correct wiring.
- Rigid PVC tubing shall be placed over splice for protection.
- Appropriate T Base Drawing (typically 600 series Cabling,Cable Rack) shall be marked with location, type and number of splice(s).

In–line coaxial splicing is not approved for repairing cables.

12. Shields

12.1 The exposed shield on any twin conductor and shielded type cables shall be protected.

12.2 All shielded type cable connections shall be made using the crimp–type, wrap–soldered, or shield sleeve–type connections as indicated on the manufacturer's connection drawings.

12.3 These types of shielded type cable connections are permissible if the documentation does not specify otherwise.

(a) A typical soldered–type ground lead connection to the shield of a shielded wire or cable is shown in Figure 11. When this method is used for ground terminations on wire or cable having TFE–PTFE insulated center conductors, the inner sleeve is not required. The sleeving shall be provided under the shield braid for all other types of wires prior to making the soldered connection. No movement shall exist between the shield braid and the soldered ground lead at the connection. Apply an overlapping layer of plastic tape or heat shrinkable tubing for protection.

(b) A typical shield–sleeve–type ground lead connection consists of a heat shrinkable type tubing and a ring of solder positioned within the tubing as shown in Figure 12. Wire or cable having TFE–PTFE insulated center conductors is shown in Figure 13. A sleeve–type barrier is positioned under the shield braid to prevent damage to the insulation on the center conductor of the cable during heat application. Heat is applied to the assembly using an approved tool to make the soldered connection and simultaneously shrink the tubing.

12.4 Where the grounded shield of two shielded wires or cables are to be connected together and not grounded at the apparatus as shown in Figure 14, a single ground wire may be used to connect the shields.

12.5 The shield of all shielded wire shall be terminated a maximum of 1 1/2 inches from the connecting point of the apparatus. When terminating at the terminal strip, the shield shall be as close as practicable to the fanning strip, whether or not the ends of the shield are grounded unless otherwise specified on the wiring drawings.

12.6 The shields of shielded cables shall be cut, positioned and bonded to ground as specified in the job documentation.

EXCEPTION: SHIELDED CABLES FOR TIMING SUPPLIES SHALL BE BONDED AND GROUNDED AT THE BITS(TIMING SOURCE). CURRENT EXCEPTIONS TO THIS REQUIREMENT ARE THE FT2000 AND DDM2000 DUE CABLE ASSEMBLY DESIGN.

13. Fiber Optic Connections

13.1 Care must be used when handling and terminating fiber optic connectors. The facing surface of an optical fiber is highly polished to prevent reflection and refraction. The installer shall observe the following requirements when handling and terminating fiber optic connectors.

(a) Always use a pressurized optical duster to clean optical connectors before mating them. **Hold optical duster in an upright position when spraying as foreign matter may be in bottom of can and may escape when can is nearly empty or upside down.** Also, dust particles may scratch the polished surface, permanently damaging the connector.

(b) If the connector requires a more thorough cleaning, isopropyl alcohol may be applied with a lint free cloth or swab. **Do not use rubbing alcohol, as it contains water and other contaminants that will cloud the fiber connection.** After cleaning, the connector should be blown dry with the optical duster.

(c) Always protect optical connectors with protective covers when they are not in use. Before protective covers are re−installed, they should be cleaned with the optical duster. **After installation, these protective covers should be stored in a clean container and turned over or made available to local Capacity Manager for future use.**

(d) Never touch the polished optical surface of a connector. Oil from your finger or other foreign matter can cause excessive loss.

(e) Do not overtighten the plugs. Overtightening can damage or strip the threads. Finger-tight is adequate.

CAUTION: Never look directly into an unterminated fiber optic connector unless it is absolutely known that no optical power and/or laser radiation is present. Laser safety glasses are recommended when installing or servicing fiber optic equipment.

13.2 If fiber connections assignments are not available at time of installation, the jumpers shall be designated. Requirements on the type tag and information on tag are outlined in Section 29.

14. Terminal Connections

14.1 Connection made to screw–type terminal blocks or other flat surfaces with #10 to #22 gauge wire will be made using the correct color–coded insulated fork tongue–type connector.

14.2 The proper size connector must be used for the wire size being terminated as detailed in the manufacturer's specification. Do not fold smaller wires to fit connector.

14.3 Only one wire end may be terminated in a lug.

14.4 The stacking of fork tongue–type and ring–type connector's is limited to two under any one screw type terminal. This type of termination is permissible if the documentation does not specify otherwise.

14.5 If the equipment design does not allow a terminal lug to be connected, then form bare end of lead around terminal in a clockwise direction so that when the screw/bolt/nut is tightened, loop will tighten rather than unwrap. Tin stranded wire prior to making connection. (See Figure 15)

EXCEPTION: **When connecting #24 solid wire to screw terminals, a washer shall be placed under the screwhead to prevent the wire from breaking off.**

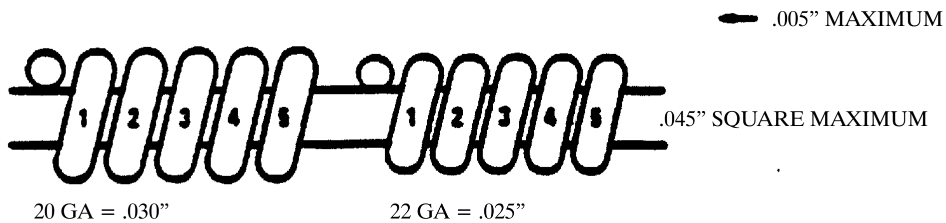
14.6 Requirements for ground connections made to bay–frame uprights(i.e.,chassis ground, shield ground, etc.) using #10 to #22 gauge wire are as follows:

(a) Metallic surfaces to be joined shall be prepared to a bare, bright finish (paint and oxidation removed). NO–OX–ID "A" or approved equivalent is required for all grounding conductor joints.

(b) The proper size ring–type connector must be used for the wire size being terminated.

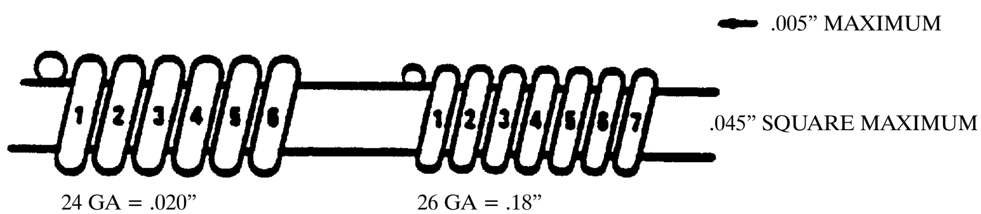
(c) A star washer, one that bites both ways, shall be placed between the screw head and terminal lug.

(d) The stacking of ring–type connector's is limited to two under any one screw head. This type of termination is permissible if the documentation does not specify otherwise.



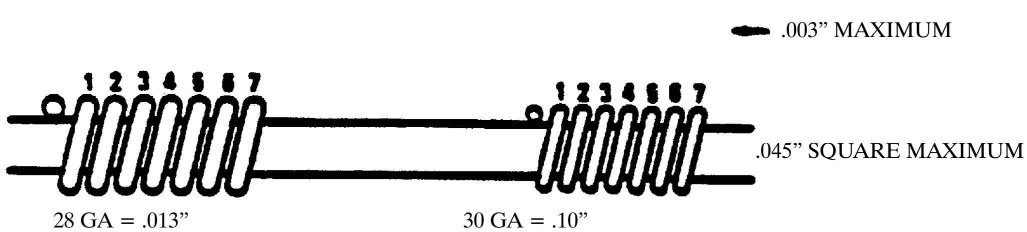
NUMBER OF TURNS OF 20 AND 22 GAUGE WIRE WITH MAXIMUM SPACING OF .005” BETWEEN TURNS.

Figure 1 − 20 And 22 GA Solderless Wire Wraps



NUMBER OF TURNS OF 24 AND 26 GAUGE WIRE WITH MAXIMUM SPACING OF .005” BETWEEN TURNS.

Figure 2 − 24 And 26 GA Solderless Wire Wraps



NUMBER OF TURNS OF 28 AND 30 GAUGE WIRE WITH SPACING OF .003” BETWEEN TURNS.

Figure 3 − 28 And 30 GA Solderless Wire Wraps

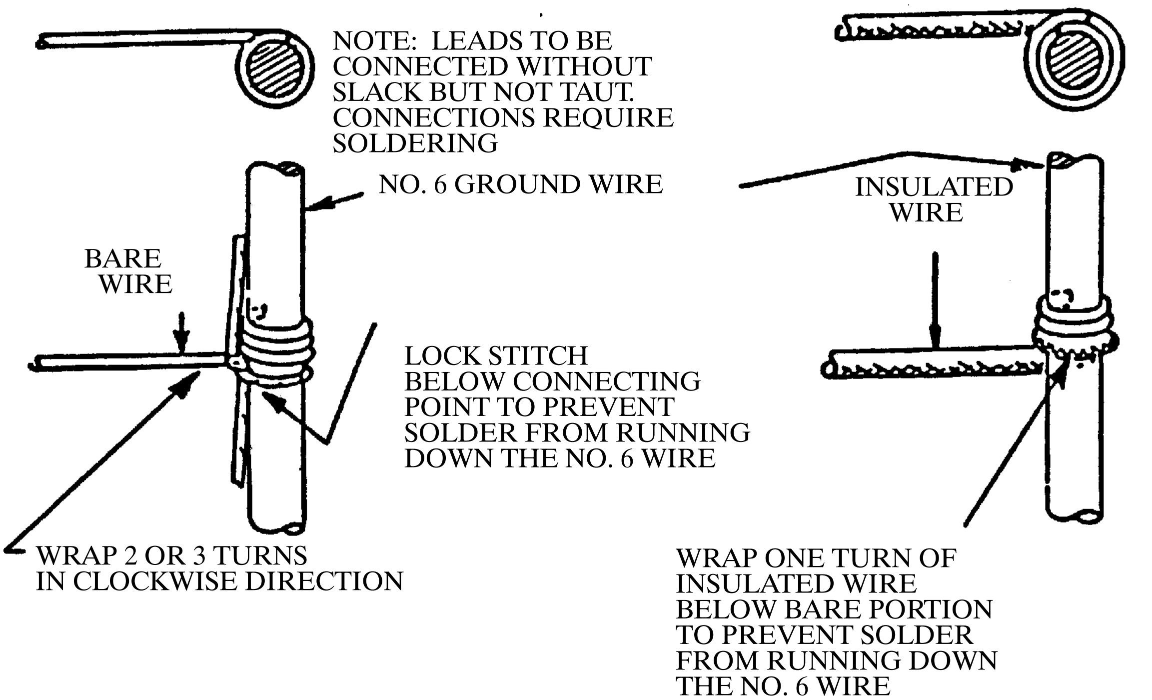
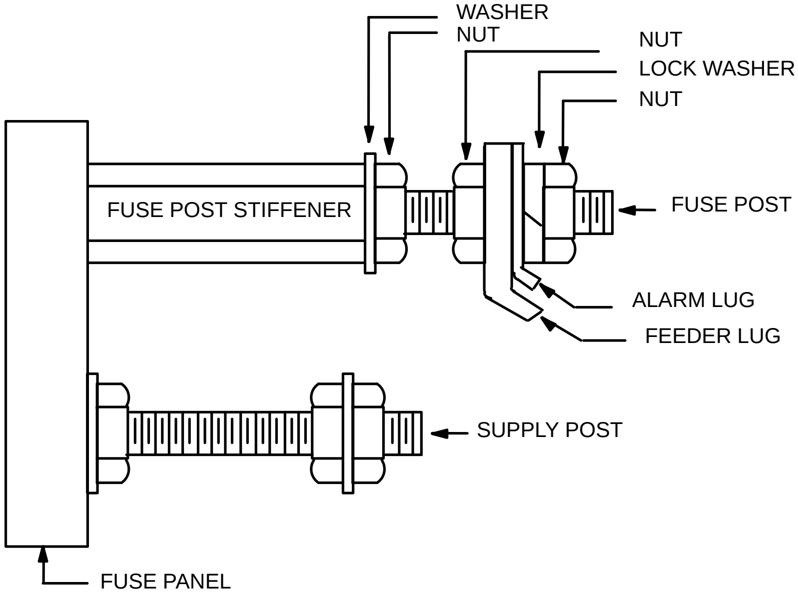


Figure 4 − Connecting Ground Leads To No. 6 Ground Lead



INSTALLATION PROCEDURES

1. USE A POST STIFFENER WHEN THE POWER FEEDER CABLE IS 1/0 OR LARGER.
2. LEAVE DUMMY FUSE IN PLACE UNTIL WORK OPERATION IS COMPLETE.
3. ALL TOOLS USED ON WORKING EQUIPMENT MUST BE INSULATED.
4. SCREW STIFFENER ONTO FUSE POST UNTIL IT IS SNUG AGAINST PANEL.
5. INSTALL IN THE FOLLOWING MANNER: NEXT TO STIFFENER PLACE WASHER AND NUT, TIGHTEN TO SECURE STIFFENER IN PLACE.
6. INSTALL NUT, FEEDER LUG, ALARM LUG, LOCK WASHER, AND NUT. TIGHTEN TO HOLD LUG SECURE.
7. SECURE POWER CABLE TO FORM WITH TWINE.
8. REMOVE DUMMY FUSE.

NOTE: Figure 5 is only an example and does not apply to a Lorain or AT&T fuse panel. It illustrates typical application of when a lock washer should be used and how it should be sequenced on a fuse post. If the sequencing of the lock washer against the alarm lug causes any distortion to the alarm lug, then a washer may be placed between the two.

Figure 5 − One Hold Lug Power Connection

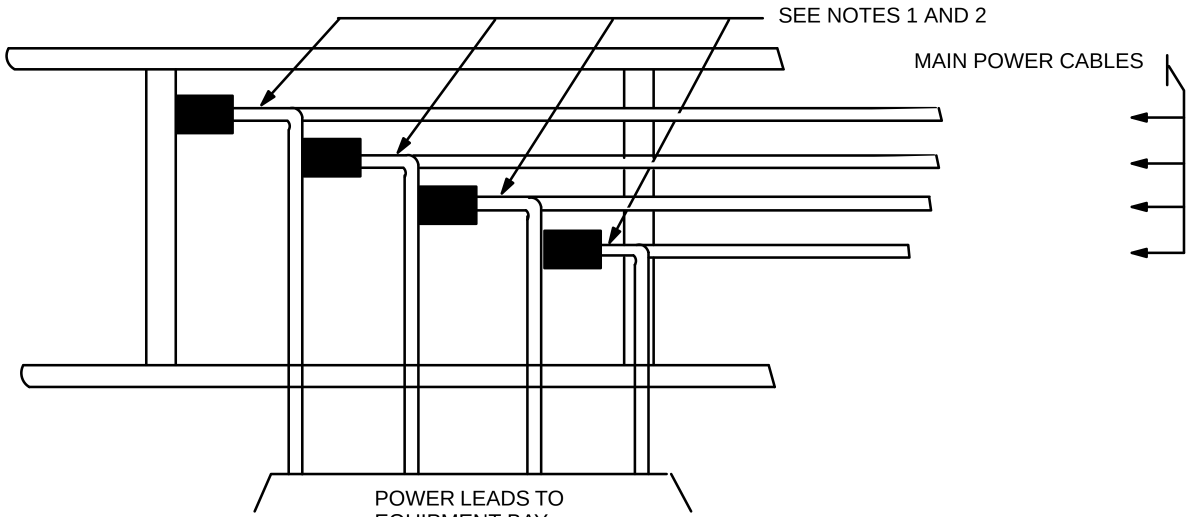


Figure 6 − Parallel Connectors For Dedicated Bay(s)

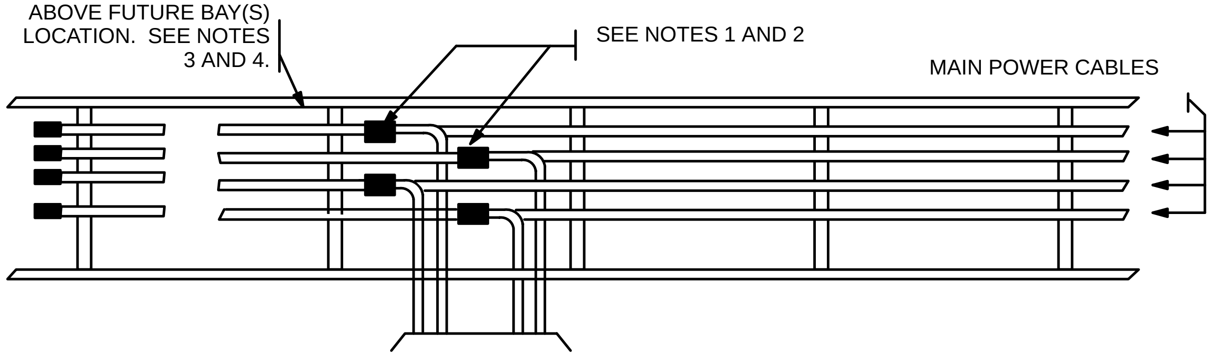
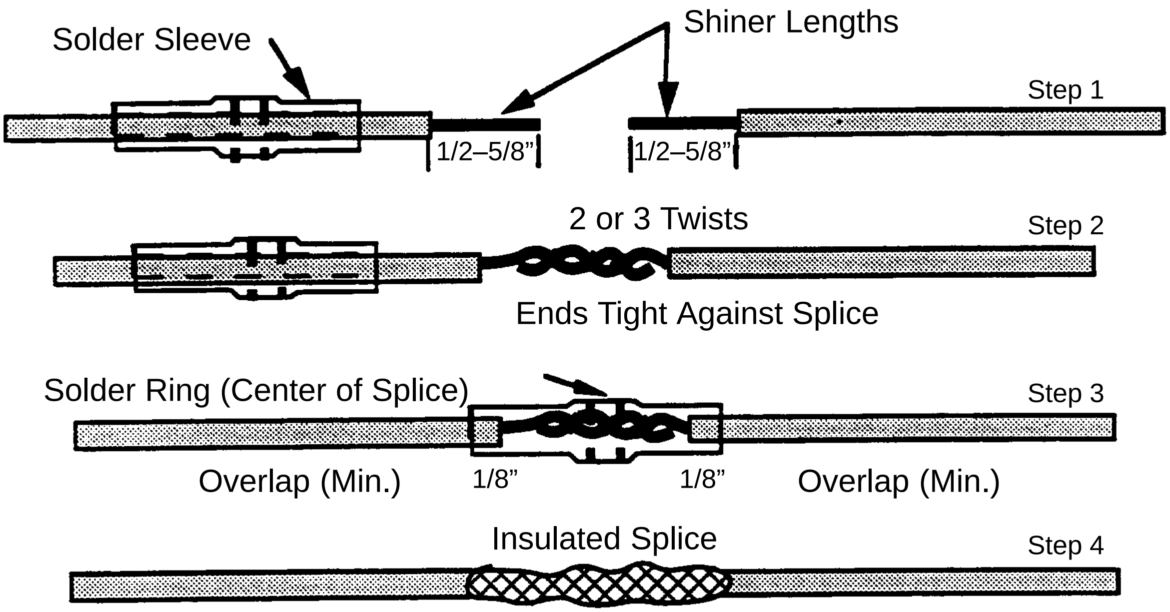


Figure 7 − Parallel Connectors For Future Bay(s)

NOTES:

1. PLACE COVER OVER H–TAP AND SECURE WITH CORD.
2. SECURE POWER DROP CABLE TO MAIN FEEDER WITH CORD.
3. STENCIL AND SECURE ONE 145C TAG OR EQUIVALENT AT CABLES END TO IDENTIFY OTHER END. (i.e., POWER SOURCE) SEE SECTION 29.
4. USE HEAT SHRINK CAPS DESIGNATED FOR THE CABLE SIZE, WHICH IS THE PREFERRED METHOD.

STRAIGHT SPLICE

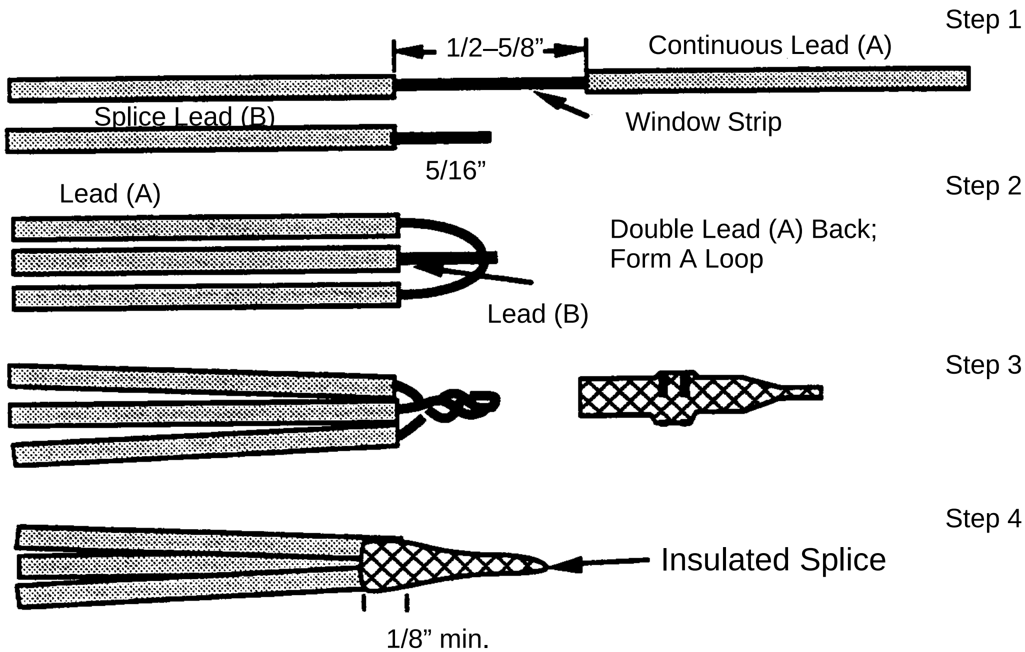


Method for Making Straight Splice

1. Remove approximately 1/2" to 5/8" of insulation from the ends of the two wires to be spliced; insert solder sleeve over the end of one lead.
2. Twist the bare wire ends together; make at least two full twists and keeping the wire ends tight as possible against the splice.
3. Slice the KS–2156L1 or L2 solder sleeve over the twisted bare wire so the solder ring is centered. Sleeve must overlap the wire insulation (minimum of 1/8") at both ends. No bare wire protruding out the ends of the sleeve.
4. Apply heat to the solder sleeve using a heat shrink gun. The heat will melt the solder ring (soldering the connection) and shrink the heat shrinkable insulation tight against the connection.

Figure 8 − Straight Splice

“Y” SPLICE



Method of Making Inservice “Y”

1. Three inches of slack needed for this splice.
2. “Window Strip” Lead (A) exposing 1/2” to 5/8” of bare conductor and remove 5/16” of insulation from Lead (B) (Step 1).
3. Double Lead (A) back and place Lead (B) as shown in Step 2; twist the three leads together making 2–3 full twists and trim to about 1/4” long (Step 3).
4. Slide large end of the KS–2156L3 solder sleeve over the twist wires. Be sure that (A) the solder ring is in the approximate center of the bare wire twists and (B) the sleeve overlaps onto the insulated portion of the wires for at least 1/8” (minimum).

Figure 9 − “Y” Splice

Figure 10 − Future

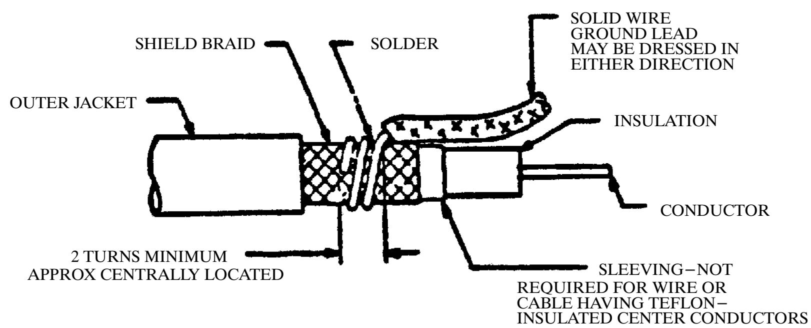


Figure 11 − Wrap-soldered-type Ground Lead Connection To Shields Of Shielded Wire

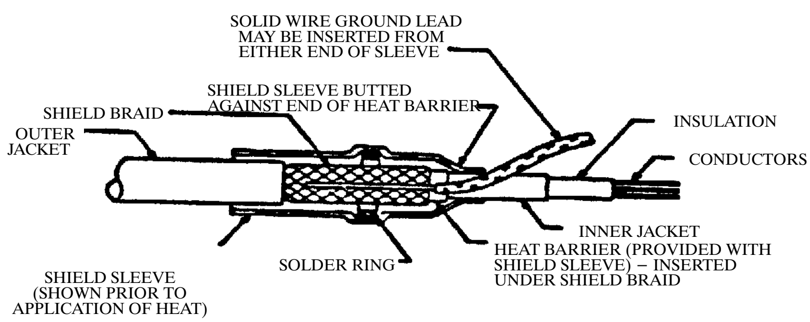


Figure 12 − Shield-sleeve-type Ground Lead Connection

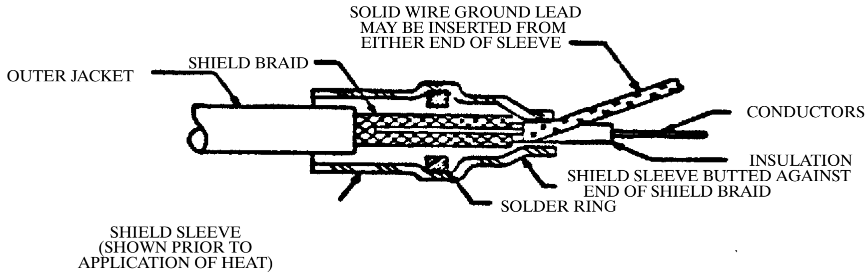


Figure 13 − Shield-sleeve-type Ground Lead Connection

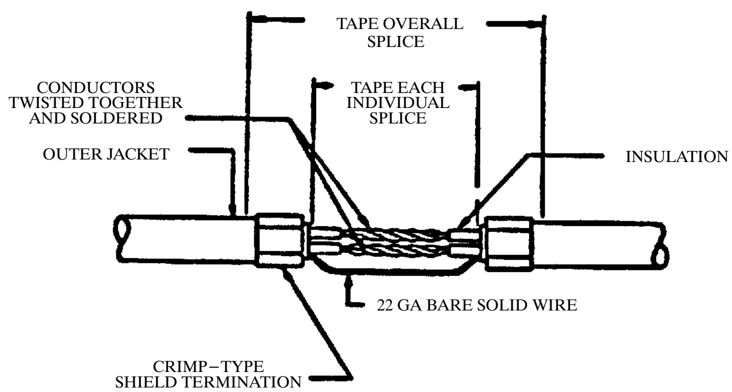


Figure 14 − Method Of Splicing Shielded Wires

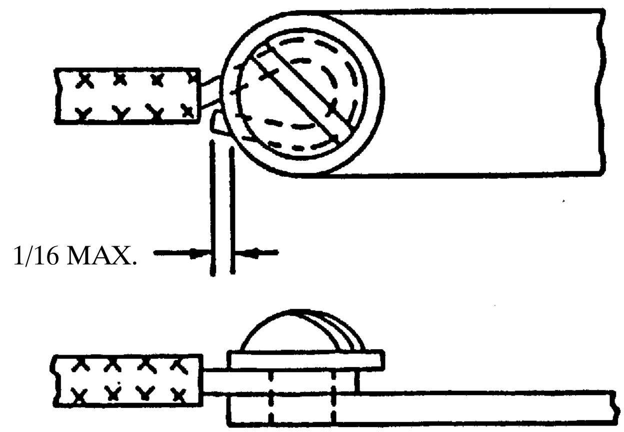


Figure 15 − Solderless Connections At Screw Type Terminals

TABLE 1

Distance from Terminal Equipment to Cross−Connect Field	Type Cable	Type Connector: Straight Connector	Type Connector: 90° Angle Connector	Cable Preparation Tool	Outer Sleeve Crimp Tool	Die Code	Center Pin Crimper	Notes
		AT&T KS−23558 L16	AT&T KS−23626 L16	AT&T R5865	AT&T R5648 e/w D−2T		AT&T R5761	1
	AT&T 735A	Kings KS−23558 L16						
0−250'	Comscope 5535	Speciality KS−23558 L16						
		Trompeter UPL220−026	Trompeter UPLR220−026	Trompeter BCS/ C24T31	Trompeter CT3 e/w CD3−15	5	Trompeter 010−0055	2
	Alcatel 735A	Alcatel 357−7523−440	Alcatel 357−0131−060	Schleuniger HC207	Daniels HX3−X577 e/w .160 x .475		Soldered	2
		AT&T KS−23558 L15	AT&T KS−23626 L15	AT&T R5865	AT&T R5648 e/w D−2T		AT&T R5761	1
	AT&T 734D	Kings KS−23558 L15						
251'−455'	Comscope 5568	Specialty KS−23558 L15						
		Trompeter UPL220−025	Trompeter UPLR220−025	Trompeter BCS/ C24T3D	Trompeter CT3 e/w CD3−15	4	Trompeter 010−0055	2
	Alcatel 734A	Alcatel 357−7523−400	Alcatel 357−0131−050	Schleuniger HC207	Daniels HX3−X577 e/w .255 or T&B WT411 e/w .255		Soldered	3

NOTE: 1. Must be crimped using AT&T center pin crimp tool. All KS−23558 L16 are interchangeable. Tension setting for outer crimp must be at five or six.

2. Must be crimped using Trompeter's crimp tools. Tension setting for outer crimp must be at five or six.

3. Center pin can only be soldered by certified Alcatel installers.

FIRESTOPPING REQUIREMENTS FOR FLOOR AND WALL OPENINGS − INSTALLATION PROCEDURES

CONTENTS

FIRESTOPPING REQUIREMENTS FOR FLOOR AND WALL OPENINGS − INSTALLATION PROCEDURES

1. General

1.1 This section defines the requirements for firestopping floor and wall penetrations.

1.2 Whoever opens or causes a hole/slot to be opened, shall ensure firestopping integrity in accordance with this section.

1.3 Cable holes shall be retrofitted to the BellSouth approved intumescent material when the current undertaking designates access to an opening. Wholesale cable hole retrofitting is not recommended.

CAUTION: **Existing cable holes that are opened and the cover is of a transite material (Asbestos) shall not be cut up or reduced in size prior to disposal. After removal, the cover shall be adequately wet with water. After wetting, the cover shall be placed into leak−tight container or bag while wet. The container shall be marked with a warning label. See Figure 1.**

NOTE: **The installer shall contact BellSouth Building Services at 780−2740 for disposition and shipment of asbestos material.**

1.4 Cable holes shall be permanently closed at the end of each working day or at the end of the cabling operation, which ever occurs first.

1.5 The Installation Supplier shall provide adequate protection for open cable holes to protect personnel and equipment where there is the danger of material or personnel falling through the cable hole/opening to the floor(s) below.(i.e., area roped off, caution signs, etc.)

1.6 The Installation Supplier shall notify the BellSouth representative when a cable hole cannot be closed/sealed as required to properly meet the firestopping requirements specified in the job documentation.

1.7 There shall not be a mix of intumescent and non−intumescent material on a cable penetration.

1.8 The most current issue of 3M Fire Protection Products Division's **Applications and Specifiers Guide for Fire Protections Systems** can be used as a reference for all installations. Every system in this Guide is U.L. listed. See Section 4 for more details.

(1) **FLOOR PENETRATIONS−** The major exception to the 3M floor hole requirements (see FB3004 typical) is the option of reusing 12 ga. steel cover plates at the discretion of BellSouth operations. **When the steel cover plate is reused, the bolt spacing shall be 8 inches maximum. When the steel cover plate is not used, the steel bolt spacing shall be 6 inches maximum. For retrofitting an existing floor hole, additional bolt holes, steel bolts and 1−1/4 inches diameter fender washers for the steel bolts may be required.**

(2) **WALL PENETRATIONS−** The spacing between the 1/4" diameter by 1 inch bolts on Figure 3 shall be 6 inches maximum. **For retrofitting an existing wall**

nole, additional bolt holes, steel bolts and 1−1/4 inches diameter fender washers are required. Please see CAJ4003 or WL4004 for more detailed instructions. **Where the seams of the intumescent sheets reaches the wall, the 2” wide 26 Ga. galvanized steel strip shall be held down by two 1/4” by 1 inch steel bolts secured into new holes (drilled and tapped into the existing steel flange) on each side of the seam and 1/4” diameter by 1−1/4 inch fender washers.** The rest of the steel strip shall be secured by sheet metal screws on each side of the seam at maximum 3” on center. Standard sheet metal screws of either #6 or #8 by approximately 1/2 inches long shall be used. Note also that a bead of 1/8” thick and 1/2” wide putty shall be placed over the seam before attaching the steel strips.

2. Firestop Certification Label

2.1 The certification label is 3 inch by 6 inch, pressure sensitive and features black printing on a white background with red border. (See Figure 2)

2.2 Firestopping seal labels shall be placed on both sides of floor and wall cable hole penetrations. Exception: Floor penetrations that have been converted to the top closing format (bottom composite sheet is attached to either stirrups or steel plate) shall have firestopping seal label on the top side only. The installer shall complete the following information on the label:

(a) The BellSouth job order number that opened and closed the cable hole.

(b) Installation Supplier’s name.

(c) Installer’s name who firestopped the hole.

(d) The date the hole was closed.

2.3 The certification shall be affixed to an opening’s cover plate and building surface upon completion of the firestopping activity in a manner that will cause the label to tear when the cable hole cover is removed. For penetrations such as pipe and cable sleeves that do not have cover plates, the label shall be affixed to the penetrating item and building surface. For multipiece covers, the label shall be affixed to a cover piece that must be removed to add or remove cables.

3. Firestopping With Intumescent Products

A. General

This part covers the procedures for firestopping wall and floor penetrations using BellSouth approved intumescent materials. It is assumed that cable hole sheathing is in place prior to installation.

3.1 When adding a new cable hole or retrofitting an existing hole with intumescent products, adequate protection shall be provided at the opening to protect equipment on the floor below from falling tools and materials. This protection may be accomplished by leaving ceiling plates in place or by providing a temporary canvas drop panel under the cable hole. Protection shall remain in place until after the bottom plate is secured.

3.2 Except for holes required in cable hole sheathing channels, all cutting and drilling operations associated with installing firestops and cable hole covers shall be done in a designated area.

3.3 Openings to be retrofitted with intumescent firestopping materials shall have the existing mineral wool bags and other filler material removed from the opening and placed in suitable containers for shipment to material reuse warehouse.

3.4 The wire mesh of the composite sheet shall always face the inside of the cable hole. Composite sheets shall be cut with the sheet metal side down to minimize the presence of jagged edges. Jagged and sharp edges, including wire mesh shall be removed prior to installing covers.

3.5 When cables are added to a retrofitted firestopped cable hole the moldable putty is not removed. Cables are run on top of the putty. To reclose the cable hole, additional putty is required.

3.6 It is acceptable to fabricate top covers from more than one piece of composite sheet to avoid unnecessary waste of the intumescent product. The seam or joints of the individual pieces shall be in a horizontal direction to the cable rack. Apply a bead of moldable putty at joints of the composite sheet. See Figure 3. The number of splices allowed is limited to three.

B. Preparing Rectangular Floor Openings

3.7 The bottom steel plate shall be used as the preferred alternative to the stirrups to support a drop in composite sheet. Cut the steel plate so there is a 2 inch lip at the ceiling line. The drop in composite sheet shall be secured to the steel plate with 1/4 inch sheet metal screws in the same manner that it would be secured to the stirrups.

(a) Five support stirrups shall be used to support a drop−in composite sheet in a normal 1−0x2−0 foot cable hole and seven supports shall be used for larger riser type holes which are usually 2−0x2−0 foot. Place stirrups approximately 12 inches apart in preferred and alternate locations as shown in Figure 4.

NOTE: Fabricate stirrups from 2in. wide 10−gauge steel.

One end of the stirrup shall be bent 90 degrees to form a 2 in. flange. The length of the stirrup shall be long enough to reach the bottom of the opening and allow attachment to the steel riser.

3.8 Locate and drill holes in cable hole sheathing channel and fasten support stirrups to the inside of the sheathing channel with 3/4 inch fasteners. The support stirrups shall not extend below the ceiling line.

Straighten, cut, redrill and rebend stirrups if needed so there will be an approximate 2 inch support tab at the ceiling line.

C. Fabricating Cover Panels

Floor Drop−In Cover

3.9 Determine the bottom inside dimensions of the cable opening and cut the drop−in cover from a single piece of composite sheet. The size of the drop−in cover shall provide a 1/8 to 1/4 inch(maximum) gap around the bottom perimeter of the opening to permit easy removal and installation of the cover when reentry of the hole is necessary. The use of a snug fitting drop−in cover shall be avoided in all cases.

3.10 Test fit and mark drop−in cover for mounting holes. Drill 3/16 inch pilot holes for the 1/4 inch sheet screws used to secure drop−in cover to support stirrups.

3.11 Roll moldable putty into approximately 1 inch diameter ropes and apply around the perimeter of the drop−in cover at the floor opening and around the cable bundle at the steel cover. Work putty into all crevasses and gaps between building and drop−in panel, and between cable bundle and drop−in cover to obtain an air tight seal.

Floor Top Covers

3.12 Top covers shall be cut or fabricated to a size that is equal to or slightly smaller than the steel cable hole cover. The steel cable hole cover may be used as a template to determine the proper size of top cover and for locating the 7/16 inch mounting holes to be provided in top cover.

3.13 Roll moldable putty into approximately 1 inch diameter ropes and apply around the perimeter of the cable bundle. Work putty into all crevasses and gaps, to obtain an air tight seal.

3.14 Intumescent material shall completely surround composite sheet mounting screws after the cover is installed to provide an effective cable hole seal. A rope or bead of moldable putty shall be placed between the composite sheet and the surface that it is being secured to. Once the mounting screws are secured, the putty will form a gasket around the perimeter, obtaining an air tight seal.

Wall Covers

3.15 Covers for wall penetrations are fabricated similar to floor covers and attached directly to the building surface. Cover sizes may be determined by using an existing cable hole cover as a template, or by measuring the opening and adding 4 inches to its height and width. When installed, wall covers shall extend 2 inches beyond each side of a wall opening.

Firestop covers shall be installed on both sides of the wall assembly.

3.16 Wall openings with cable racks passing through them shall have two−piece covers. When the amount or height of initial cable pile−up is known, or can be reasonably estimated, the bottom section of the cover shall be sized so the seam or joint between the top and bottom sections will be approximately 1/2 inch above the height of the cable pile−up after installation. The purpose of this is to cause as much of the cable hole seal to remain in place and undisturbed on future cabling operations.

NOTE: The bottom (non−removal) section should fit snug or have up to a 1/4 inch gap along the cable rack surface.

3.17 Intumescent material shall completely surround composite sheet mounting screws after the cover is installed to provide an effective cable hole seal. A rope or bead of moldable putty shall be placed between the composite sheet and the surface that it is being secured to. Once the mounting screws are secured, the putty will form a gasket around the perimeter, obtaining an air tight seal.

3.18 Wall covers are to be fastened in place with hardware appropriate to the facing material used to form the wall opening, 1/4 inch expandable anchors, 1/4 inch hex head cap screws, or #12 round or pan head wood screws respectively are acceptable fasteners for use with concrete, steel, sheetrock catch studs or wood framed wall openings. Wall cover mounting screws shall be spaced approximately on 6−inch centers around the perimeter of the opening. For openings larger than 750 square inches, additional support is required.

4. Firestopping Rectangular Openings

General

Figures 5 through 8 illustrate configurations on firestopping various types of penetrating items.

4.1 In addition to the requirements indicated in Figures 5 and 6, apply one wrap of wrap/strips around the diameter of each cable.

5. Firestopping Circular Openings

General

The following requirements define work operations to firestop circular openings with intumescent materials.

5.1 Figure 9 illustrates the method of firestopping a circular opening penetrated by more than one cable. (Maximum opening size is 6 1/4 inches) Install a nominal 2−in. depth of moldable putty in to the opening so that it is flush with the top of the floor. Work the putty so that it is tightly packed in the opening. Work the putty around each individual cable to improve the smoke seal.

5.2 Figures 10 and 11 illustrates the method of firestopping a circular opening penetrated by fiber optic cable/PVC inner duct(maximum five inch diameter).

(1) At the ceiling, pack a nominal 2−in. depth of moldable putty in the voids within the bundle of the Inner Duct. Also, pack the moldable putty around the exterior of the bundle to achieve a circular form.

(2) Select the proper number of fire barrier FS−195 wrap/strips for the size of the Inner Duct bundle from the table below:

Bundle Diameter	No. of FS−195 Wrap/Strips
2 1/2in	1
3 1/2in	2
4 1/2in	3

(3) Tightly wrap the FS–195 wrap/strips, foil side out, around the Inner Duct and temporarily secure with tie wrap or tape. Butt the secured FS–195 wrap/strips against the underside of the concrete floor. Stagger the butted seams if more than one layer of FS–195 wrap/strips are required.

(4) Apply the Fire Barrier RC–1 Restricting Collar. Remove enough RC–1 Restricting Collar to make one wrap around the applied FS–195 wrap/strips, with a minimum one inch overlap. Bend the mounting tabs away from the Inner Duct bundle right angles, flush with the underside of the floor.

(5) Fasten the RC–1 Restricting Collar tightly around the Inner Duct bundle with a steel hose clamp, centering the clamp on the collar assembly.

(6) Secure the RC–1 Restricting Collar to the floor or wall, depending on the application, with 1/4" diameter x 1 1/2" long steel expansion bolts or an equivalent masonry fasteners, with a minimum 1 1/4 inch diameter steel fender washers.

(7) Seal the system with a generous bead of Fire Barrier Moldable Putty at the FS–195 wrap/strips bundle interface.

(8) Bend the retainer tabs toward the bundle to the lock the FS–195 wrap/strips in position.

6. Penetration Firestop For Blank Openings

Maximum area of square, rectangular or circular opening is 576 sq. inches with a maximum length of 24 inches.

6.1 Install penetration firestop system on both sides of opening. See Figures 12 and 13.

6.2 When installed, composite sheet covers shall extend 2 inches beyond each side of a wall or flush to floor opening.

6.3 Wall covers are to be fastened in place with hardware appropriate to the facing material used to form the opening, 1/4 inch expandable anchors, 1/4 inch hex head cap screws, or #12 round or pan head wood screws respectively are acceptable fasteners for use with concrete, steel, sheetrock catch studs or wood framed wall openings. Securing hardware shall be spaced approximately on 6–inch centers around the perimeter of the opening. For openings larger than 750 square inches, additional support is required.

6.4 Apply a generous bead of caulk around the perimeter of the composite sheet cover.

7. Repair/Replacement After Activation

7.1 Intumescent materials shall be checked for activation if it has been exposed to fire or temperatures in excess of 250 degrees Fahrenheit. Persons responsible for checking activation should look for product charring or expansion/swelling.

7.2 If any portion of intumescent material has been activated the entire portion shall not be installed.

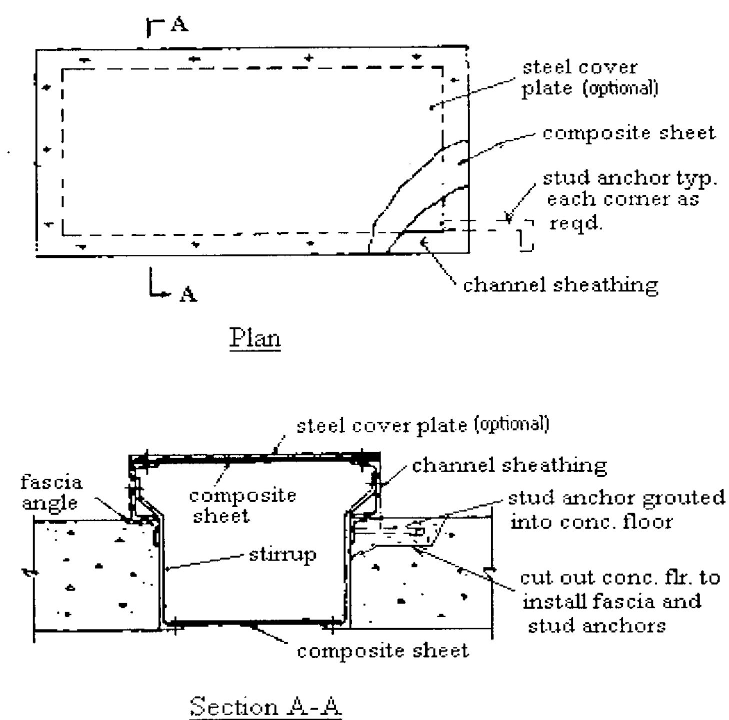
7.3 Activated intumescent material shall be treated as normal refuse during clean−up operations. Inactivated intumescent materials require incineration or burial in suitable containers in accordance with company hazardous waste treatment guidelines. This applies to any hand protection used as gloves, tweezers, thongs, etc,.

8. NEW CABLE HOLES

8.1 BellSouth Property & Services Management (P&SM) will construct new cable holes with properly installed and sealed floor and wall cable holes. The new cable holes will have the proper number of bolts and fender washers installed ready for the installation of cable racking and cables. The installers will then remove all components for reuse, before running new cable racks and cables.

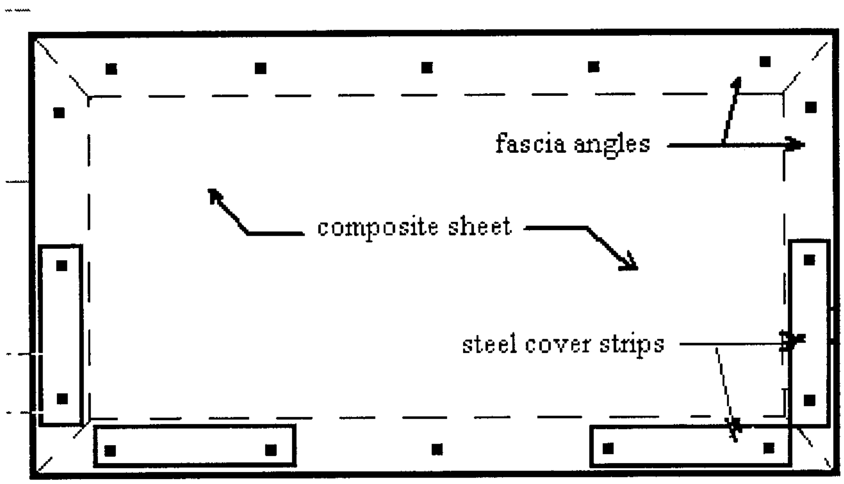
NOTE: See Section 4 for detailed description of the construction of cable holes by P&SM.

8.2 **FLOOR HOLES−** The floor holes will be installed with steel channel sheathing, stirrups, and optional steel cover plate as specified by operations.

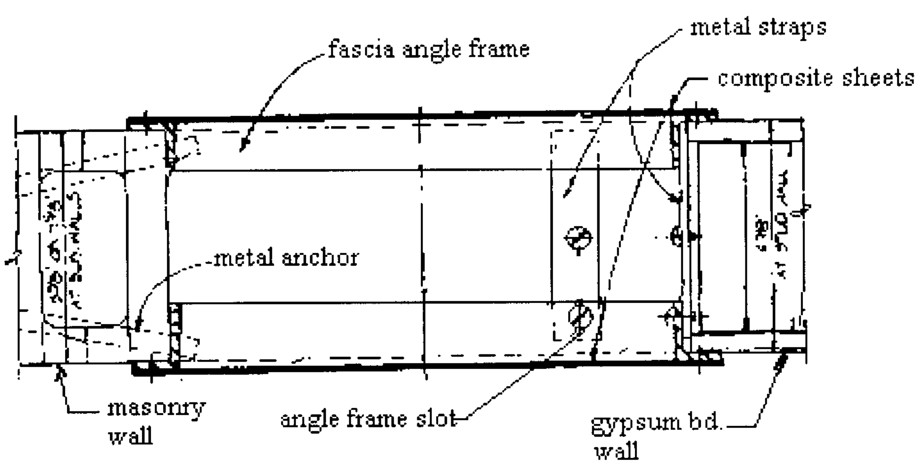


Floor Cable Hole

8.3 WALL HOLES− The P&SM will provide wall cable holes with metal fascia angles and composite sheets on both sides of the wall. The bolts will be placed at a maximum 6 inches on centers with 1−1/4” diameter fender washers on top of the composite sheet. Steel cover strips of 2” by maximum 8” will be provided as shown below to provide coverage over the composite sheet joint that will be created when the services supplier vendor places a cable rack and cables through the new wall hole. The steel cover strip will replace the two bolts on both sides of the composite sheet seam per Figure 3. However, the 2” wide 26 Ga. galvanized steel strips are still required to be placed over the seem between the steel cover strip and cable bundle. A bead of 1/8” thick and 1/2” wide putty shall be placed over the seam before attaching the steel strips and the steel cover strips.



Elevation



Plan

Partition Cable Hole

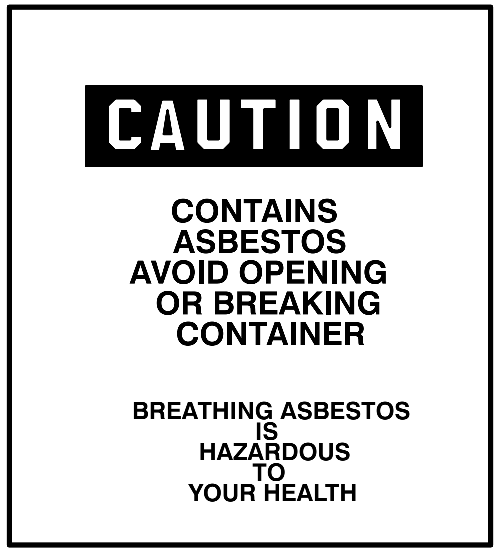


Figure 1 − Asbestos Warning Label

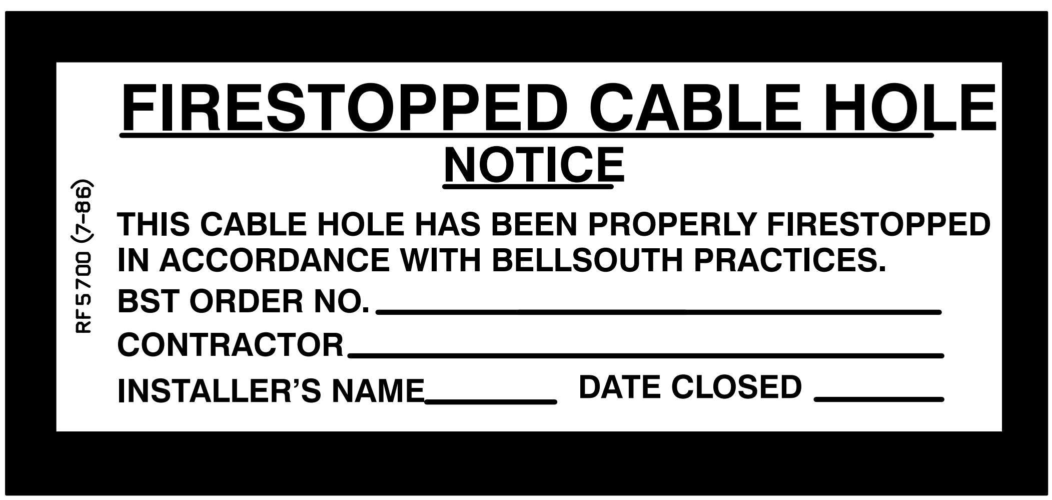


Figure 2 − Cable Hole Label

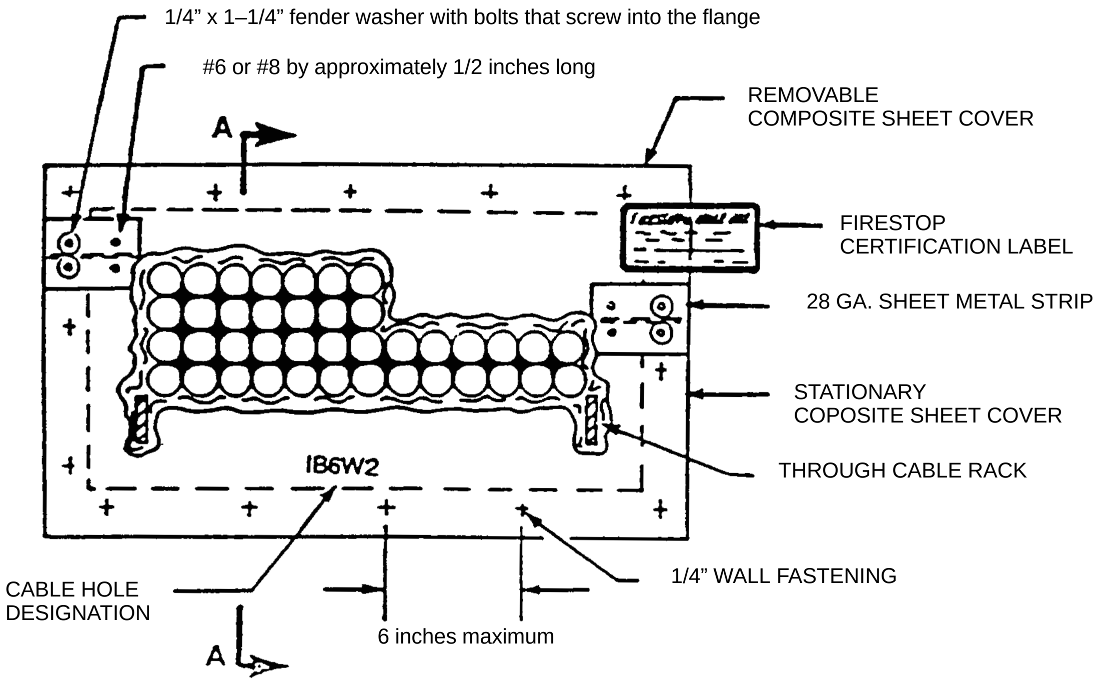
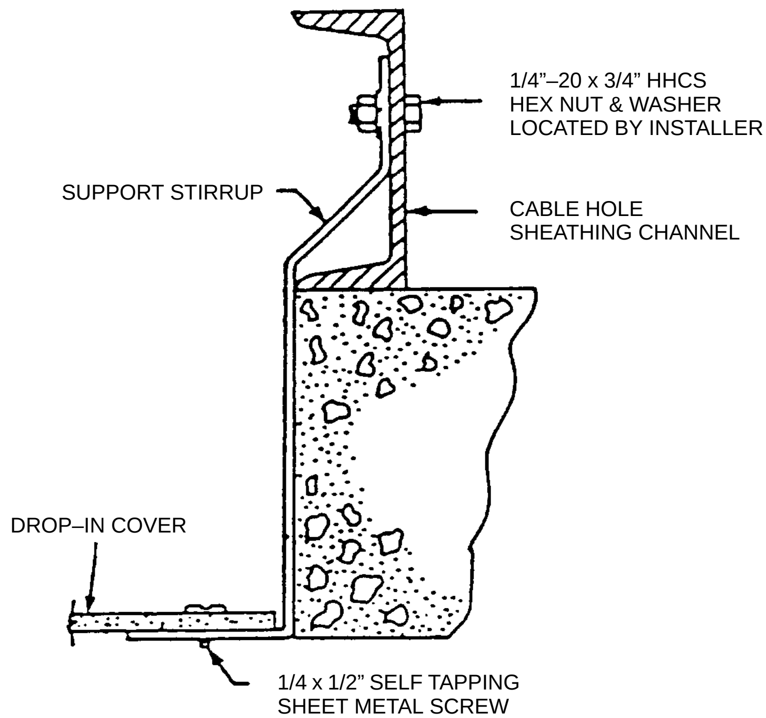


Figure 3 − Intumescent Firestopping − Through Wall Penetrations



DROP–IN CORNER ARRANGEMENT

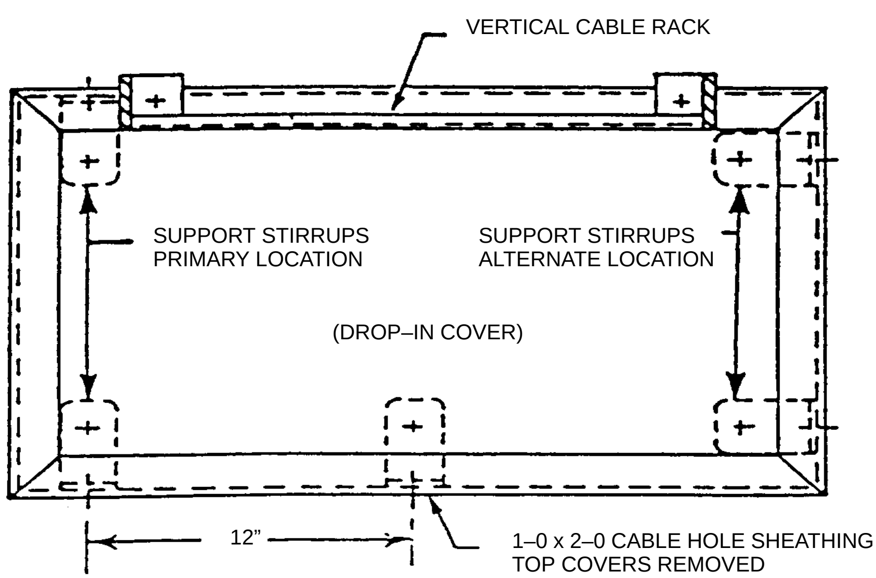


Figure 4 − Intumescent Drop−In Cover Support

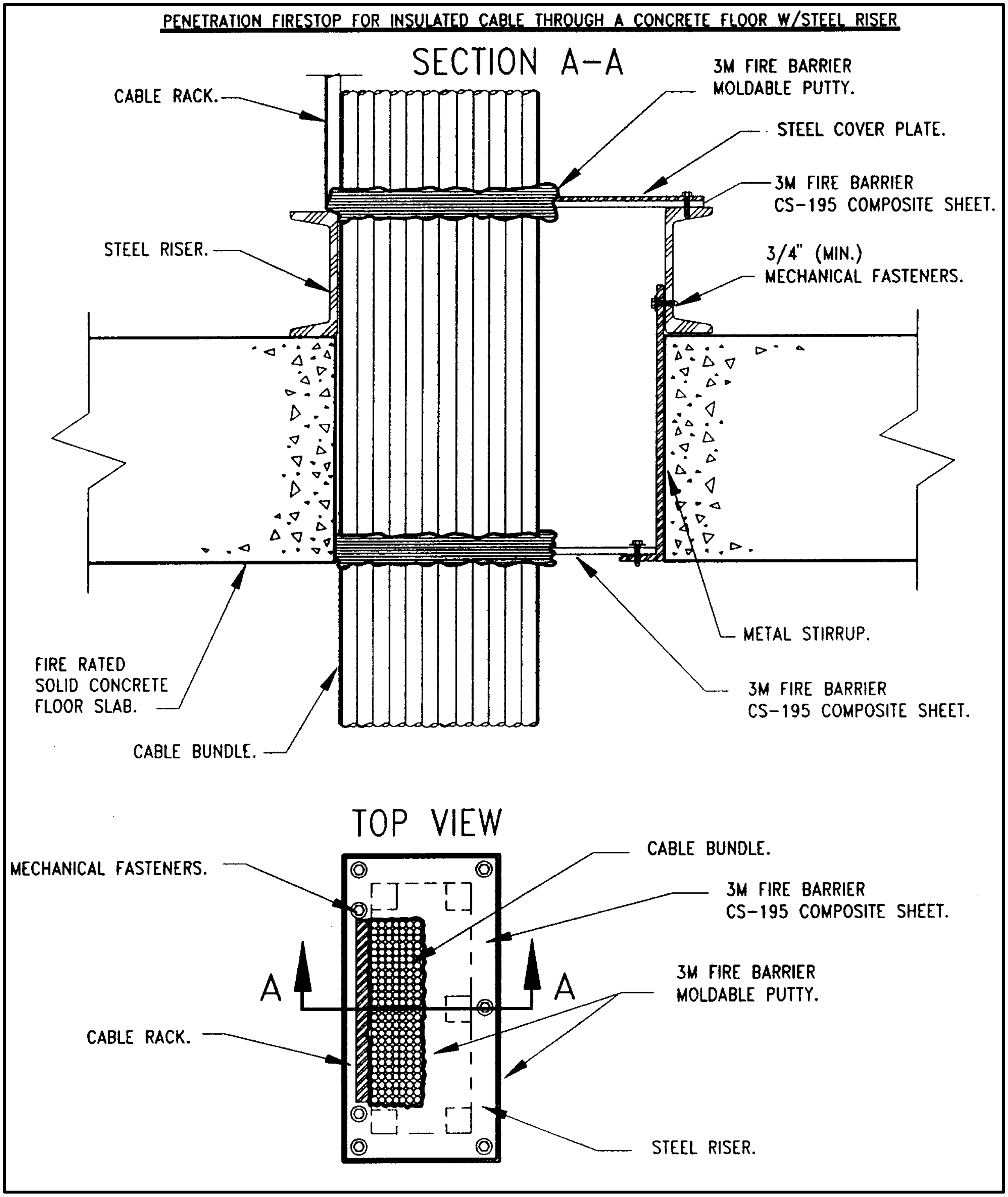


Figure 5 − Penetration Firestop For Insulated Cable Through A Concrete Floor W/Steel Riser

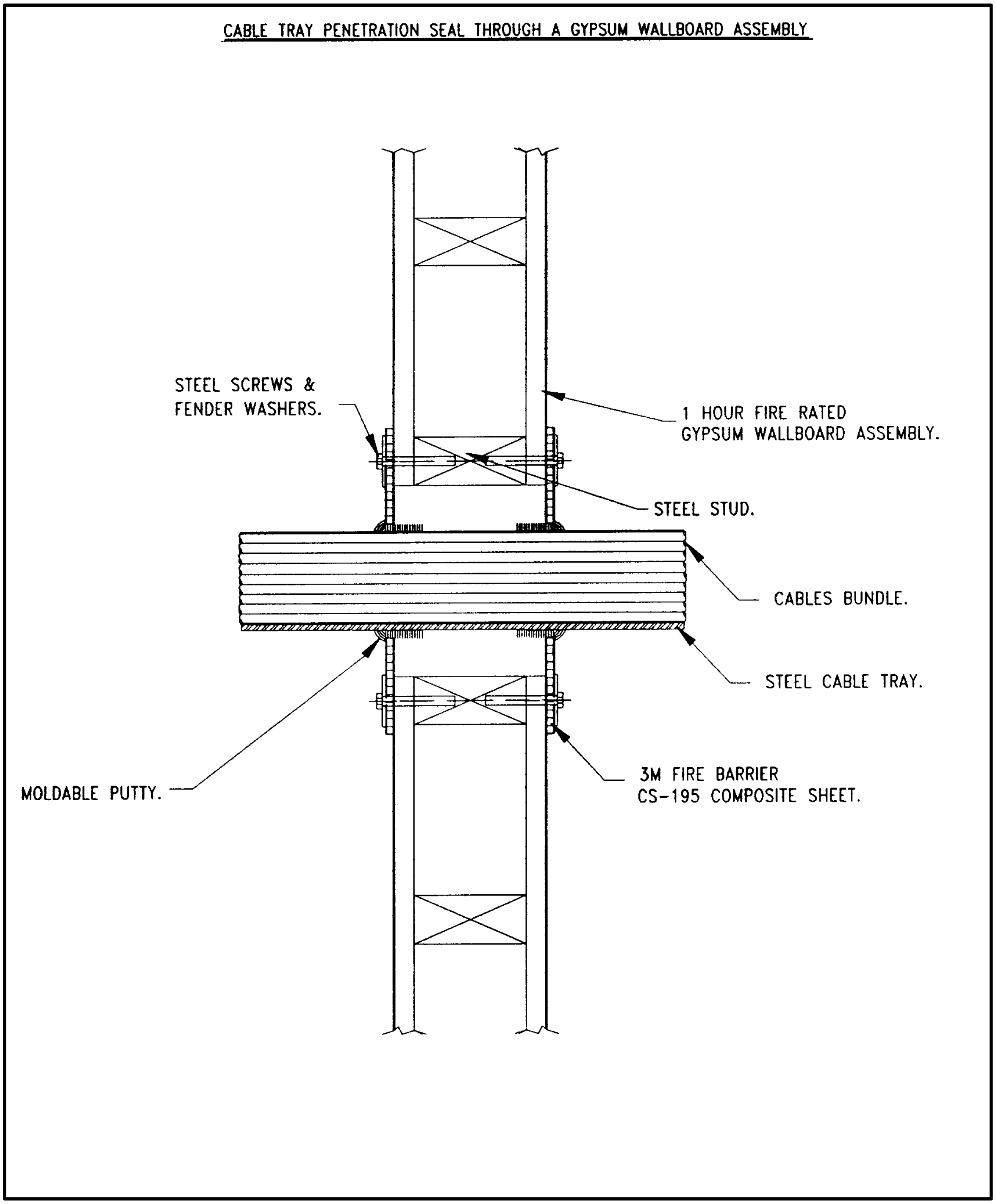


Figure 6 − Cable Tray Penetration Seal Through A Gypsum Wallboard Assembly

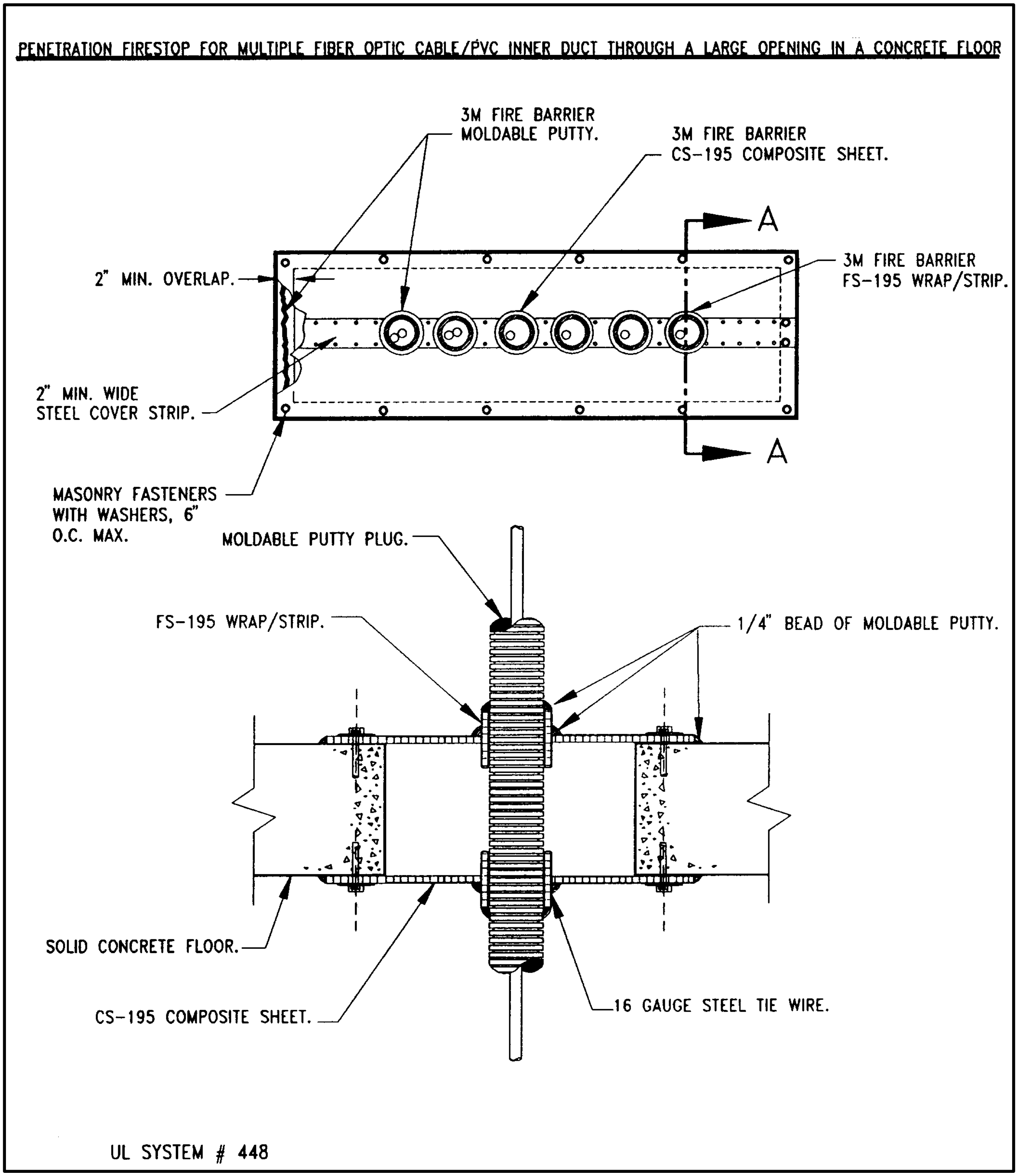


Figure 7 − Penetration Firestop For Multiple Fiber Optic Cable/PVC Inner Duct Through A Large Opening In A Concrete Floor

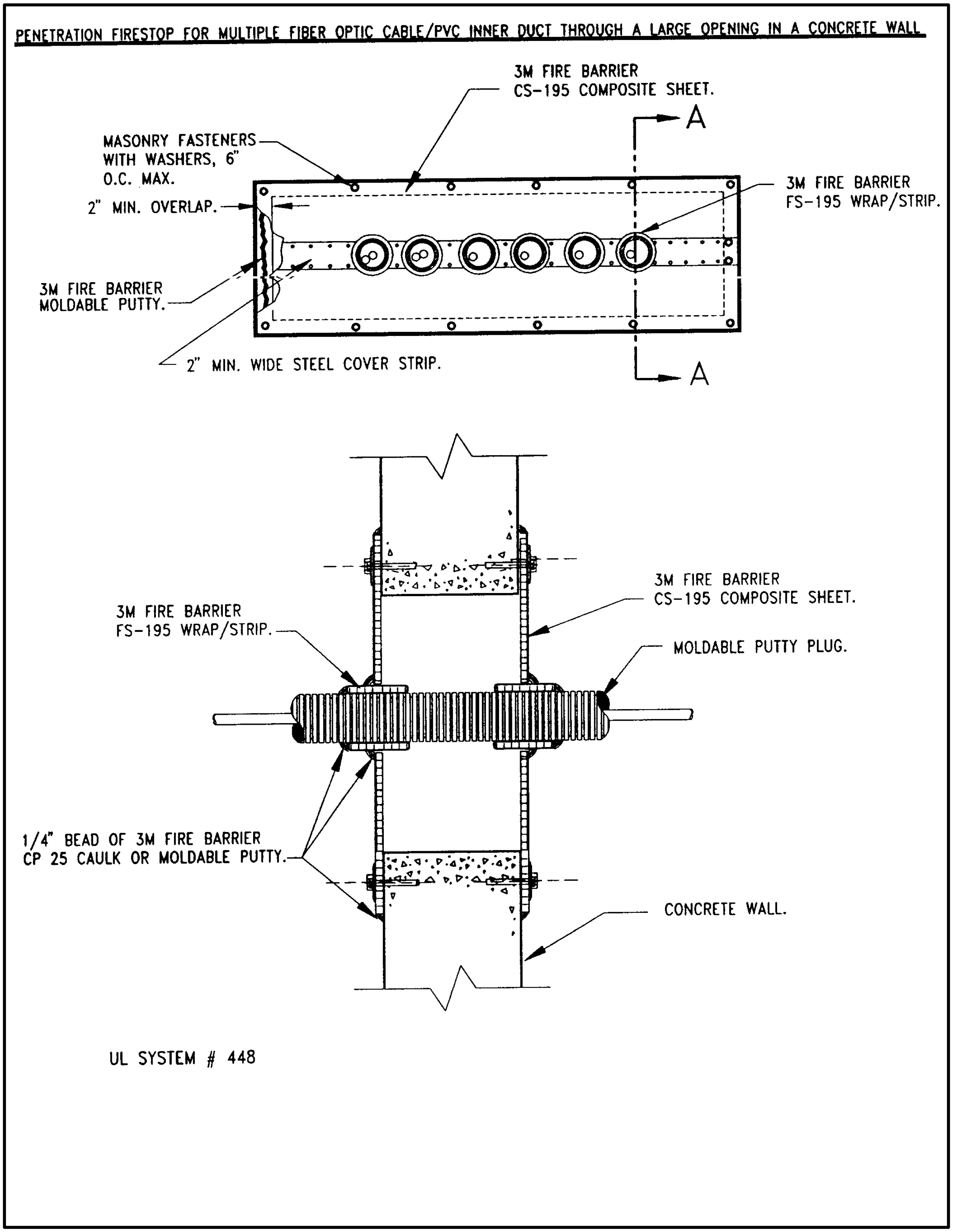


Figure 8 − Penetration Firestop For Multiple Fiber Optic Cable/PVC Inner Duct Through A Large Opening In A Concrete Wall

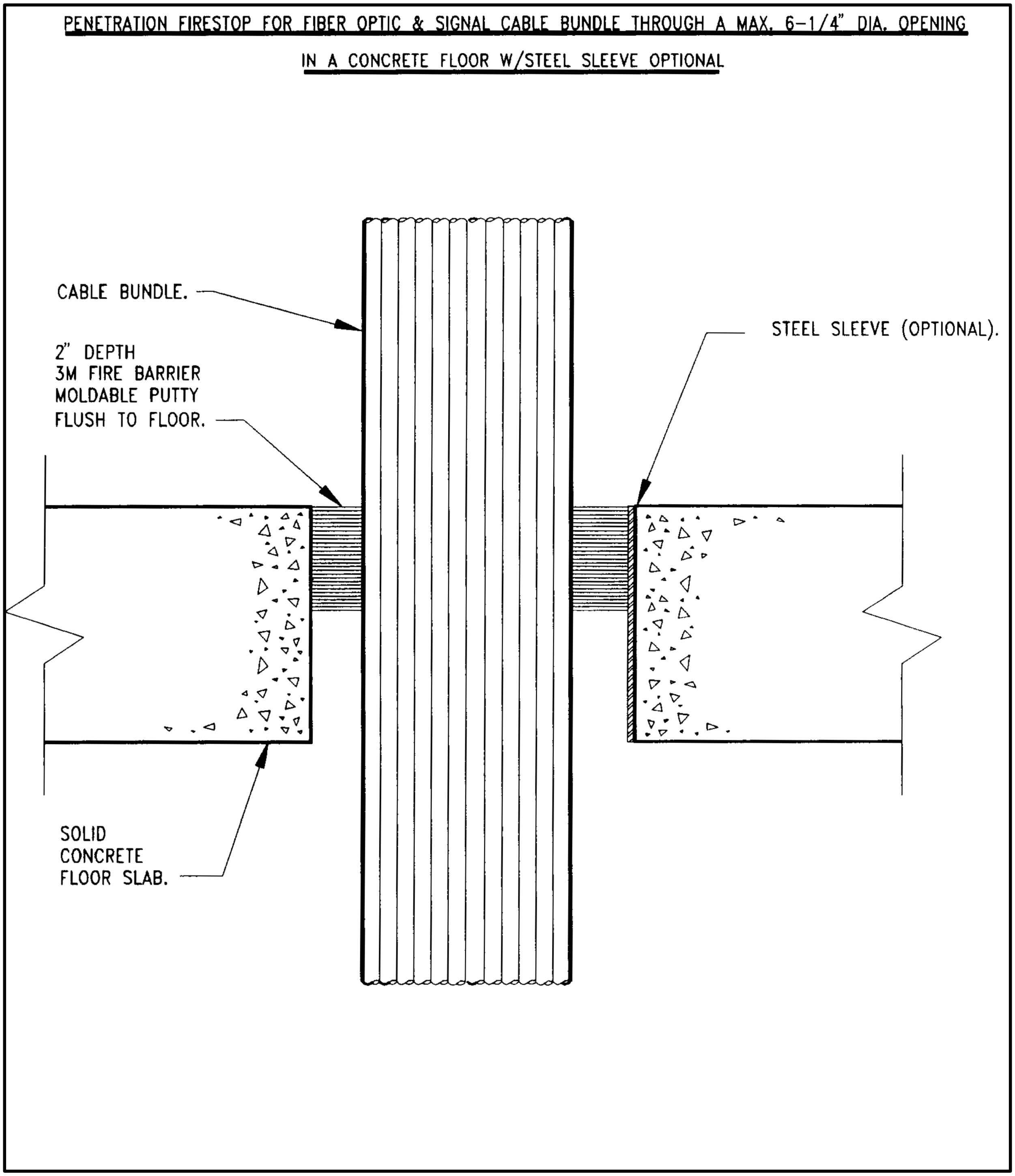


Figure 9 − Penetration Firestop For Fiber Optic & Signal Cable Bundle Through A Max. 6−1/4” Dia. Opening In A Concrete Floor W/Steel Sleeve Optional

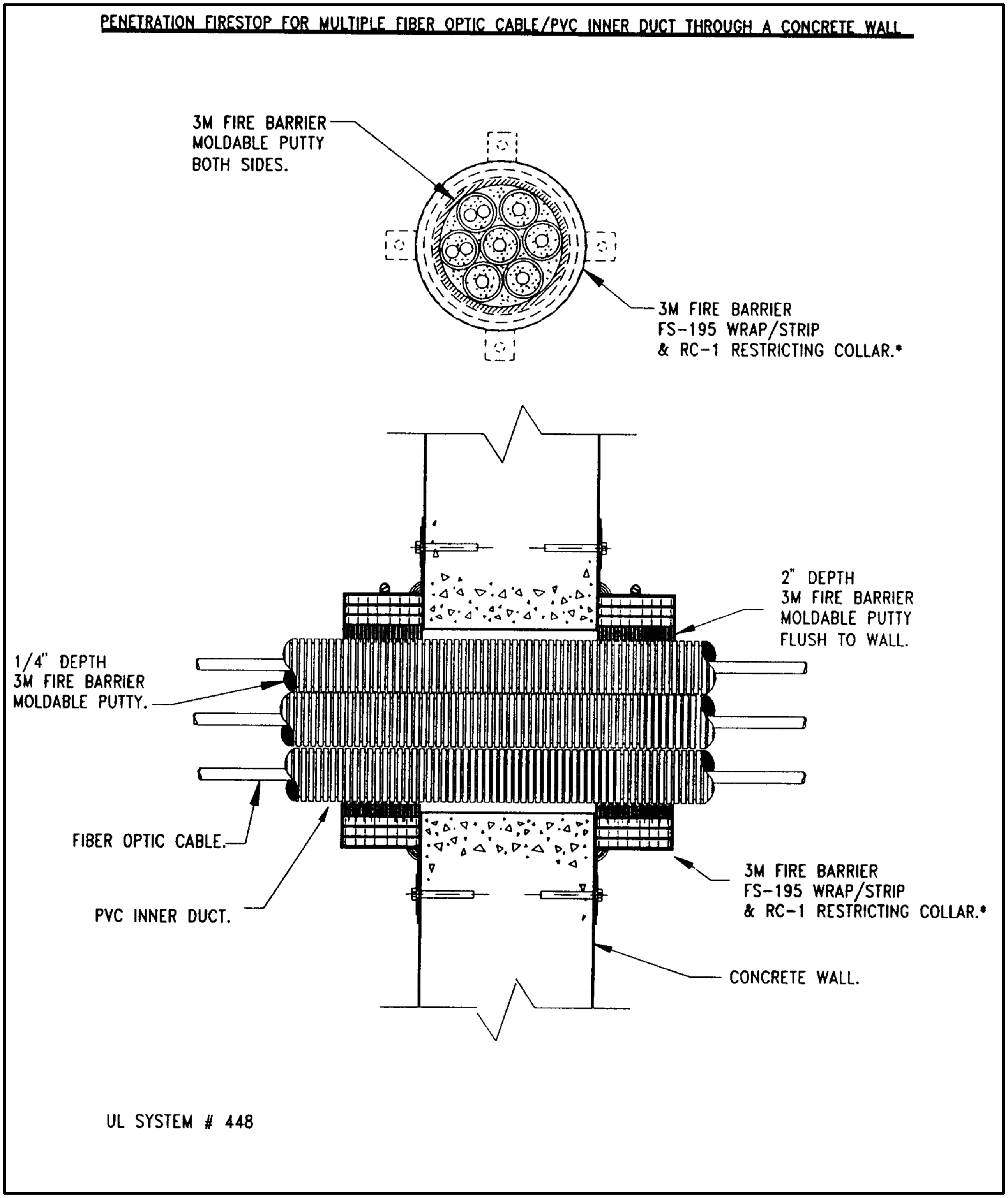


Figure 10 − Penetration Firestop For Multiple Fiber Optic Cable/PVC Inner Duct Through A Concrete Wall

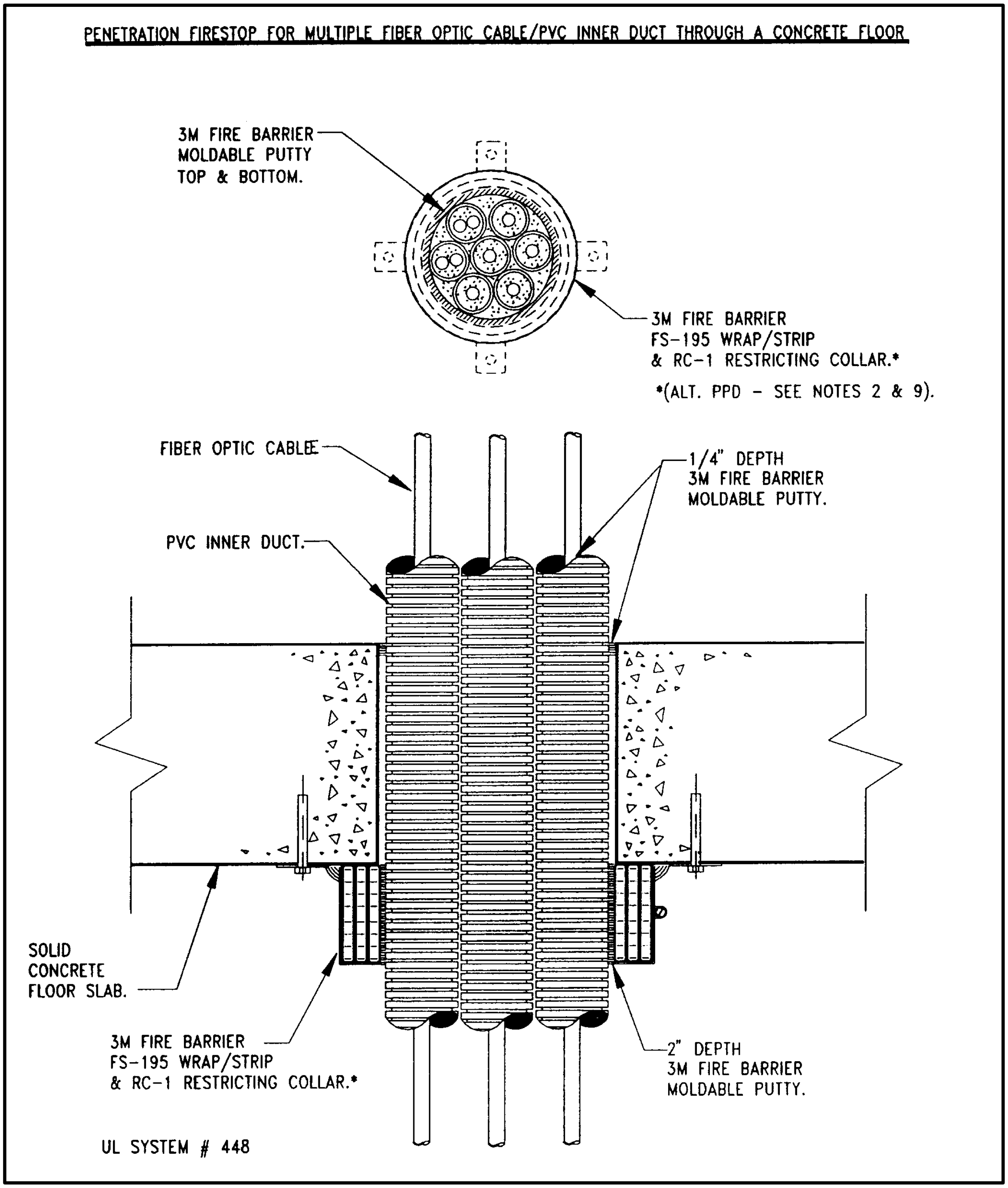


Figure 11 − Penetration Firestop For Multiple Fiber Optic Cable/PVC Inner Duct Through A Concrete Floor

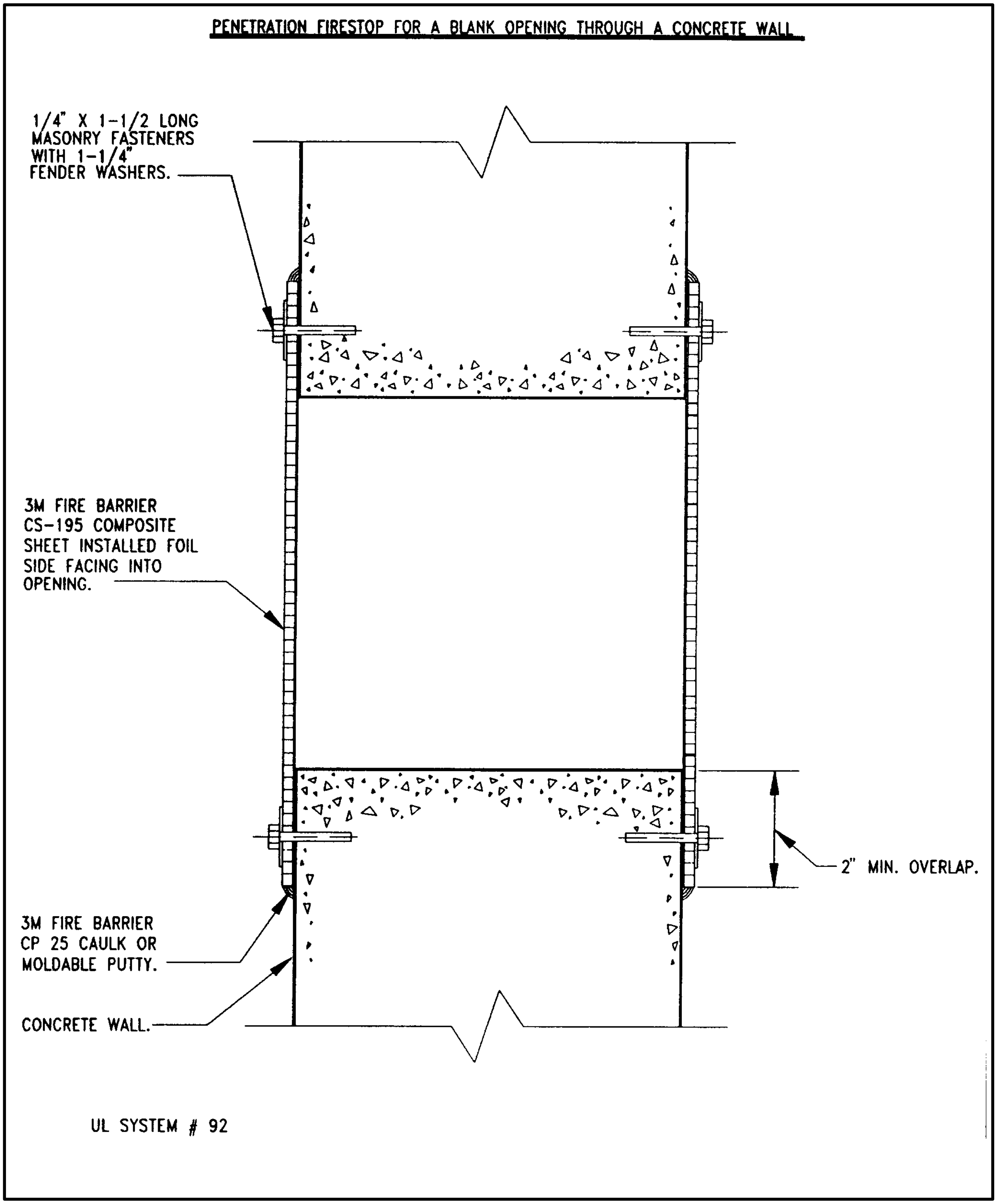


Figure 12 − Penetration Firestop For A Blnk Opening Through A Concrete Wall

PENETRATION SEAL FOR A BLANK OPENING IN A CONCRETE FLOOR

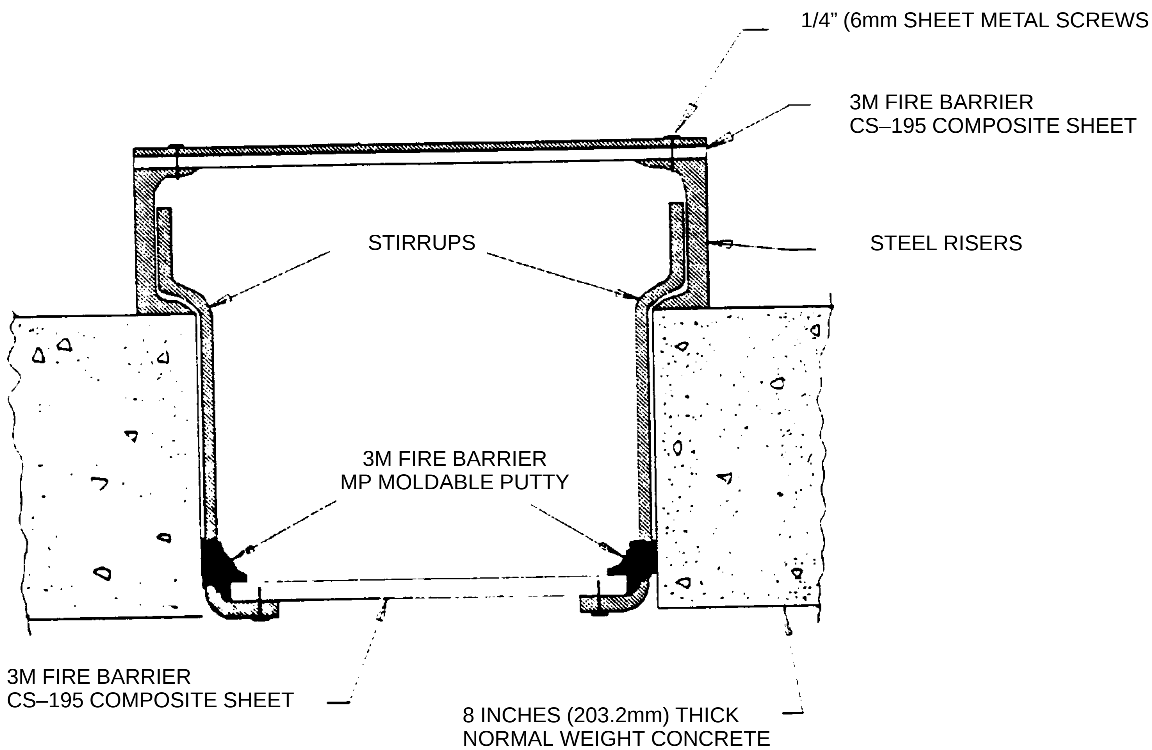


Figure 13 − Penetration Seal For A Blak Opening In A Concrete Floor

AUXILIARY FRAMING AND CABLE RACK − INSTALLATION PROCEDURES

CONTENTS

AUXILIARY FRAMING AND CABLE RACK − INSTALLATION PROCEDURES

1. General

General Assembly/Floor Plan Layouts And Equipment Location

1.1 This section covers installation guidelines for the installation of auxiliary framework, cable racks, fiber optic pathways, and rolling ladders.

1.2 All apparatus shall be installed per the manufacturer's specifications and instructions unless otherwise stated herein. The specific installation instructions and Central Office Base drawings shall provide the installer a current floor plan drawing(s) associated with the proposed framework addition and/or removal locations.

1.3 Bolts, cap screws, machine screws, and similar threaded parts shall be free from stripped threads, defaced heads, and sharp edges, and shall not be burred or bent to such an extent as to interfere with the placing or removal of a nut. Bolts, nuts, screws, and similar parts used for fastening shall be the size and type specified and be properly installed and tightened. All fasteners shall be properly torqued to the manufacturer's specifications. In the absence of such specifications refer to Figure 1.

	STEEL BOLTS/NUTS			BRASS BOLTS/NUTS			SOCKET SIZES	
Tool	**Thread Diameter**	**Dry, Clean Threads**	**Lubricated** Threads**	**Thread Diameter**	**Dry, Clean Threads**	**Lubricated** Threads**	**Thread Diameter**	**Socket**
Torque Wrench 3/8" drive, 8−80 ft. lb. rating	5/16" 3/8" 7/16" 1/2" 9/16" 5/8"	11 19 30 45 66 −−	8 13 21 32 46 65	5/16" 3/8" 7/16" 1/2" 9/16" 5/8"	9 16 26 32 47 76	6 11 18 25 33 53	5/16" 3/8" 7/16" 1/2" 9/16" 5/8"	1/2" 9/16" 5/8" 3/4" 7/8" 15/16"
Torque Wrench 1/2" drive, 30−200 ft. lb. rating	5/8" 3/4"	93 150	−− 105	−− 3/4"	−− 104	−− 73	5/8" 3/4"	15/16" 1−1/8"

NOTES:

1. Stainless steel, battery intercell connecting hardware should be tightened to 12.5−foot pounds (150−inch pounds).
2. Torque values for lead−coated intercell connecting hardware have not been established.
3. Identify torqued connections with R−5583 "GLYPTAL".

* All values are expressed in foot pounds.

** Lightly oiled or no−ox applied.

Figure 1 − Torque Values For Industrial Fasteners

1.4 The kinds of bolts, screws, washers, and nuts used for similar purposes should be uniform throughout a particular unit of equipment.

1.5 The threaded end of a bolt, screw, or threaded part may extend beyond the nut or tapped part by an amount equal to the diameter of the screw or threaded part, except where such protrusion will interfere with equipment or wiring, or would present a personal injury hazard.

1.6 When it is necessary to cut threaded fasteners,auxiliary framing, cable rack, braces, etc., all exposed metal resulting from the cutting operation shall be painted with BST gray rust proof paint to prevent exposure to the air. In addition, the sharp or jagged edges caused as a result of the cutting process shall be removed.

1.7 Self tapping screws and swage form screws have tapered and fluted ends to facilitate entry. In order to get full thread engagement, the screws should be tightened so that the tapered and fluted end protrudes a minimum of a full taper and a maximum of a full taper plus three threads.

1.8 A sufficient number of threads shall be engaged to provide a secure fastening. Generally, this is accomplished when the ends of screws or bolts are flush with the top surface of nuts. A screw or bolt may be considered too short if more than one thread in a nut remains unengaged.

1.9 Hanger rods shall be inserted into ceiling inserts a minimum of seven full turns, however a greater number of turns is desirable.

1.10 Screws and bolts in tapped holes should be engaged to a depth equal to the diameter of the screw or bolt, or the thickness of the panel or part, whichever is least.

1.11 The tips of cotter pins shall be bent back so that they rest against the rod or bolt.

1.12 In the placing of auxiliary framing, regardless of the means of support, a minimum clearance of 1/2 inch shall be maintained between the ends of the framing bars or channels and any building obstruction.

1.13 The finish color of cabling and auxiliary framing shall be consistent with the finish color of the existing installation in the central office or floor of a multi−story central office. In an initial installation the finish color shall be the normally provided color of the major supplier of equipment.

1.14 Endguards shall be provided and installed at both ends of a lineup in a central office. This does not apply to CDOs or remote sites.

1.15 When making measurements for reference lines, the installer shall make certain that they are taken from the correct points as shown on the floor plan drawings where floor plugs or other reference points have been installed by BST. The reference lines will be designated as “REFERENCE LINES” on the Floor plan. If the reference lines are inconveniently located from an installation standpoint, auxiliary reference lines shall be established in an accessible location and the BST shall be advised as to the reason for their addition.

1.16 All frameworks shall comply with the following minimum requirements:

(a) All frames in a lineup should have the same depth and height. Frame extenders and/or offset closing details should be provided for this purpose.

(b) No part of any apparatus attached to the frame shall extend horizontally beyond the front or rear edges of the base or guardrail of the frame. Guardrail extenders should be provided for this purpose. This excludes maintenance terminals, and writing shelves in the raised or writing position.

(c) The fronts of the base or guardrail, and the uprights of all frames in a frame lineup shall be flush.

(d) Frames shall be level and plumb. The use of shims, leveling screws, and floor moldings shall be part of the frame alignment procedure to compensate for variations in finished floors.

(e) Anchors shall be positioned so that they are flush to slightly under flush to the concrete surface, and floor bolts shall be installed to the full depth of the thread in the anchor. After the hold down nut is tightened there shall be a minimum of 1−1/2 threads or more showing above the nut. Torque requirements for 3/8 hex nuts shall be 40 foot pounds and 50 foot pounds for 1/2 inch hex nuts.

CAUTION: **Vinyl floor tiles may contain asbestos. When drilling (setting) loxins in the floor, a High Efficiency Particulate Air (HEPA) filtered vacuum should be used. The area should then be wiped with a damp cloth and all contaminated debris, including the vacuum cleaner bag, shall be disposed of as asbestos contaminated waste. For instruction on the disposition of this material the vendor can contact the BST Material Services at 205−977−9311.**

1.17 In a lineup where there are different types of frameworks, each group of frames of the same type shall be considered as a separate lineup when determining the number and location of the anchors. Two floor bolts (studs) shall be used at the outer ends of the first and last framework in a lineup and two floor bolts shall be placed in staggered locations at junctions between adjacent frameworks. Isolated frameworks shall be equipped with one bolt in each corner of the baseplate. Exposed bolts in anchors securing open floor base members or frames without guardrails may extend beyond the nut by an amount equal to the diameter of the bolt. Where such a protrusion would interfere with equipment or wiring or would present a safety hazard, the bolt shall be cut off flush or minimum of 1−1/2 threads within the nut, filed and painted.

1.18 The installer will contact the Capacity Manager before drilling floors or walls below ground level. The installer may be referred to the BST Building Engineer for specific requirements. Drilling in waterproofed floors, where authorized by BST is limited to depths indicated on the basement floor plan drawing listed under Engineering and/or Installer's Notes. (See "Waterproof Floors" in Section 18)

1.19 Finishing caps are required on the ends of all low−type auxiliary framing unless it is within 3 inches of a wall, column, etc.. This includes mounting finishing caps on exposed ends of auxiliary framing bars which are placed below low−type framing.

1.20 The vertical alignment of all frameworks shall be plumb within the following allowable deviations.

HEIGHT	MAXIMUM ALLOWABLE DEVIATION
4 feet 6 inches and less than 7 feet	1/8 inch
7 feet to 9 feet	3/16 inch
9 feet to 11 feet 6 inches	1/4 inch

1.21 Distributing and protector frames with sheet metal bases or base angles, and other frame structures of these types in which the uprights are flexibly attached to long horizontal members, may follow the general contours of the floor. However, for appearance reasons, the terminal strips or shelves of these frames should not be more than 1/4 inch above or below a straight reference line extending the full length of the ultimate lineup. This reference line may slope with the floor.

Arrangement Of Auxiliary Framing, Low Type/High Type

1.22 This subsection covers in greater detail the installation requirements for low−type auxiliary framing over lineups of switching, transmission and power equipment. It also covers the installation requirements for ceiling−suspended high type auxiliary framing, as well as the frame and rack supports associated therewith.

Auxiliary Framing

1.23 A minimum clearance of approximately 2 inches will be provided between the lower edge of the auxiliary framing and the tops of the frames to facilitate the installation or the removal of frames. The office record drawings will specify the height at which auxiliary framing is to be installed, and that height will be measured from the finished floor to the bottom edge of the auxiliary framing, unless otherwise stated. The tolerance is +−1/8 inch.

If added frames are grouped together in a separate building bay from the original equipment, separate auxiliary framing at the appropriate level shall be used without regard to the original installation.

(1) 11 FEET 9 1/2 INCH FRAMING: In additions to older offices of two or more building bays, where there is a minimum clearance of 13 feet under all obstructions, the auxiliary framing shall be installed 11 feet 9 1/2 inches above the floor, as shown in Figure 2 and Figure 3.

(2) In Toll offices where wide cable rack is used, the auxiliary framing shall be installed 11 feet 9 1/2 inches above the floor as shown in Figure 4.

1.24 In offices that utilize rolling ladders, the auxiliary framing shall be supported at a level approximately 3 1/2 inches above the tops of the frames. This allows for free movement of frames without disturbing the ladder track. A typical arrangement of auxiliary framing over frames is shown in Figure 4.

1.25 For Toll offices using cable duct−type frames, the auxiliary framing shall be placed directly on the frames.

1.26 In combined offices, such as Miscellaneous Equipment Frames and Toll, where there is a minimum clearance of 13 feet under all obstructions, the auxiliary framing shall be installed 11 feet 9 1/2 inches above the floor, as shown in Figure 2.

1.27 In order to obtain maximum rigidity, framing bars or channels shall be installed in stock lengths wherever possible. Channels are not as rigid as bars and may become bent during installation. Additional clips shall be provided to hold the channels parallel.

1.28 Where the auxiliary framing supports cable racks, ladder tracks, or lighting over the aisle, support is not required unless the distance between the point of support and the point of load exceeds 2 feet 6 inches.

1.29 Where more than one row of frames are to be ultimately installed or where one ultimate row of frames is separated from the initial equipment by columns, the framing bars or channels shall extend approximately three inches beyond the last set of clips, to provide for splicing.

1.30 Splices in the same aisle of adjacent pairs of bars or channels of auxiliary framing shall be avoided when practicable. In no case shall more than two adjacent pairs be spliced in the same aisle. They shall be placed at least one aisle apart and the splices so positioned as to not interfere with clips used to fasten ladder tracks, lighting conduit, or cable racks.

1.31 When extending 2 x 3/8 inch framing bars, they may be spliced per Figure 5. However, instead of splicing the parts of a pair at the same point, one bar shall be spliced in one aisle and the other bar in a different, not necessarily adjacent aisle.

1.32 Extended framing channels shall be spliced per Figure 6 and bar framing extended by channel framing (or vice−versa) shall be spliced to the original bars per Figure 7. A space may be left between the ends of paired channels to compensate for variations in length provided that a minimum overlap of two inches is maintained at the clip. Alternate pairs of existing channels shall be cut back just beyond the next to the last row of frames, so that added channels can be fastened to the last two rows of existing frames to obtain a rigid junction.

1.33 The extended framing channels shall be spliced to the original channels using 3−hole splice plates as shown in Figure 8. The use of 3−hole splice plates permit splicing at support locations such as lighting, cable racks, tops of frames, ladder track,etc. The splices shall be staggered to obtain a rigid junction. Figure 10 shows typical applications.

1.34 Bar framing extended by channel framing using 3−hole splice plates, shall be spliced to the original bars, as shown in Figure 9.

1.35 An alternate method of extending bar or channel framing for additions to existing equipment, which eliminates the necessity for cutting back the existing bars or channels, is shown in Figure 11.

1.36 11 feet 8 inch framing extended by 11 feet 9 1/2 inch framing shall be spliced to the existing 11 feet 8 inch framing per Figure 12. Staggering is not required.

1.37 Where pairs of auxiliary framing bars or channels running at right angles to each other are at the same level and are to be junctioned, the fastenings shall be made as shown in Figures 13 and 14. Low−level framing shall be junctioned to high−level framing, as shown in Figure 15.

1.38 Where bars or channels of low–type auxiliary framing extend more than three inches beyond a clip or support, they shall be equipped with clips. Clips may be omitted where the ends of bars or channels extend to within three inches of a wall, column, or other vertical surface.

1.39 Where auxiliary framing crosses directly over another set of auxiliary framing, they shall be supported per Figure 16.

Arrangement Of Auxiliary Framing–low Type

1.40 Auxiliary framing shall run in continuous lengths at right angles to the frames supported. The pairs of bars or channels shall be located on centers of approximately five feet, and shall in no case exceed six feet. They shall be located so that they will not interfere with cable rack supports in offices with 11 feet 6 inch auxiliary framing or with the cabling, lighting fixtures, conduit, or other equipment.

(a) The 2 x 9/16 inch channel auxiliary framing shall be paired with the backs of the channels to the outside.

(b) When auxiliary framing is slightly offset (approximately 1 inch) over junctions of frames, it is permissible to employ a supplementary framing bar or channel to achieve the proper support.

(c) **The exposed ends of the bars or channels shall be capped with finishing caps, except where they are within 3 inches of a wall, column, or vertical surface.**

1.41 Auxiliary framing adjacent to end or main cross aisles shall be located as near the frame uprights as practicable, except at aisles containing conduit runs and/or main aisle power cable brackets or racks, in which case the framing shall be set back a minimum of nine inches from the extreme end of the lineup. Exceptions occur in some Toll offices where the auxiliary framing has been set back a minimum of six inches. In these instances, the additional framing shall be installed to conform with the existing arrangement. In offices where bar–type cable racks are employed, the horns of the cable racks shall be located no closer than three inches to the auxiliary framing.

1.42 Framing bars or channels at the ends of frame lineups shall be located so that the distance between the end of the lineups and the last point of support will not exceed 2 feet 6 inches. Short frames located at ends of lineups, that are less than 2 feet 6 inches in length, shall have at least one point of top support.

1.43 Where auxiliary framing is unsupported for a distance in excess of eight feet, the auxiliary framing shall be supported by additional pairs of bars or channels placed at right angles to the regular auxiliary framing and located under ceiling inserts or beam clamps. These bars or channels shall be fastened above the auxiliary framing and shall be supported from ceiling inserts or beam clamps by means of 5/8 inch threaded rods, clips, and nuts. In computing the unsupported distance for a pair of auxiliary framing bars or channels, the cable rack over a missing frame may be considered a support if the cable rack is supported independently of the framing.

1.44 The auxiliary framing (11 feet 8 inches high) over frames shall be fastened to the double top−angles, of bulb angle type frames/framework, by means of T−bolts, clips, and spacers. Adjacent frames in a lineup shall be fastened together at the top with junction plates and T−bolts. In some cases, the top−angles of adjacent frames in a lineup cannot be junctioned. For example, adjacent frames facing in opposite directions, or adjacent frames separated from each other for cabling reasons with frame base filler details. Where the top−angle junctions cannot be made, the frame ends involved shall be attached to the cable rack with pairs of short channels or bars so that each frame has at least two points of top support.

1.45 Where a frame lineup extends beyond the last pair of regular auxiliary framing channels or bars by more than 2 feet 6 inches, the end of the lineup shall be attached to the cable rack by means of a pair of short channels or bars with J−bolts at each stringer. Where a frame or several short frames extend wholly beyond the framing bars or channels and are not junctioned to a regular lineup, both ends of the frame or short lineup shall be attached to the cable rack with similar short bars or channels in the same manner above.

1.46 In central offices where frames are installed in regular rows and are of a uniform height, the auxiliary framing shall be fastened with V−bolts directly to the top−angles of the frames.

NOTE: The above is to be used only for additions to 11 feet 6 inch frames and is superseded by the following.

1.47 In central offices where bulb−angle and channel−type frames are installed in regular rows of uniform height and the auxiliary framing is at the 11 feet 8 inch level, the framing shall be fastened with V−bolts, channel−type spacers, and clips in the case of frames with single top−angles, and with T−bolts, spacers, and clips for frames with double top−angles.

(a) In offices where auxiliary framing is at the 11 feet 6 inch level, auxiliary framing shall be attached directly to cable duct−type frames or to a one inch junction pipe at locations of future frames. The one inch junction pipe shall be attached to auxiliary framing.

(b) Where the one inch junction pipe extends beyond the end of the cable duct−type frames, the end of the pipe shall be capped with a finishing cap.

1.48 Where frames with single top−angles, such as distributing frames, are installed in offices having auxiliary framing at 11 feet 9 1/2 inch level, the frames shall be attached to the framing, using V−bolts, clips, etc.

1.49 An isolated frame shall be supported at a minimum of two points. In the case of duct−type frames, the short pair of framing bars or channels, in addition to being fastened to the cable rack, shall also be fastened to an adjacent cable rack.

1.50 Auxiliary framing over power boards shall be installed only where required for the support of Bus Bars or a cable rack above the power board. The auxiliary framing shall be fastened to supports attached to the power board, as shown in Figure 17. Where the power board is equipped with rear doors, the auxiliary framing support must be mounted on top of the bay with a bracket as shown in Figure 18.

1.51 Auxiliary framing over Battery Distribution Fuse Boards shall be attached to the top−angles of the fuse boards, as shown in Figures 19 and 20 for 11 feet 6 inch, 11 feet 8 inch, and 11 feet 9 1/2 inch auxiliary framing heights, respectively.

1.52 Auxiliary framing over generator control panels shall be installed as shown in Figure 21. Pairs of longitudinal framing bars or channels shall be fastened approximately one inch above the top−angles of a lineup of control panels and at right angles to the panels with 5/8 inch screws, clips, and washers. Short transverse pairs of bars or channels for the support of Bus Bar insulators, the cable rack, and the bus duct shall be provided over each generator bay. Intermediate supports shall be provided between bays so that support spacing is not over six feet on centers. These intermediate supports shall be suspended from the ceiling or high−level framing with 5/8 inch threaded rods.

Arrangement Of Auxiliary Framing−high Type

1.53 Expansion shields may be used for hanger rods, braces, and similar occasional ceiling attachments in areas not supplied with ceiling inserts such as may occur in power rooms. In such cases 5/8−11 expansion shields shall be used. Hanger bolts are occasionally used to support heavy loads where other building attachments have not been provided.

1.54 5/8−11 threaded rods shall be used to support the auxiliary framing or other equipment from ceiling inserts, beam clamps, or expansion shields. Rods shall be threaded their entire length. A 5/8−11 hex nut and 1 3/4 inch washer shall be used at the ceiling on all hanger rods and bolts, regardless of the type of finish on the ceiling or the kind or support.

1.55 Where false or suspended ceilings are encountered, an additional 1 3/4 inch washer and two 5/8−11 nuts shall be used on each rod. The washer shall be placed below the ceiling with one nut to hold it in place against the ceiling and the other to serve as a lock nut.

1.56 When used with beam clamps, threaded rods shall be screwed into beam clamps until firmly seated, then backed away approximately one full turn to prevent binding, after which the lock nut at the ceiling shall be tightened.

1.57 In general, hanger rods or threaded rods used for braces should not be spliced. However, where splicing cannot be avoided, splices shall be made by use of a splice coupling with both ends of the rods visible through the sight hole.

1.58 The 2 x 9/16 x 3/16 inch channel auxiliary framing shall be paired with the backs of the channels to the outside.

1.59 Double−level auxiliary framing is commonly used in areas where high framing is specified. Upper level primary bars or channels shall be spaced 5 feet to 6 feet apart directly under the ceiling attachments and secondary bars or channels are usually fastened at right angles to the underside of the primary framing. When additional headroom is required, the secondary bars shall be placed flat above or below the primary bars or channels as shown in figure 22.

1.60 Single−level auxiliary framing, as shown in figures 23 and 24, shall be used where additional headroom is required, but its use should be restricted due to the excessive amount of cutting and fitting required for the secondary bars or channels.

1.61 Secondary framing shall be placed above primary framing where additional headroom is required and space above the primary bars or channels is available.

1.62 No pair of bars or channels used for the direct support of vertical loads shall have fewer than two points of support. A splice at the end of a pair of bars or channels is not considered a point of support.

1.63 Where the horizontal distance from the regular framing support to the furthermost point of support for an equipment load does not exceed three feet, the auxiliary framing requires no additional support beyond the load.

(a) Where this distance exceeds three feet, the framing shall be extended to the next row of primary bars or channels, hanger rod, or to the wall.

(b) Where the secondary bars are of the single−bar type and the horizontal distance referred to above exceeds one foot, the secondary bar shall be extended to the next row of primary bars, channels or to the wall.

1.64 Where bars or channels are extended to the wall, they shall be supported as shown in Figures 25, 26, and 27. Where they terminate at a hanger rod, they shall be supported as shown in Figure 28. Framing bars or channels shall be braced as shown in Figures 29, 30, 31, and 32 where upper level bars or channels are one foot or more below ceiling, where lower level bars or channels are one foot or more below upper level framing, and where necessary to provide rigidity for the framing that supports the cable rack.

(a) A single brace shall be used at each end hanger rod as shown in Figure 33 where distance to ceiling or distance between levels is one foot or more.

(b) Double braces shall be provided as shown in Figures 32 and 33 at intervening hanger rods as necessary to secure rigidity where hanger rods exceed 2 feet 6 inches in length.

(c) On rows of primary framing bars or channels adjacent to columns, the framing may be braced to the columns, as described in paragraph 1.85, and the diagonal braces omitted for these rows.

(d) Where the framing bars or channels are used only for the support of cable racks, bracing shall be furnished only as required for rigidity of the cable racks.

1.65 Where splicing of auxiliary framing is necessary, splices shall be made as follows:

(a) The 2 x 3/8 inch bars shall be spliced to 2 x 1/2 inch bars in the case of extensions of old high−type framing installations as shown in Figures 34 and 35. Clamp splices as shown in Figure 37, shall be used where 2 x 3/8 inch bars are spliced together either in pairs or singly.

(b) The 2 x 3/8 inch bars or 2 x 1/2 inch bars shall be spliced to channels as shown in Figure 36. Channels shall be spliced together as shown in Figure 38.

1.66 Only primary framing shall be provided where supports are such that framing bars or channels can be fastened to frames at right angles.

1.67 Splices in framing bars or channels supporting distributing frames shall be avoided wherever possible. Where necessary, they shall be located within 1 foot of a support.

1.68 Auxiliary framing shall be located as high as practicable above distributing frames to provide cabling clearance and headroom.

1.69 Auxiliary framing shall be provided under beams or girders only where required for the support of equipment. Figures 39 through 42 cover various arrangements of framing under beams or girders.

1.70 Auxiliary framing shall not be supported by ventilating ducts, or other obstructions at the ceiling. The framing shall be supported from the main ceiling, beams, or girders.

1.71 Where a hanger rod supporting auxiliary framing interferes with the attachment of other framing or frame supports, U−shaped details shall be provided as shown in Figures 43 and 44.

1.72 Auxiliary framing utilized to support frames and racks shall be arranged so that it will also support the associated ladder tracks, cable racks, and conduit. Additional framing for these purposes shall be arranged so that track and cable racks can be supported on centers.

1.73 Frames and racks shall be rigidly supported to auxiliary framing.

1.74 The supporting details shall be placed on approximately 5 feet or maximum of 6 feet centers for the entire length of the lineup. This spacing corresponds to the usual spacing of the framing bars or channels located at right angles to the lineup. The distance between the end of a lineup and the nearest point of support shall not exceed 2 feet 6 inches. Frames at the end of a lineup that are less than 2 feet 6 inches long must have at least one point of support.

1.75 V−bolts shall be used for support where the distance between the framing and the frame top−angle is 8 inches or less.

1.76 Single adjustable braces shall be used for supports where the distance between the framing and the frame top angle exceeds 8 inches, but does not exceed 1 foot 6 inches. Adjacent brace supports shall be installed on opposite sides of the frame top angle.

1.77 Where frames are not rigid, or the angle of braces greatly exceeds 45 degrees from the horizontal, or where the distance between the framing and the frame top−angle exceeds 1 foot 6 inches, double adjustable braces shall be used for support.

1.78 The angle of adjustable brace supports attached to framing bars or channels parallel with the frame top−angle shall be not less than 15 degrees nor more than 60 degrees from the vertical.

1.79 Each separate line of frames or racks shall be supported at a minimum of two points.

1.80 An end brace shall be provided for individual frames standing alone. A single adjustable brace shall be used in line with the top−angle and approximately 45 degrees from the vertical.

1.81 Adjustable braces may be attached to hanger rods and to a junction of primary and secondary framing in order to provide support.

1.82 Where frames and racks are to be secured to plastered, wood, or wood beam ceilings, they shall be fastened with lag screws to wood strips. Where the ceiling is unobstructed, the wood strips shall extend the entire length of the top of the frame.

1.83 Supports to walls and partitions shall, in general, be avoided. Where necessary, frame supports shall be fastened to concrete walls or partitions with expansion bolts or shields or other equally secure devices. Wood strips shall be provided between the support and the wall as shown in Figure 45. On wood stud constructed walls, a wood strip shall be fastened to the wall and support fastened to the wood strip or through to the stud with lag screws as shown in Figure 46.

Bracing

1.84 The entire auxiliary framing structure shall be braced with either column braces or ceiling braces of the adjustable rod or angle type. The braces shall be located at approximate building column intervals or about 20 feet in a building not having columns.

1.85 Where column bracing is used and the column is located between two lines of auxiliary framing but not adjacent to either line, single channel braces shall be bolted at right angles and held tightly against opposite sides of the column as shown in Figure 47, View A. Where the column is adjacent to a line of auxiliary framing, the braces shall consist of additional pairs of framing bars or channels, placed on edge and bolted at right angles to the regular framing so as to be held flatly and tightly against opposite sides of the column as shown in Figure 47, View B. The outer edges of building bays adjacent to walls require supplementary braces in addition to the column braces when the framing bars or channels extend ten feet or more beyond the last column brace. These supplementary braces shall be of the ceiling type.

1.86 Where ceiling braces are used throughout an area unsuited for column braces such as wooden buildings, or used as supplementary braces in areas having column bracing, the braces shall be attached to the ceiling and to the auxiliary framing as follows:

DISTANCE BETWEEN CEILING AND AUXILIARY FRAMING	TYPE OF BRACE
1 foot 6 inches or less (Figure 48)	Single−rod brace
Over 1 foot 6 inches through 4 feet (Figure 48)	Single−rod brace
Over 4 feet (Figure 50)	Double−angle brace

While Figures 49 and 50 show double braces sloping from the same point of attachment to the auxiliary framing, it may be necessary to attach these braces at separate points along the framing in order to avoid interference. In such cases, the points of attachment to the auxiliary framing shall be kept as close as possible. Another alternative may be braces sloping from a common point on the ceiling to two points on the auxiliary framing.

1.87 Where continuous rows of embedded ceiling channel (Unistrut) are provided, hanger rods should be fastened as shown in Figure 51 and braces shall be fastened as shown in Figure 52.

1.88 The slant of auxiliary framing braces shall, where possible, be parallel with the auxiliary framing. Where single rod braces are used, the braces for any one lineup of frames shall slant in the same direction, but adjacent rows of braces shall slant in opposite directions.

1.89 Auxiliary framing in power rooms requires bracing only where it supports Bus Bars over floor–mounted batteries or for framing bar–supported individual or widely spaced Bus Bars.

Cable Racks/Fiber Optic Pathways

1.90 This subsection covers apparatus requirements and installation considerations for the placement of cable rack and fiber optic pathways over switching, transmission, and power equipment.

Description And Sizes

1.91 Snap–on brackets, when used, shall normally be located on alternate straps of the cable racks. At crossing points and points where cables drop off the racks, it may be necessary to locate the brackets elsewhere.

1.92 Single brackets, 5 and 7 inches high, respectively, are used on cross straps as shown in Figure 1, section 8, View A; or they are used to separate runs of cable on a wide rack as shown in Figure 1, section 8, View C.

1.93 The double bracket shown in Figure 1, section 8, View B, is provided for use on 5 inch racks.

1.94 Modified ladder–type cable rack with straight side bars and thin metal plates, shown in Figure 53, are provided for heavy loads of unsecured cabling on extended runs between separated equipment areas.

Location

1.95 For horizontal cable runs, the ladder–type cable racks are usually placed with the cross straps upward. Cable racks for inverted cable runs and basket runs are placed with the cross straps downward. In a basket run, the cable rack is inverted to gain cabling space. Fiber insulators are required on the cross straps to protect the cables.

Cable Rack Engineering/Installation Requirements

1.96 Cable racks shall be securely supported and fastened to carry the ultimate cabling and equipment supported by the cable rack.

1.97 Cable racks shall be installed so that no excessive load or binding will be imposed on frames, racks, or other equipment attached or adjacent to the cable racks, unless such equipment is engineered to support the cable racks. Cable racks shall not be supported from the cross straps.

1.98 The maximum width of cable racks for both horizontal and vertical power cable runs shall be limited to 1 foot 8 inches.

1.99 To protect cabling at T−intersections of bar−type cable racks and cross−aisle racks, finishing caps shall be installed on the ends of all cross straps that project within the T−intersection area. The finishing caps shall be secured to the cable rack horns by coating the inside of the caps with an adhesive prior to placing the caps on the horns.

1.100 Some examples of clamping details used for the assembly of ladder−type cable racks are shown in Figures 54 through 61.

1.101 Clamping details shall not be altered except where necessary to avoid interference with cable straps or other details. The clamping details may be modified slightly provided a secure fastening is obtained. Where straps interfere with the proper placing of the clamping details, the rack shall be cut back such that the straps will not interfere with the clamping details.

1.102 Corner clamps may be assembled in positions opposite those shown in the assembly figures to avoid interference with other clamps, stringers or straps.

1.103 Sections of ladder−type cable rack shall be assembled so that support for the cabling is provided approximately every 9 inches. At turns or junctions in vertical or inverted horizontal cable runs where the turn of the cables is such that proper support is not provided for the cables, 1/2 x 1 inch channel shall be placed diagonally across the rack in a manner to provide proper support for the cables. These channel straps shall be secured by bolts at the corner clamps.

1.104 The joining of sections of cable rack for usual conditions is shown in Figures 62 through 72. Figure 67 covers arrangements for making small vertical offsets in horizontal racks. In cases where a small cable rack passes closely under an obstruction leaving insufficient clearance for the cabling, an offset in the cable rack can be avoided by the use of U−shaped brackets as shown in Figure 67, View E.

1.105 In general, the longest length of sections and the fewest parts practicable shall be employed in assembling cable−racks. Not more than one splice shall be placed between any adjacent points of support on horizontal runs. A splice shall not be used beyond the last point of support when the end of a rack extends in cantilever fashion. Splices shall be made as shown in Figures 54 and 55.

1.106 Spiral cable racks and straight sections of cable rack adjoining the spiral shall be laterally braced.

1.107 Offsets in exposed vertical cable racks shall be as shown in Figure 73. Vertical runs in shafts and in other locations, where appearance is not a factor, shall be offset in the manner used for horizontal runs.

1.108 Ladder−type cross−aisle cable racks may be installed and junctioned at the same level as the ladder−type over−frame racks, or at the higher level shown in Figure 75, where necessary to clear lighting conduit or other obstructions. In switching offices where the cable run is not exceptionally heavy, cross−aisle cable racks may be installed as shown as Figure 76.

(a) The cable rack shown in Figure 74 is designed for the support of cross−aisle cabling and shall not be used for continuous runs of cabling across an area. While satisfactory for use over a single aisle or to span a space where one row of frames is omitted, it shall not be used over a space where the unsupported span exceeds 8 feet.

(b) Continuous runs of ladder−type, cross−aisle cable racks fastened above and across over−frame cable racks with 3−bolt fastenings, as shown in Figure 75, are permitted where ceiling heights are favorable. The 3−bolt fastenings shall be installed at 5 to 6 feet intervals.

1.109 The open ends of sections of ladder−type cable racks and the protruding ends of supporting bars shall be protected with rubber bumpers.

(a) Closing bars of the same width and thickness as the stringers of the ladder−type cable racks, as shown in Figure 77, shall only be used at horizontal junctions and offsets.

(b) Where a power cable rack of the type shown in Figure 78 is located at the ends of frame cable racks, closing bars may be omitted to locate the power cable rack so that the outer edge of the channel is flush with the ends of the cable rack stringers.

1.110 Vertical ladder−type cable racks arranged to attach directly to floors or to similar flat surfaces shall be terminated as shown in Figure 79. When the foot of the rack is enclosed and space permits, the cable rack feet may be turned outward.

1.111 The general requirements for splices in ladder−type cable racks also apply for splices in bar−type cable racks. Bar−type cable racks shall be spliced with the same type details as those for ladder−type cable racks.

1.112 Sections of bar−type cable rack shall be assembled so that cross strap support for the cabling does not exceed 11 5/8 inches.

1.113 Bar−type, over−aisle cable racks shall be junctioned to bar−type, cross−aisle cable racks at the same level as shown in Figure 80.

1.114 Bar−type, over−aisle cable racks shall be junctioned to bar−type, cross−aisle cable racks 2 inches higher, as shown in Figure 82.

1.115 Bar−type, over−frame cable racks shall be junctioned to bar−type, cross−aisle cable racks 2 inches higher, as shown in Figure 81.

1.116 Bar−type cable racks shall be junctioned to ladder−type Cable racks at the same level as shown in Figures 83 through 86.

1.117 The open ends of sections of bar−type cable racks and the protruding ends of supporting bars shall be protected with rubber bumpers.

(a) Where bar−type cable rack is terminated with rubber bumpers, the sheet metal plate shall be moved back so that it terminates at the last cross strap.

1.118 Flat tubular extension sleeves arranged to fit over the vertical ends of the cross straps are available for increasing the capacity of bar−type, over−aisle cable racks. Extension sleeves shall be installed at all T−intersections of bar−type over−aisle cable racks on the ends of the cross straps on both sides of the intersection as shown in Figures 80, 82, 83 and 84. In these cases the extension sleeves shall be provided with finishing caps. The caps shall be secured to the sleeves with adhesive.

1.119 Bar−type, cross−aisle cable racks shall be run at the same level as over−aisle cable racks where ceiling supported lighting is furnished. Where frame supported universal type fluorescent lighting fixtures are furnished, cross−aisle cable racks shall be raised 2 inches above the auxiliary framing. The metal plate covering the bottom of bar−type, cross−aisle cable racks may be cut away to permit cabling to pass through the rack to the frames beneath.

1.120 Bar−type, cross−aisle cable racks run at the same level as over−aisle cable racks shall be supported at locations where frames have been omitted. If run at a level 2 inches higher, where frames have been omitted, the cross−aisle cable racks shall be supported by additional framing covered in the unit for low type framing.

1.121 Where power distribution cables are to be run parallel to bar−type cable racks, the supporting details shall be attached to the cable rack stringer as shown in Figure 87.

1.122 Cable rack provided for fiber cables should be dedicated. These cable racks shall be stamped “FIBER OPTIC CABLE ONLY” at 10 feet intervals on each side of the stringer. No other cables are to be run on these racks.

1.123 Horizontal to vertical transitions and horizontal or vertical turns should not exceed the minimum bending radius of the cable.

Support Of Cable Rack

1.124 In cases where other cable racks, conduit runs, ladder tracks, or other equipment are hung from horizontal cable racks, the supports shall meet the requirements for all the equipment supported from the cable racks. Where ladder tracks are supported from ladder−type cable racks, 5/8−11 hexagonal nuts shall be placed above the cable rack hanger clips on the cable rack hanger rods supporting the cable rack.

1.125 Cable racks do not ordinarily support frames and racks but are, in general, supported by low−type auxiliary framing, hanger rods, or other cable racks. Support by means of low−type auxiliary framing shall be in accordance with the manufacturer’s documentation, this section, and section 8.

(a) Where cable racks are directly attached to low−type auxiliary framing both stringers shall be bolted to the framing at each end of a run. At intermediate points, only one bolt is required at each auxiliary framing intersection, the bolts are to be staggered so that adjacent fastenings along the rack can be made on opposite sides of the rack.

(b) Where a bar−type, over−aisle cable rack is directly attached to low−type auxiliary framing at a point where the cable rack cross strap is directly above the framing, two J−bolts shall be used to secure the cable rack at that point.

1.126 Frames that extend more than 2 feet 6 inches beyond a pair of regular framing bars or channels, and isolated frames shall be fastened to cable racks with short pairs of framing bars or channels from cable racks.

1.127 In offices with 11 feet 9 1/2 inch framing over box−type frames, the bar−type over−aisle cable racks, serving two lines of frames, shall be supported over the center of the wiring aisle between lines of frames.

1.128 Cabling between rows of frames was formerly carried from row to row on large cable racks in the main aisles. This practice has been discontinued to a large extent in favor of cross−aisle racks spaced at frequent intervals along the lines of frames. In those cases where main aisle racks are encountered, they shall be supported by corner clamps fastened to the cable racks over the frames or aisles, so that the bottom of the stringers of both racks are at the same level. The main aisle rack may be continuous or it may be installed in short sections and joined to continuous over frame or over−aisle cable racks in cases where it appears more practicable to extend these across the main aisle. Where the main aisle racks are continuous, additional supports are to be used as follows.

(a) Where the normal spacing between cable racks exceeds 6 feet center to center, as in the case of offices with cable racks on 8 feet centers, additional auxiliary framing attached to the regular auxiliary framing with bolts and clips shall be used.

(b) Where the normal spacing of over−frame or over−aisle cable racks does not exceed 6 feet, additional supports are required only where some of the over−frame cable racks are omitted. Where all of the cable racks over the frames on one side of a main aisle rack are not installed initially, the main aisle cable rack stringer on that side shall be supported with hanger rods from ceiling inserts or auxiliary framing.

1.129 Ladder−type end aisle cable racks, as in the case of main aisle racks, are generally not provided. In those cases where they are specified, end aisle cable racks shall be clamped to the over−frame cable racks or over−aisle cable racks on one side and supported by hanger rods from ceiling inserts or high−type auxiliary framing on the other side. They shall be supported so that the bottom of the stringers of the end−aisle racks are at the same level as the bottom of the over−frame or over−aisle cable rack stringers. Where over−frame cable racks or over−aisle cable racks are not installed initially as end aisles, the frame side of end aisle cable racks should be supported with additional framing bars or channels. In offices where the end aisles are not equipped with conduit, the cable rack may be attached for support directly to additional auxiliary framing at the same level as the regular framing bars or channels.

1.130 Ladder−type cable racks supported from power boards or similar framework shall be supported as shown in Figure 88.

1.131 Cable racks in areas not equipped with low−type auxiliary framing shall generally be supported by means of threaded hanger rods attached to high−type auxiliary framing, to other cable racks, or to beam clamps or ceiling inserts.

1.132 Bar−type, over−aisle cable racks supported by hanger rods from ceiling or high framing require a pair of bars or channels under the racks, as shown in Figure 89, to avoid having the rods pass through the cable run.

1.133 Spliced cable rack hanger rods may be used occasionally. In no case, shall more than one splice be made in a hanger rod.

1.134 The use of offset bent hanger rods shall be avoided where possible. Where impractical to use other devices, the offset bent rod may be used provided the bends in the rods do not exceed 20 degrees.

1.135 Hanger rod supported horizontal cable runs more than 2 feet below auxiliary framing or ceiling and over 20 feet long shall be braced sideways to prevent sway. Where practical, bracing shall be installed in a staggered arrangement on opposite stringers of the cable rack at approximately 20 foot intervals.

1.136 Vertical cable racks used to support cables passing through floors shall be supported at the floor and ceiling adjacent to the cable hole or slot as shown in Figures 90 and 91 for cable holes having channel sheathing, or Figure 92 for cable holes having angle sheathing.

1.137 Vertical cable racks used to support cable in shafts shall be supported at each floor and ceiling level at the cable rack supporting framework, as shown in Figure 93.

1.138 At turns, offsets, and intersections having the equivalent of free ended cable racks, supports shall be provided not more than 3 feet from the end of each rack at the turn, offset, or intersection. The rack is to be supported so that the clamps will not carry an appreciable load.

1.139 At intersections, where a free−ended cable rack is joined to a rigidly supported cable rack by corner clamps, supports shall be provided on the free−ended rack not more than 5 feet from the intersection.

1.140 At cable rack junctions and turns where the radii on which the cables turn are so large that an additional support is required, or where cables are spread out to avoid excessive piling, a corner bracket, as shown in Figure 62, shall be provided.

1.141 When a short straight section of rack is held with 45 degree clamps to obtain an offset or a large radius 90 degree turn the edge clamps shall not be subjected to any load other than the cabling at the turn or offset.

1.142 At the bottom of vertical cable racks that carry power cables exclusively, the intermediate cross straps shall be removed when the uninterrupted rise exceeds two floors, as shown in Figure 64, to prevent damage to sagging power cables.

Fiber Pathway Systems

1.143 Fiber Optic Pathways shall be installed in accordance with the manufacturer's specific installation instructions, the detailed engineering specification, and the Central Office Base Drawings. Conflict between these documents or existing office conditions that affect office records, such as duplication of assignment, locations or designations, shall not be corrected and/or reassigned without the concurrence of the engineer who provided the specific installation instructions.

1.144 The position of the fiber pathway must be such that it must not hinder the placement, removal or tracing of jumpers or other cables.

1.145 The fiber pathway intended to provide the trough for fiber jumpers must be located in such a manner so as not to interfere with the cable rack supports, cabling, lighting fixtures, conduit or other equipment.

1.146 In new or existing offices the fiber pathway systems can be installed by attaching it to the cable racks. The basic mounting of the system is onto 1/2" and 5/8" threaded rods. The mounting hardware allows the flexibility to mount the fiber pathway on existing threaded rod or to mount new rod on super bar, unistrut or cable rack.

1.147 Threaded rods that support cable racks, auxiliary framing or the fiber pathway shall be covered with fiber tubing where they may come in contact with cables.

1.148 In order to obtain maximum rigidity, pathways should be installed in stock lengths. Fiber pathways and fittings should be joined together using the procedures and materials specified by the manufacturer.

Rolling Ladders

1.149 Ladders are assembled with the handrails on the right–hand side as shown in the illustrations. Where the floor plan arrangement is such that a ladder serves equipment on the right side only, the handrail shall be mounted on the left side of the ladder. Where a ladder serves both a distributing frame and other equipment frames, the handrail shall be located on the side away from the distributing frame. The installer shall drill the left side of the ladder for handrail brackets, where required. It is not necessary to fill the bracket holes remaining in the right side rail after the handrail has been relocated.

1.150 Rolling ladders are to be equipped with fenders only where the frame guard rails are located above the shoulder of the ladder wheel brackets as is the case at distributing frames. In such cases, the fender shall be attached to the side rail of the ladder and located to engage with the frame guardrail. The guard plates on the vertical legs of platform–type ladders shall be relocated to engage with the guard rails in such cases. Ladders used in offices with cable duct frames having removable guard rails, shall be equipped with two wheel guards. Rolling ladders shall also be equipped with two wheel guards in lineups where frames with guard rails extending to the floor are installed. Ladders used at distributing frames shall be equipped with one wheel guard located on the side of the ladder adjacent to the distributing frame.

1.151 The ladder shall be suspended from the upper support or hanger step by threaded rods. The effective length of the rods shall be such that the steps of the ladder are level.

1.152 Rolling ladders and ladder track at distributing frames shall be located in accordance with the following:

(a) Where a ladder serves a distributing frame on one side and relay racks or other frames on the other side, the ladder shall be located with respect to the distributing frame.

(b) When a ladder serves a narrow–type distributing frame of approximately the same width as and in line with relay racks or frames, the ladder shall be located as shown in Figure 94.

(c) Where a single line of ladders is located between distributing frames or between a protector frame and a distributing frame, the ladders shall be located in the center of the aisle.

(d) When the distance from the center line of the ladder to the guardrail exceeds that recommended in Figure 94, the question of safety shall be reviewed with the local Capacity Manager.

1.153 At relay racks and fuse bays ladders and ladder track shall be located as shown in Figure 94. Where a ladder is to serve a double line of frames, only one line of which is installed initially, the ladder shall be located in the center of the aisle between the present and future line of frames.

1.154 For frames, racks, or other equipment not specifically covered herein, the ladder locations shall agree, if possible, with the location shown on the illustrations for the equipment they most closely resemble.

1.155 The minimum clearance for single or double line of ladders is shown in Figure 95.

1.156 The direction of slant of rolling ladders shall be such that the ladders are in the most suitable position for use by the maintenance force. Some of the factors with reference to the slant of rolling ladders are as follows.

(a) Ladders shall slant in a direction such that the foot is nearest the main cross aisle or central maintenance point.

(b) Ladders in a single line of frames shall slant such that the foot of the ladder is toward the right when facing the frames.

(c) Ladders at distributing frames, where the approach is equally convenient from either direction, shall be slanted so that the right side of the person standing on and facing the ladder will be nearest the frame.

(d) Ladders between lines of frames, equally convenient for approach in either direction, may slant in either direction, preferably in the same direction as other adjacent ladders in the same section of the building.

(e) Where a ladder, slanted in accordance with the above, cannot be run a sufficient distance beyond the end of a row of frames to provide access to equipment in the upper portions of the end frame due to track interference, the direction of slant of the ladder shall be reversed.

(f) The slant of platform–type ladders shall be in the direction which permits access to the equipment of the upper portion of the end frames.

(g) At frame lineups, where the guard rail has an offset to a wider guardrail at one end, the ladder shall be slanted so the ladder will not strike apparatus due to the wheel being opposite the narrow rail. Where a reversal of the slant of the ladder is not practical, the wider guardrail shall be extended to prevent interference.

Rolling Ladder Track

1.157 Ladder track shall be installed, wherever practical, in sections of 8 feet and 10 feet in length.

(a) Where the ultimate length of a lineup of track is being installed initially, or when the existing lineup is being extended to the ultimate and the overall length is such that one of the track sections is less than 5 feet, the shorter section shall be placed at some intermediate location in the track instead of at the end.

(b) Where the ultimate length of a lineup of track is not installed, but the track will be extended at some later date, the shorter length of track shall be located at the growing end of the track.

(c) The ladder track shall be extended at the position of future frames to obtain access to distributing power terminal strips, fuse cabinets, aisle pilots, etc., located at the ultimate end of a lineup.

1.158 The length of the ladder track shall be such as to provide an overhang at the ends of the lineup for access to all of the equipment on the frames. It shall be long enough to permit proper support from the auxiliary framing or other details provided. A clearance of not less than 1 foot 3 inches between one end of the track and the wall toward which the ladder slopes shall be provided for the removal of the ladder trolley or brake from the track.

1.159 The end of the track toward which the ladder inclines shall, where practical, extend sufficiently to permit placing a ladder stop 4 feet 2 inches beyond the end frame upright. The other end of the track shall extend a minimum of 3 feet beyond a ladder stop to permit entrance of maintenance equipment into the frame aisle. Ordinarily, the location of the stop in line with the end upright will meet this requirement.

(a) When the ladder stop in the end of the rolling ladder track toward which the ladder slopes is located 4 feet 2 inches from the frame upright as mentioned above, the foot of the ladder blocks egress from the aisle. Where space permits, the ladder track may be extended such that the foot of the ladder will clear the end of the aisle to permit entrance. The requirements for the number and spacing of track supports still apply.

(b) Where the ladder track is installed close to and beyond a column so that the rolling ladder cannot pass the column, a platform−type rolling ladder is used and the stops located so that the ladder can approach the column without touching it.

(c) Where the ladder track serves equipment in close proximity to partitions or walls, so that platform−type ladders have to be used to reach all of the equipment, the minimum distance from the end of the last frame to the center of the ladder stop shall be 12 inches.

(d) For partial equipment frame lineups where the ultimate requirements for ladder track are furnished initially, the stops shall be installed at the ends of the track to permit ladders to serve the ultimate lineup.

1.160 Track support brackets shall be fitted closely to the tracks so as to hold the track as securely as practical against lengthwise movement. To prevent creeping of the track in the supports, the track shall be bolted to both end support brackets in each continuous line. When a line of track is extended, an additional bolt shall be added in the track support at the end of the new section. The intermediate bolt and support may be left in place.

(a) Where the ladder track is supported from high−type auxiliary framing, and end braces are required, additional creeper bolts shall be installed in the track supports of the angle braces associated with both end braces.

1.161 Where low−type auxiliary framing is used, ladder track shall be attached directly to the underside of the auxiliary framing.

1.162 Ladder track shall be located as high as cable racks will permit where frames are supported by high−type auxiliary framing. At distributing frames supported by high−type auxiliary framing, it is desirable that the ladder track be located to take advantage of available headroom.

1.163 Ladder track shall be installed as level as possible. However, where ladder tracks run continuously between areas having auxiliary framing at different levels, such as between areas having high framing and areas having low framing or between two heights of low−type framing, the difference in level may be taken care of by a slight slope of the track. For differences in level of 1 1/2 to 2 inches, the sloping portion shall not be less than 20 feet long. The ladder used at this slope shall be adjusted so that the steps are level at the midpoint of the slope. Differences of 1/2 inch or less may be taken care of by sloping the track between adjacent supports of the different levels.

1.164 Continuous runs of ladder track shall be supported at approximately 5 feet intervals and in no case shall the spacing between adjacent supports exceed 6 feet 5/8 inch.

(a) Provide at least two supports for each length of track supported from high−type auxiliary framing.

(b) Provide at least one support for each length of track supported from low−type auxiliary framing or cable rack except that end pieces shall have not less than two supports.

(c) Track shall not extend cantilever−fashion more than 3 feet beyond a support if the trolley traverses the entire length of the extension. If the travel of the trolley in the extension is limited by a stop bolt, the total extension beyond the last support shall not exceed 4 feet. In this case, the distance from the last support to the stop bolt may be up to 3 feet and the track may extend beyond the stop bolt.

1.165 Tracks shall be supported from auxiliary framing or the ceiling in steel frame and concrete buildings. Where proper support cannot be obtained with auxiliary framing, additional framing shall be installed.

1.166 When support from cable rack is required, tracks shall be fastened as shown in Figures 96 through 99. The supporting details shall be fastened not more than one foot from the cable rack support. Tracks shall not be attached to cable rack that is supported by offset bent hanger rods.

1.167 When tracks are to be supported from cable racks that utilize hanger rods, 5/8−11 hexagon nuts shall be placed above the cable rack hanger clips.

1.168 Where tracks are to be under cable racks that are supported by low−type auxiliary framing, the track shall be attached to the cable rack bars. If track supports are required at points between the cable rack supports, pairs of bars or channels shall be attached to the cable rack and the track supported from these bars or channels.

1.169 In wood joist constructed buildings, timbers shall be installed from which the track can be supported. The track supports may be fastened to or suspended by threaded rods from the timbers. Track supports shall be located approximately 3 feet, but no more than 4 feet apart.

1.170 End braces are required at each end of track where the distance between the top of the support and the bottom of the auxiliary framing or other support is 10 inches or more.

1.171 Side braces are required for ladder track where the distance between the top of the track supports and the bottom of the auxiliary framing or other support is 10 inches or more. Where this distance is 10 inches but less than 1 foot 3 inches, provide a side brace at each end support and at each alternate intermediate support. Where this distance is 1 foot 3 inches or more, provide a side brace at every support.

1.172 Where ceiling inserts are not available adjacent to walls, ladder tracks may be supported from the wall.

1.173 A ladder stop shall be installed at each end of the track and shall be equipped with cotter pins. Where rubber plugs are installed, the plug may be used as a stop as shown in figure 100.

1.174 Where a ladder track extends close to a wall, column, or equipment, the ladder stop shall be so placed that it will prevent the ladder from striking the wall, column, or equipment.

1.175 Ladder track plugs are to be furnished for the ends of track that are exposed. The plugs shall be installed per the manufacturers instructions.

(a) Ladder track plugs shall be provided where two lines of track are not continuous in the same aisle and the ends of the track overlap.

(b) Ladder track plugs shall be provided at both ends of track run. In those cases where a stop would normally be provided, the plug shall serve as the stop.

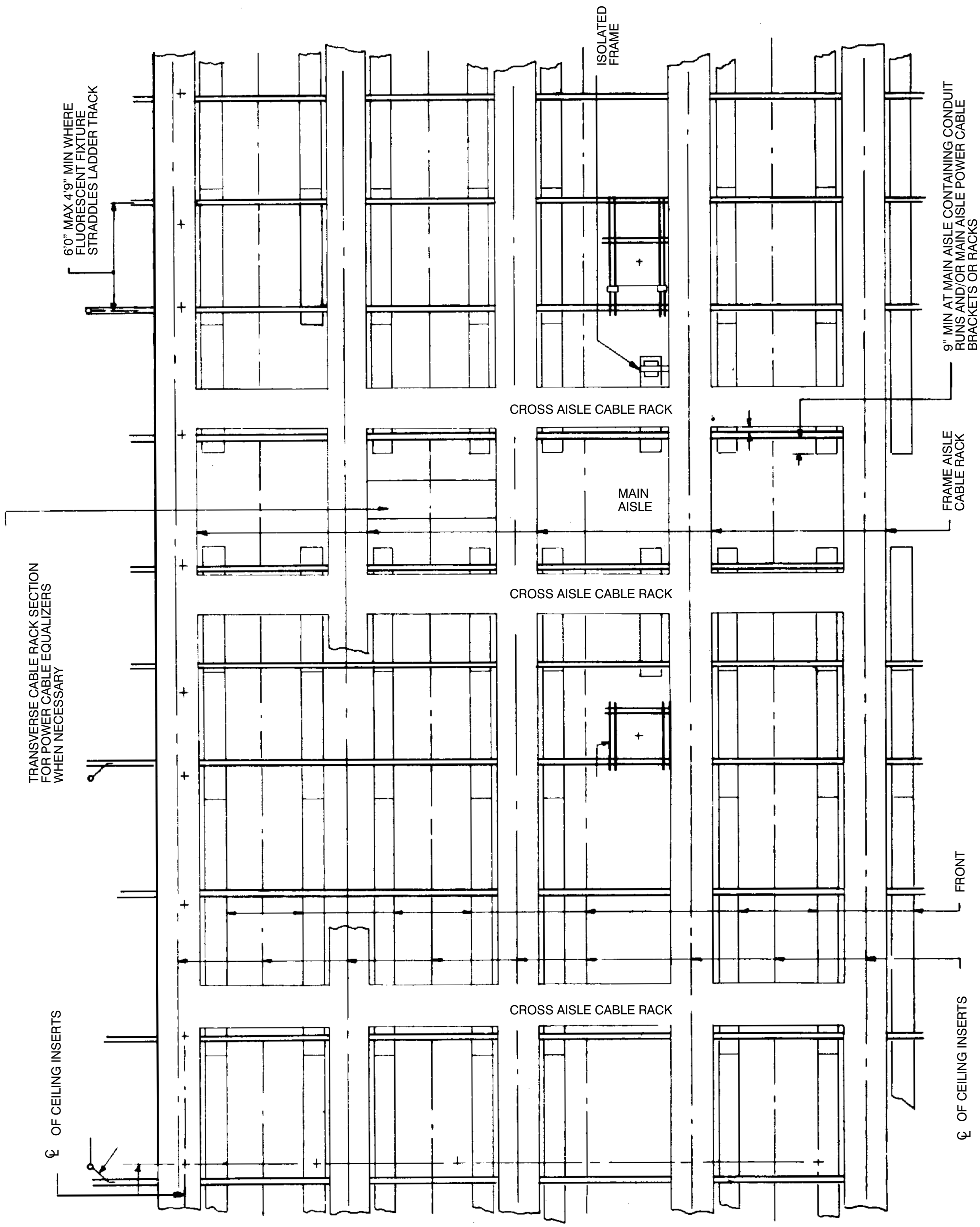


Figure 2 − Typical Arrangement Of Auxiliary Framing For Existing Offices Without Prearranged Pattern Of Ceiling Inserts

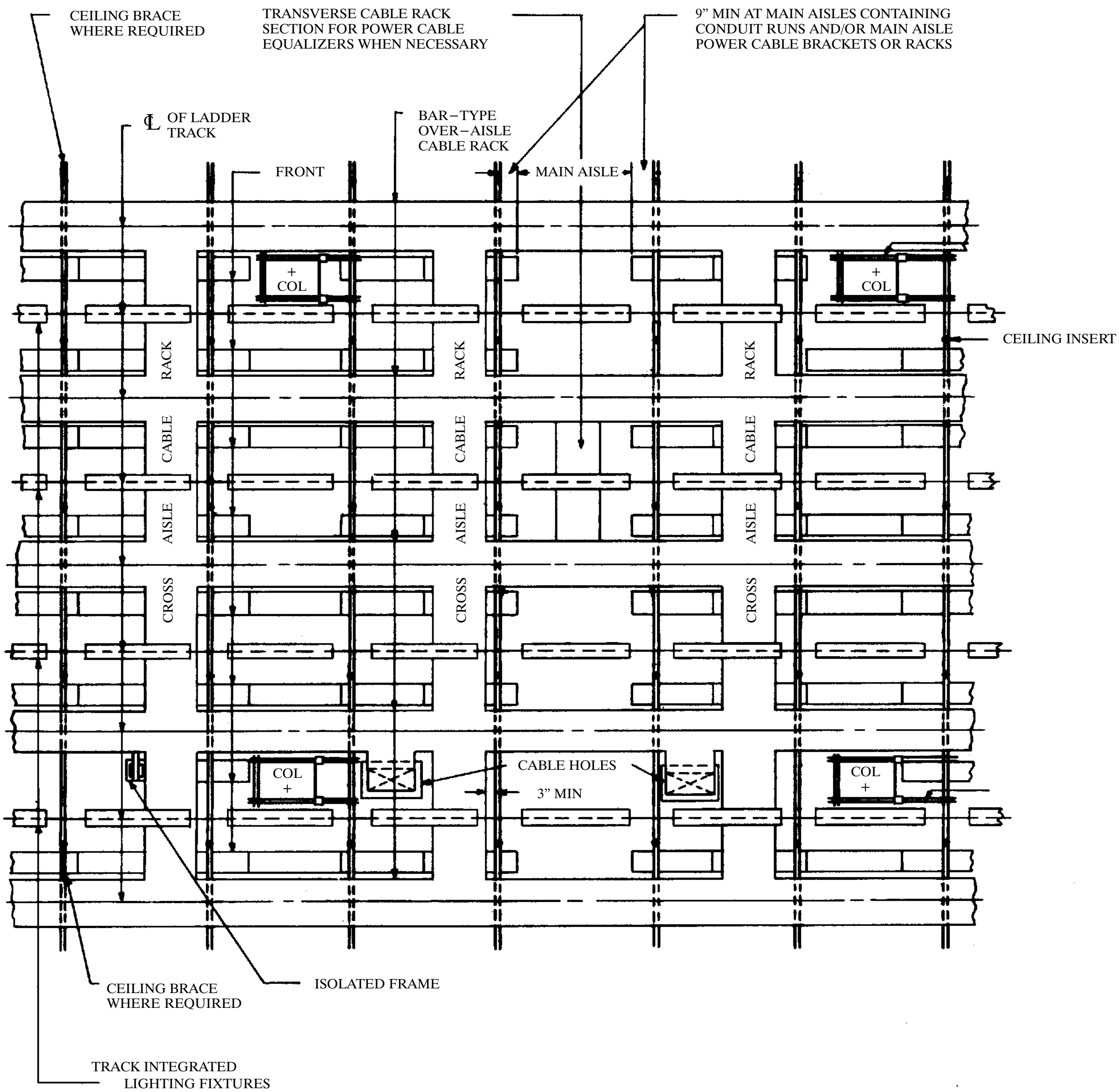


Figure 3 − Typical Arrangement Of Auxiliary Framing For Existing Toll Type Offices With 11 Feet 9 1/2 Inch Framing − Building Columns And Ceiling Inserts Prearranged To Facilitate Precabling

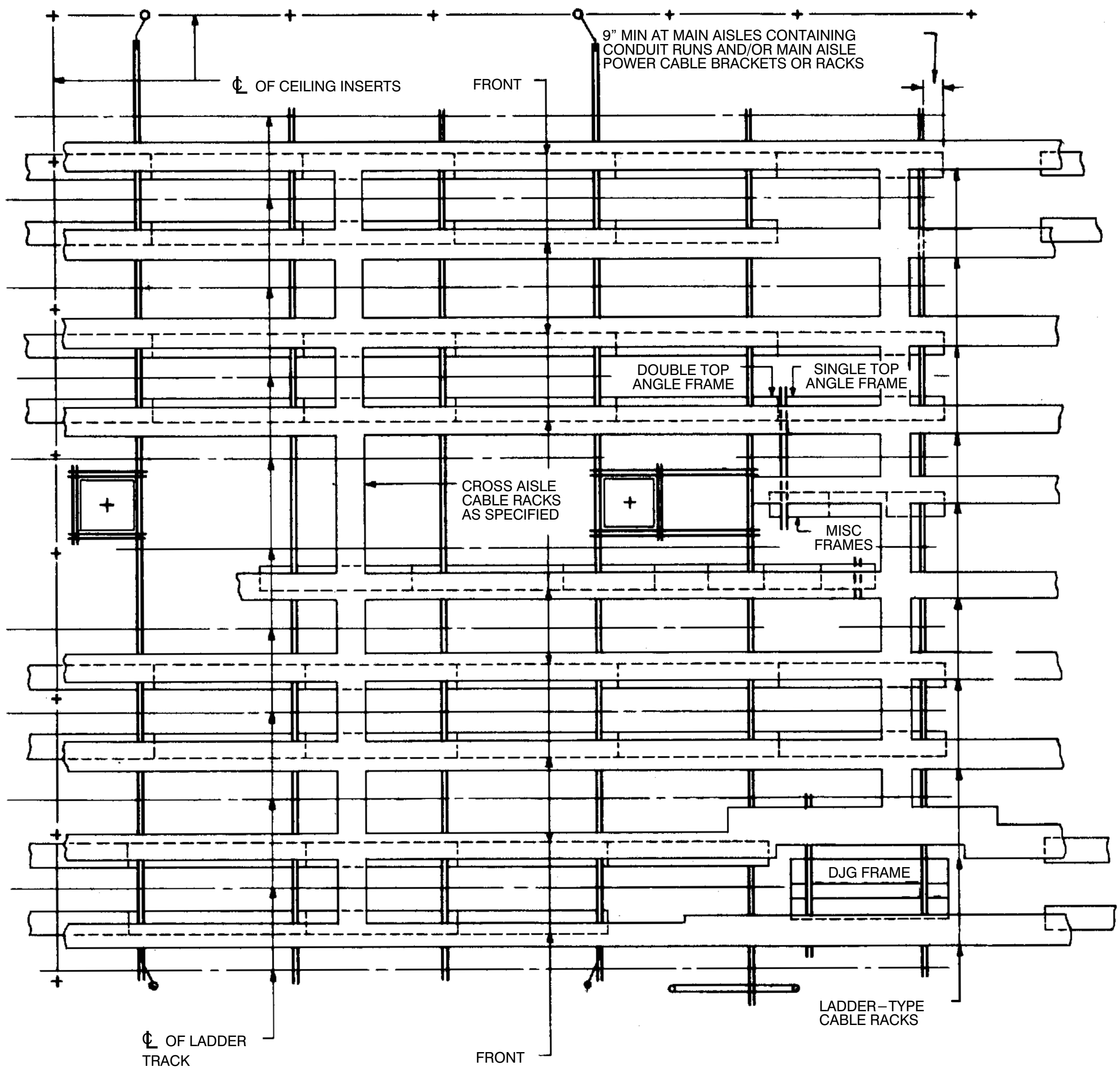


Figure 4 − Typical Arrangement Of Auxiliary Framing For Existing Offices With 11 Feet 9 1/2 Inch Framing − Wide Cable Rack

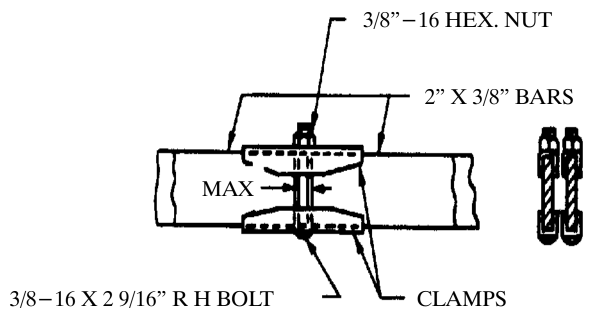


Figure 5 − Splicing Auxiliary Framing 2 x 3/8 Inch Bars To 2 x 3/8 Inch Bars

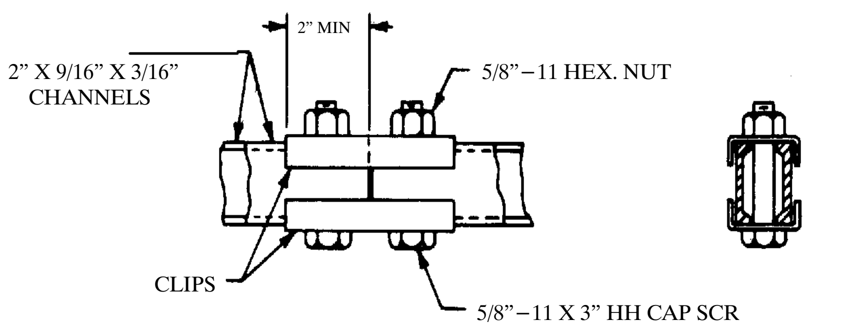


Figure 6 − Splicing Auxiliary Framing − Channels To Channels

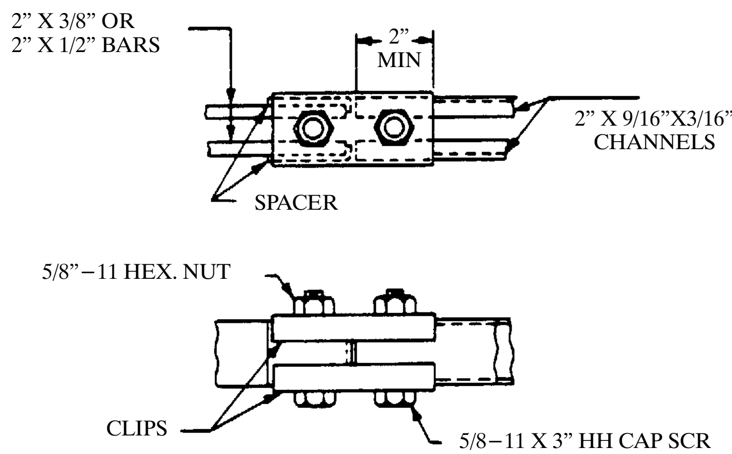
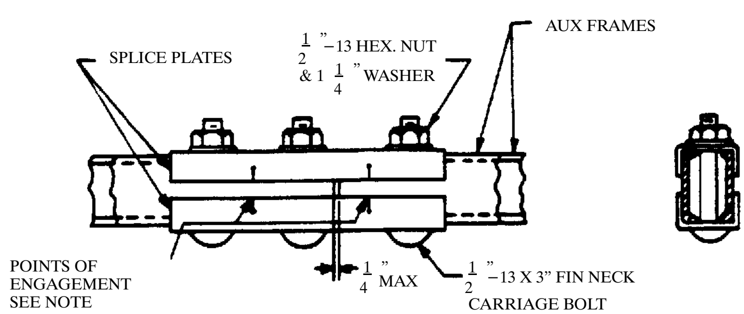


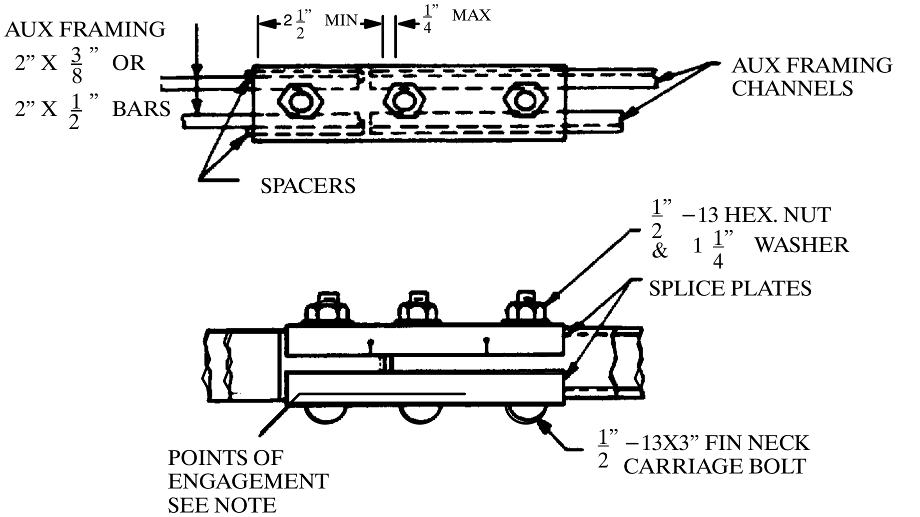
Figure 7 − Splicing Auxiliary Framing − Channels To Bars



NOTE:

THE AUXILIARY FRAMING CHANNEL ENDS MUST BE LOCATED WITHIN THE POINTS OF ENGAGEMENT WHICH ARE MARKED ON THE SIDES OF THE SPLICE PLATE.

Figure 8 − Splicing Auxiliary Framing − Channels To Channels − Using 3−hole Splice Plates



NOTE:

THE AUXILIARY FRAMING CHANNEL ENDS MUST BE LOCATED WITHIN THE POINTS OF ENGAGEMENT WHICH ARE MARKED ON THE SIDES OF THE SPLICE PLATE.

Figure 9 − Splicing Auxiliary Framing − Channels To Bars − Using 3−hole Splice Plates

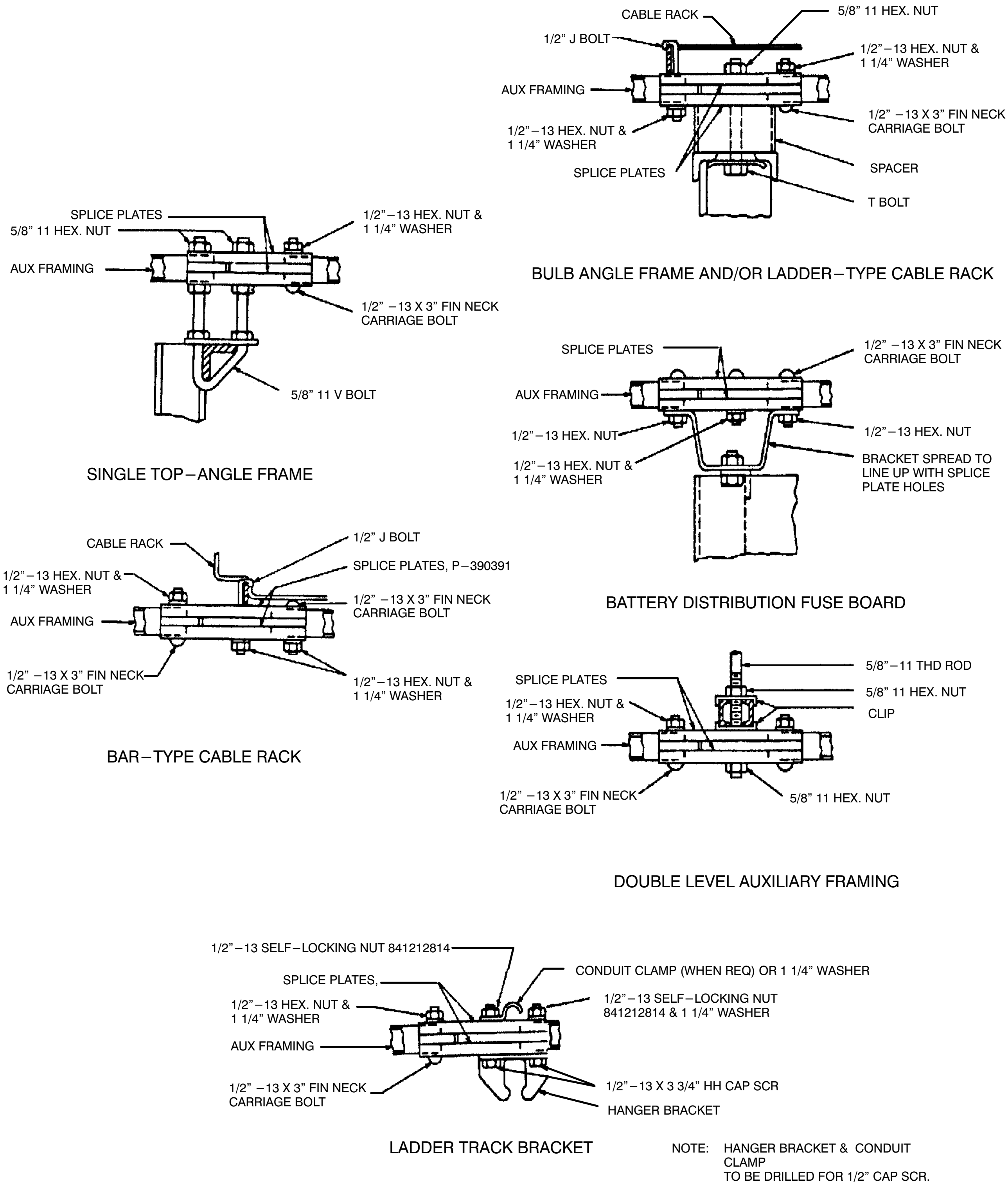
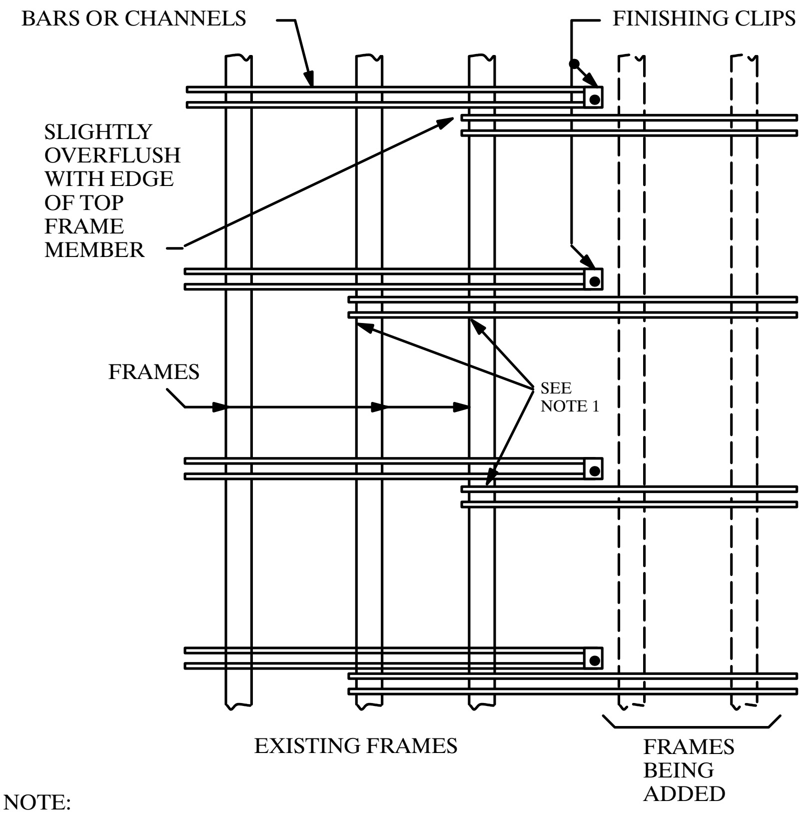


Figure 10 − Splicing Auxiliary Framing − Typical Applications − Using 3−hole Splice Plates



NOTE:

ENDS OF STAGGERED BARS OR CHANNELS MUST OVERLAPSUFFICIENTLY TO ALLOW BOTH PAIRS TO BE FASTENED TO THE SAME FRAME OR FRAMES WITH ALTERNATE PAIRS OF CHANNELS OVERLAPPING EXISTING BARS OR CHANNELS OVER TWO ROWS OF FRAMES AS SHOWN. THE EXTENDED CHANNEL MAY BE PLACED ON EITHER SIDE OF THE EXISTING FRAMING PROVIDED THE MAXIMUM SPACING OF 6’−0” IS NOT EXCEEDED. THE EXTENDED CHANNELS NEED NOT BE FASTENED TO CABLE RACK, LADDER TRACK, ETC., IN THE AISLE WHERE THEY OVERLAP THE EXISTING FRAMING.

Figure 11 − Arrangement For Extending Bar Or Channel Framing To Eliminate Necessity Of Cutting Back Existing Framing

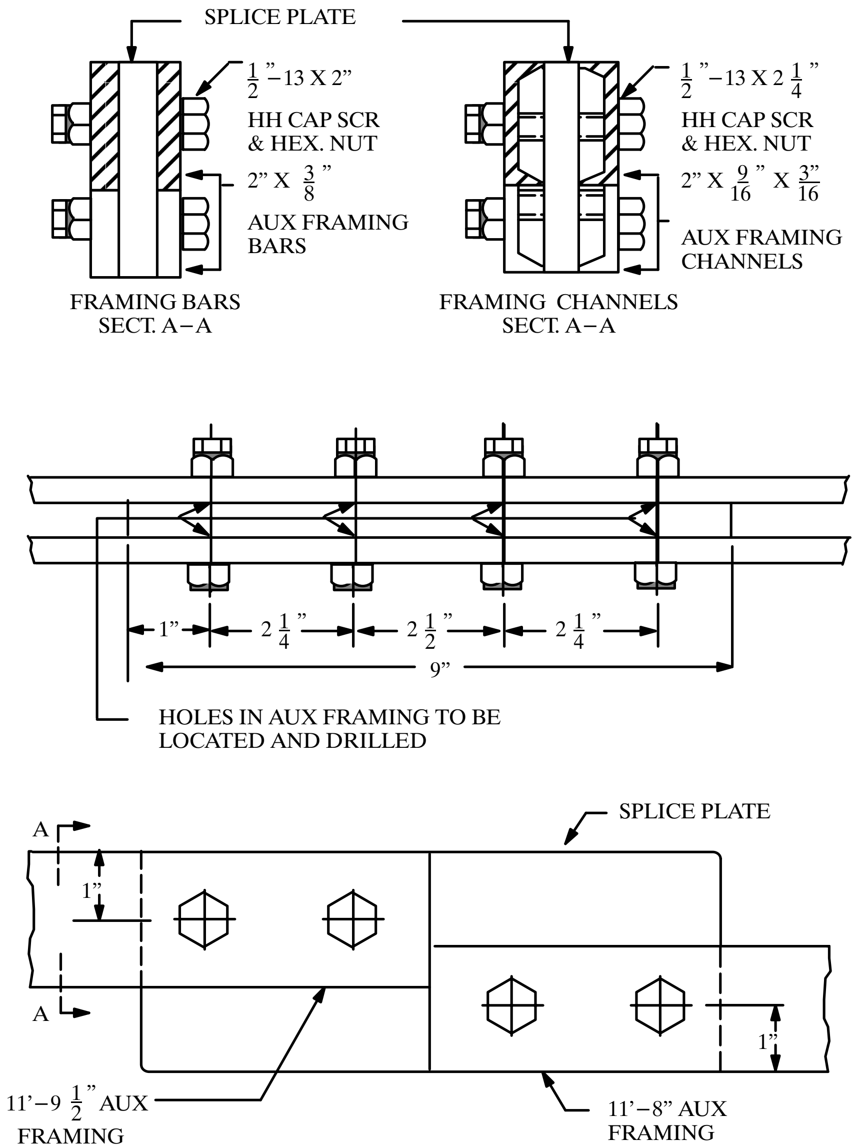


Figure 12 − Splicing Auxiliary Framing 11 Feet 8 Inch And 11 Feet 9 1/2 Inch Framing

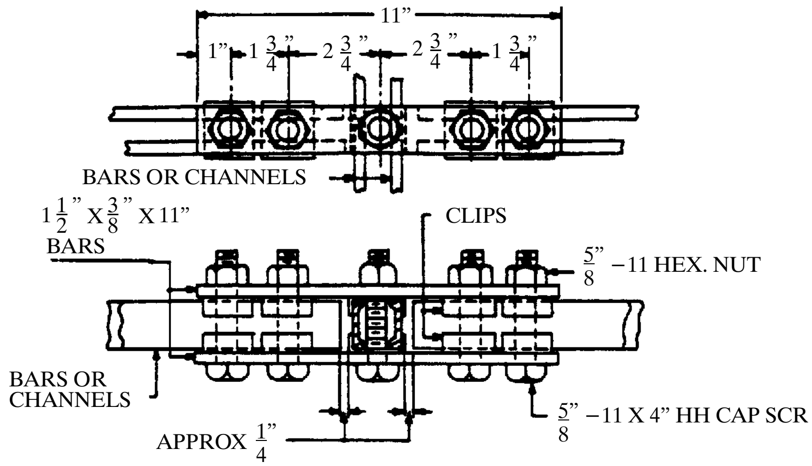


Figure 13 − Single−level Auxiliary Framing Intersection Of Primary And Secondary Bars Or Channels

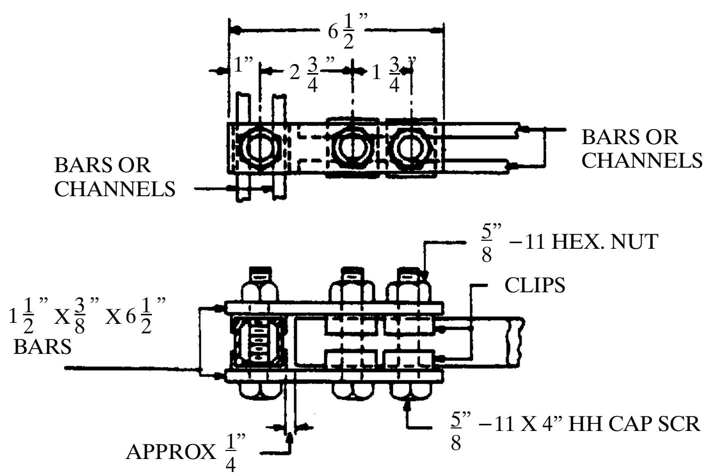


Figure 14 − Single−level Auxiliary Framing Junction Of Primary And Secondary Bars Or Channels

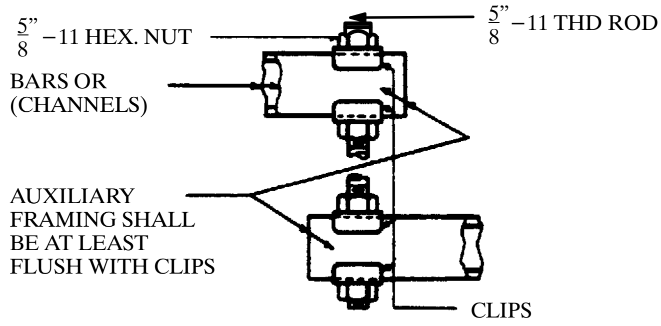


Figure 15 − Junctioning Low To High Level Framing

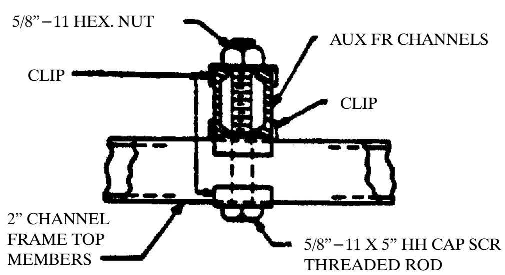


Figure 16 − Double−level Auxiliary Framing − Fastening Channel Over Channel

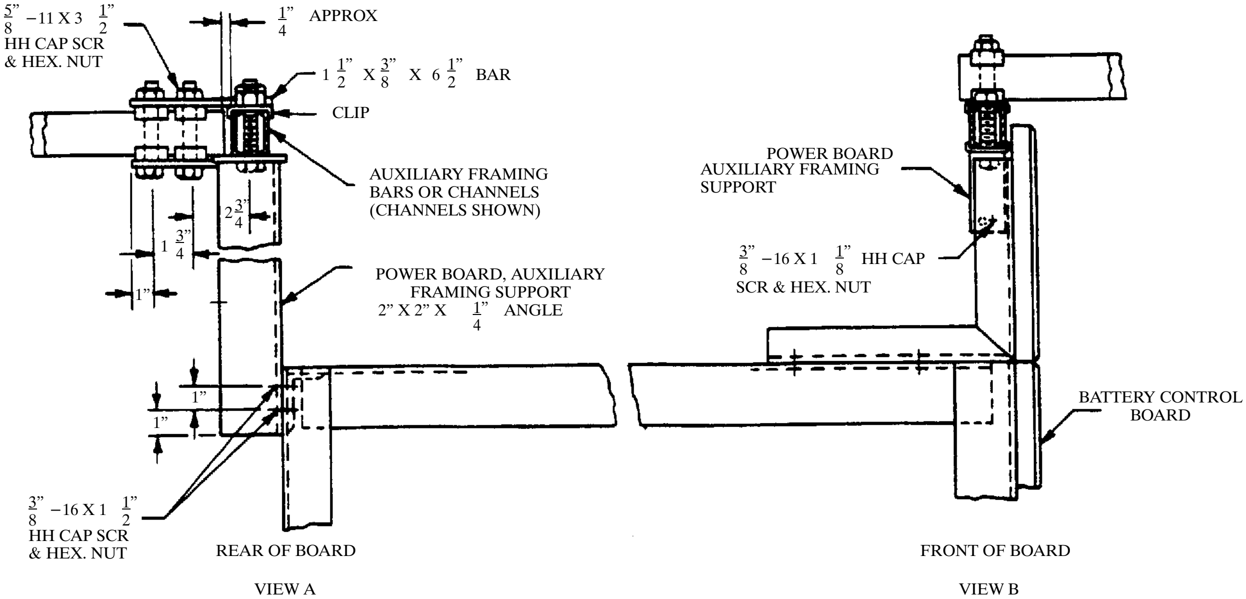


Figure 17 − Auxiliary Framing Over Battery Control Boards

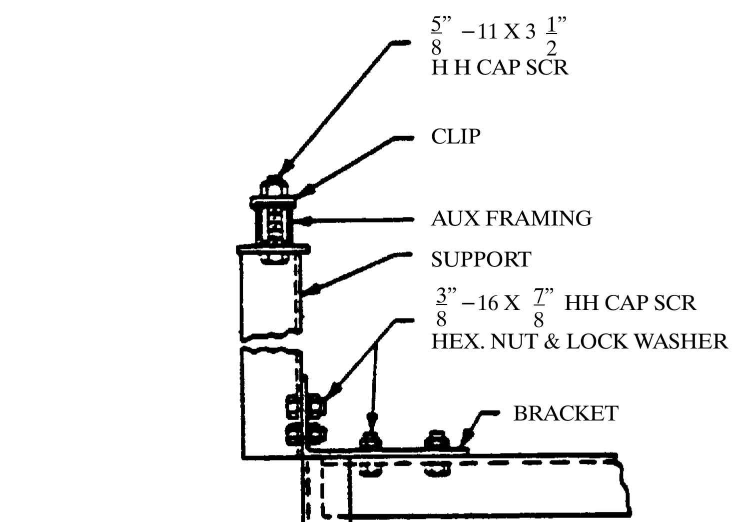


Figure 18 − Auxiliary Framing Over Battery Control Boards Equipped With Rear Doors

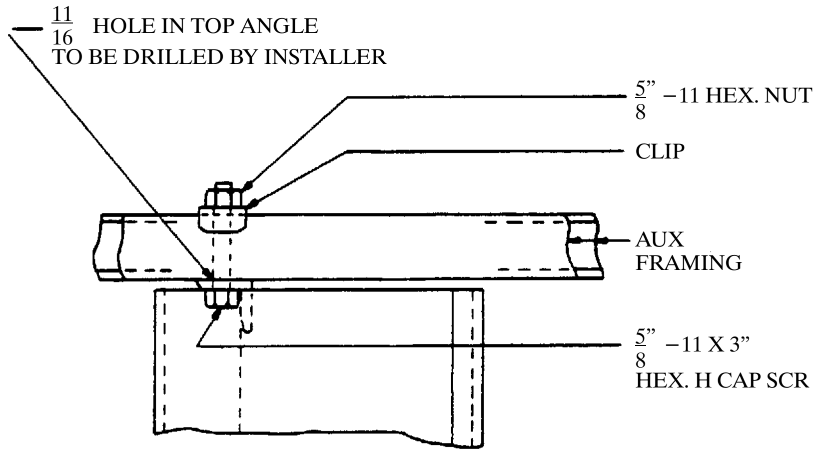


Figure 19 − Auxiliary Framing Attached Directly To Top Angles Of Battery Distribution Fuse Boards − 11 Feet 6 Inch Framing

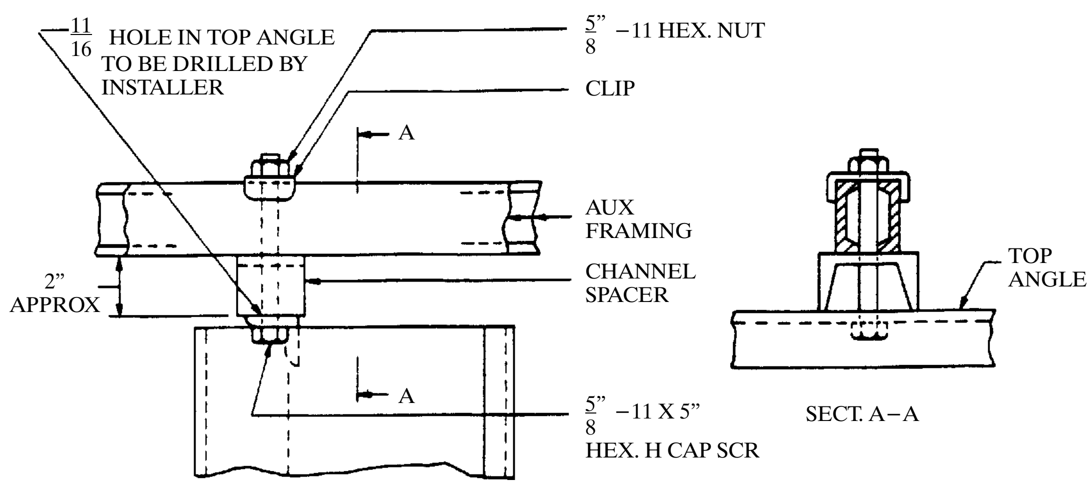


Figure 20 − Auxiliary Framing Attached To Top Angles Of Battery Distribution Fuse Boards − 11 Feet 8 Inch Framing

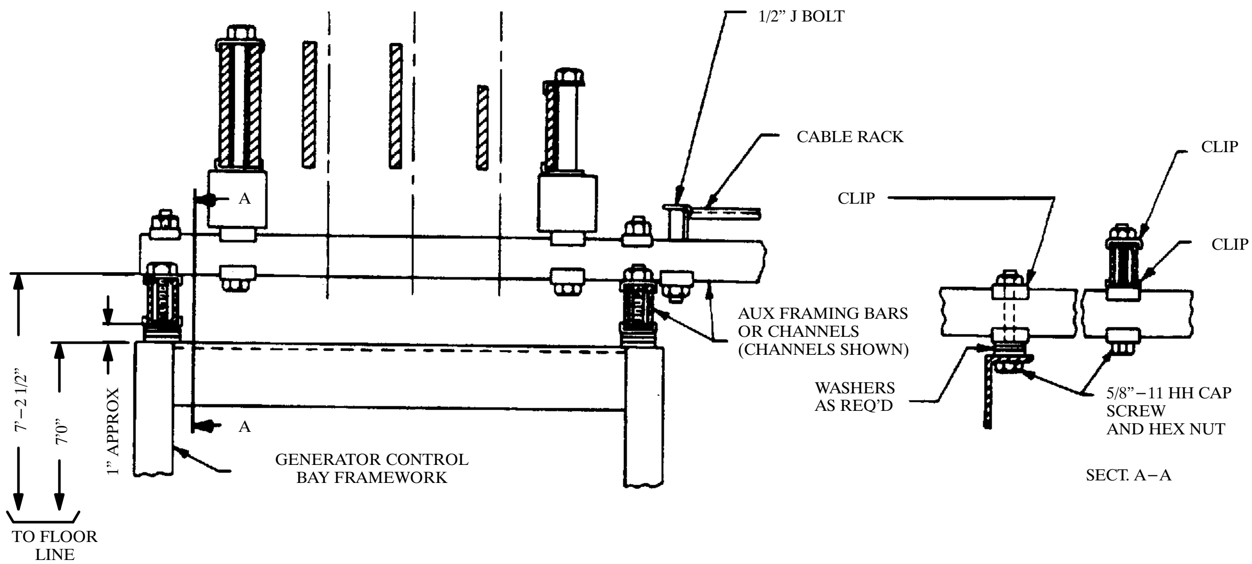


Figure 21 − Auxiliary Framing Over Generator Control Panels

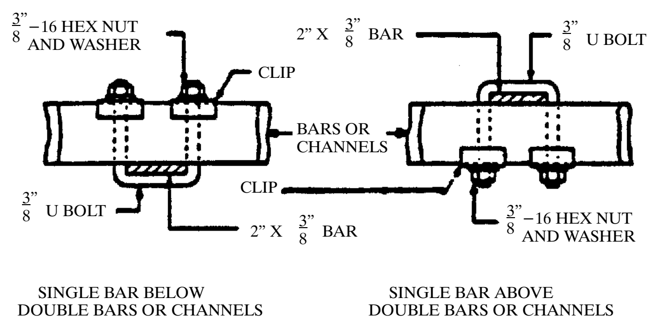


Figure 22 − Double−level Auxiliary Framing − Single Bars Attached To Double Bars Or Channels

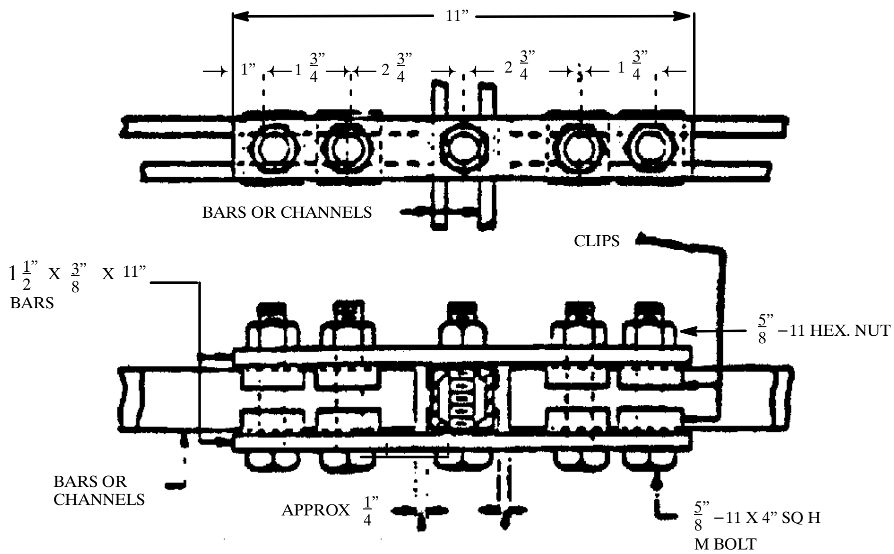


Figure 23 − Single−level Auxiliary Framing Intersection Of Primary And Secondary Bars Or Channels

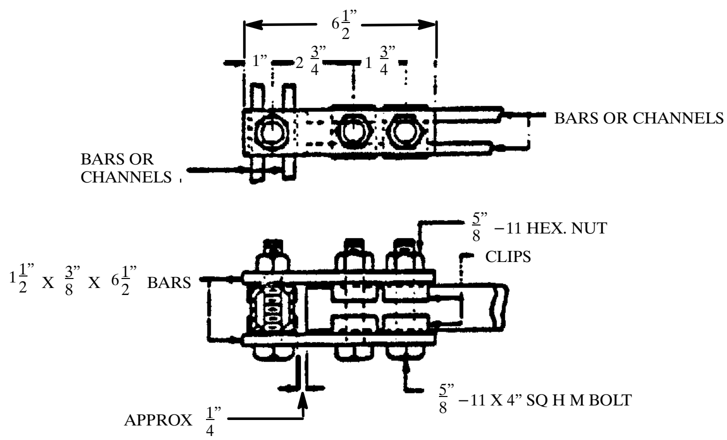


Figure 24 − Single−level Auxiliary Framing Junction Of Primary And Secondary Bars Or Channels

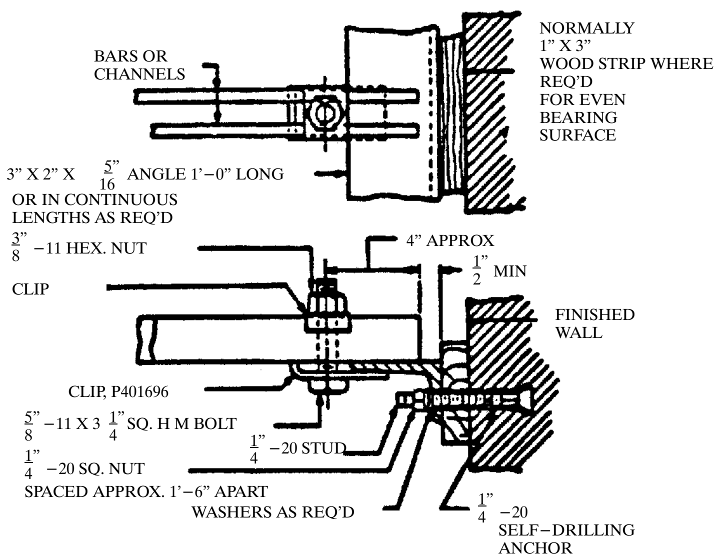


Figure 25 − Double Framing Attached To Walls Where Impractical To Drill Wall Angle

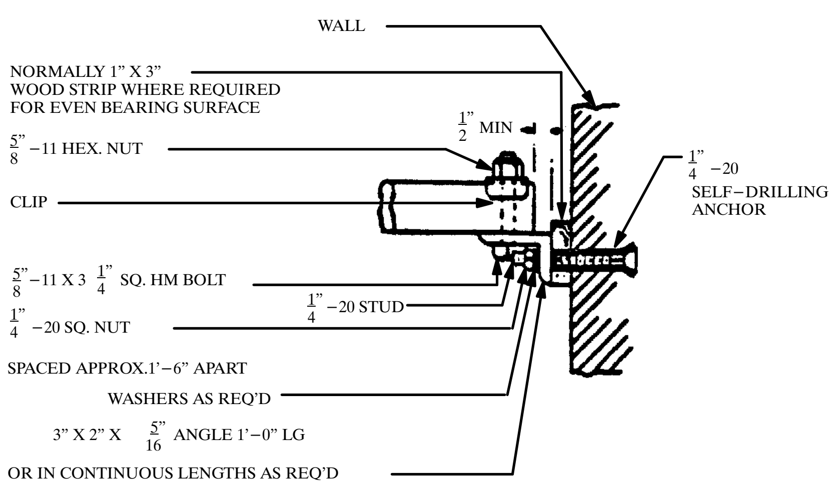


Figure 26 − Double Framing Attached To Walls Where Angle Is Drilled

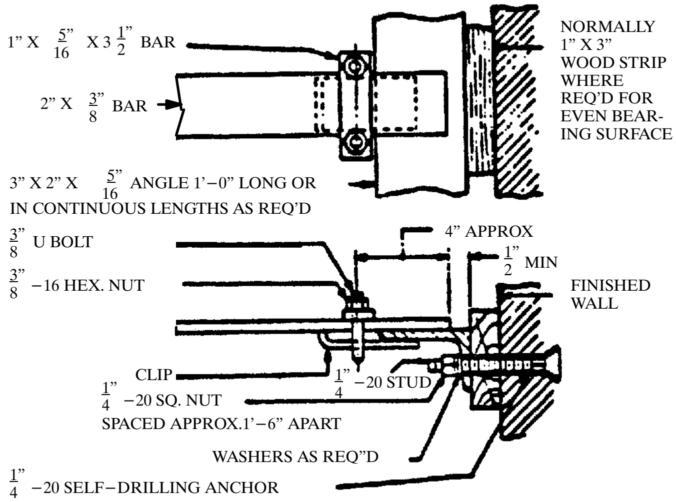


Figure 27 − Single Framing Attached To Walls

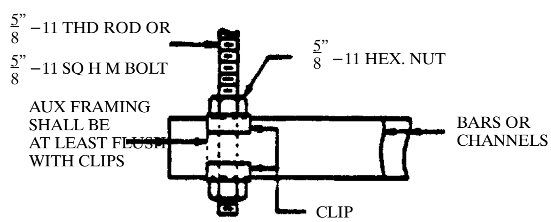


Figure 28 − Hanger Rods Or Bolts Attached At Ends Of Double Bars Or Channels

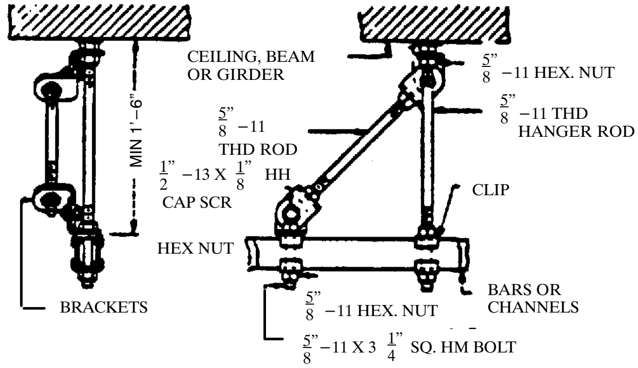


Figure 29 − Bracing Upper Level Framing

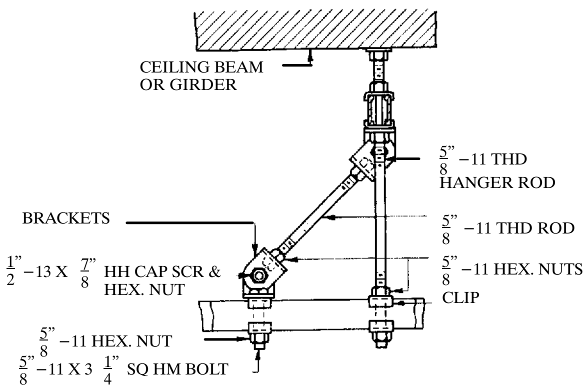


Figure 30 − Bracing Lower Level Framing At Right Angles To Higher Level Framing

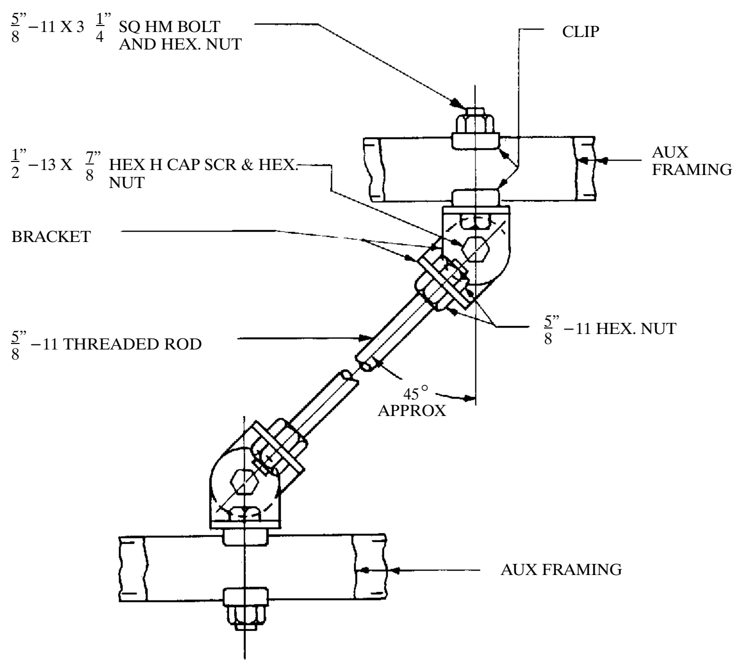


Figure 31 − Bracing Lower Level Framing Parallel To Higher Level Framing

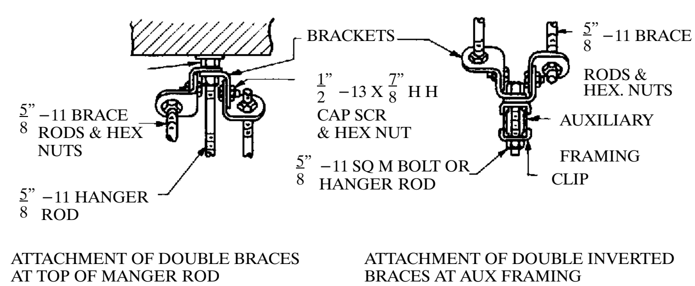


Figure 32 − Attaching Double Braces

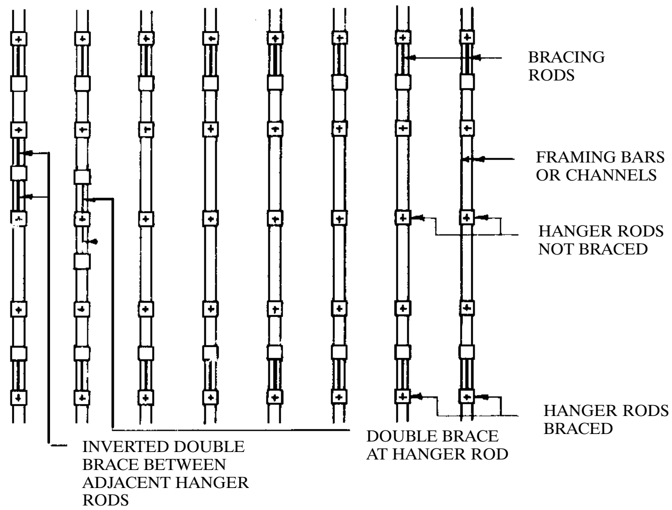


Figure 33 − Typical Layout Of Bracing Details

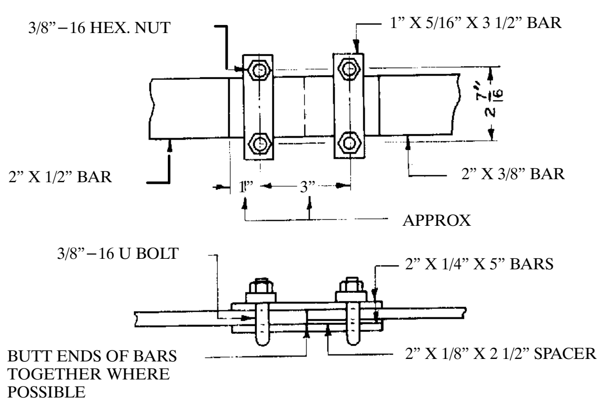


Figure 34 − Splicing Single 2 x 3/8 Inch Bars To 2 x 1/2 Inch Bars

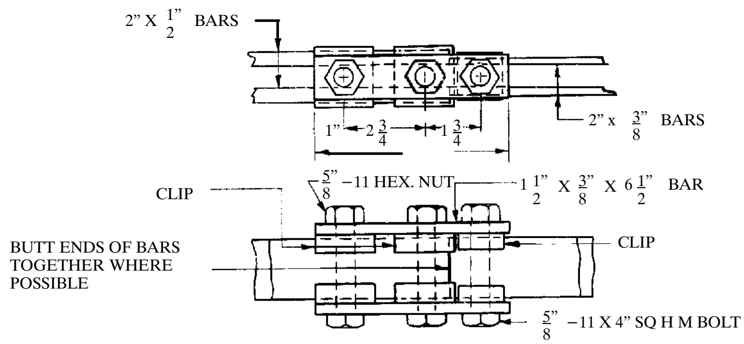


Figure 35 − Splicing Pairs Of 2 x 3/8 Inch Bars To 2 x 1/2 Inch Bars

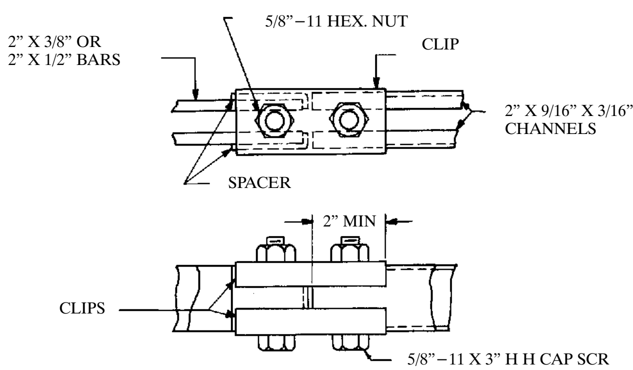


Figure 36 − Splicing Pairs Of 2 x 3/8 Inch Or 2 x 1/2 Inch Bars To Channels

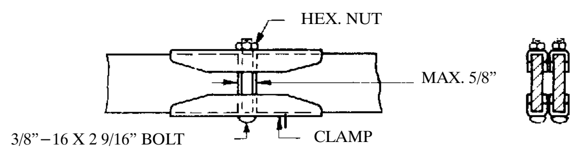


Figure 37 − Splicing Pairs Of 2 x 3/8 Inch Bars

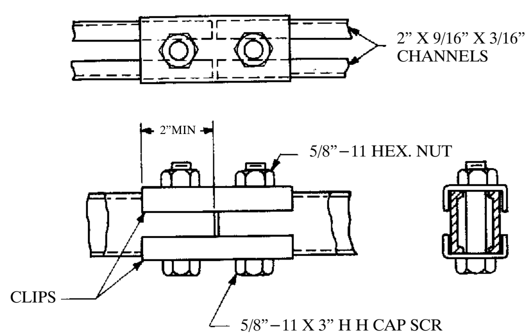


Figure 38 − Splicing Pairs Of 2 x 9/16 Inch Channels

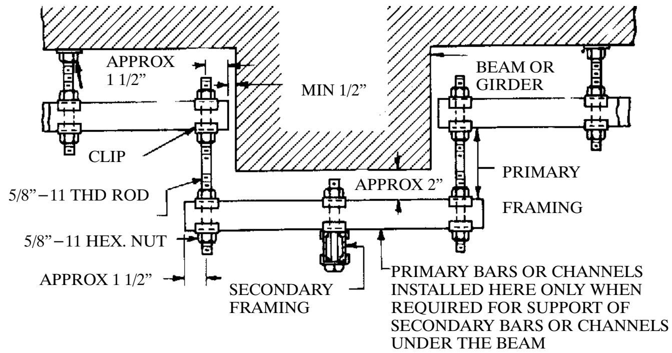


Figure 39 − Double Framing Under Beams Or Girders − Primary Bars Or Channels At Right Angles To Beams Or Girders

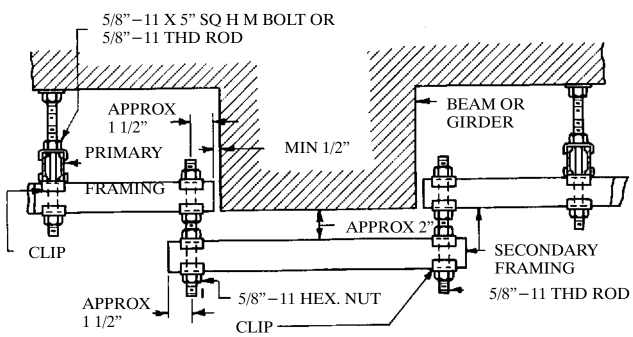


Figure 40 − Double Framing Under Beams Or Girders − Primary Bars Or Channels Parallel To Beams Or Girders

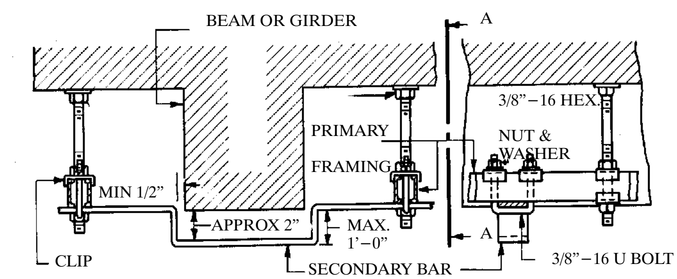


Figure 41 − Single Framing Under Beams Or Girders − Primary Bars Or Channels Parallel To Beams Or Girders

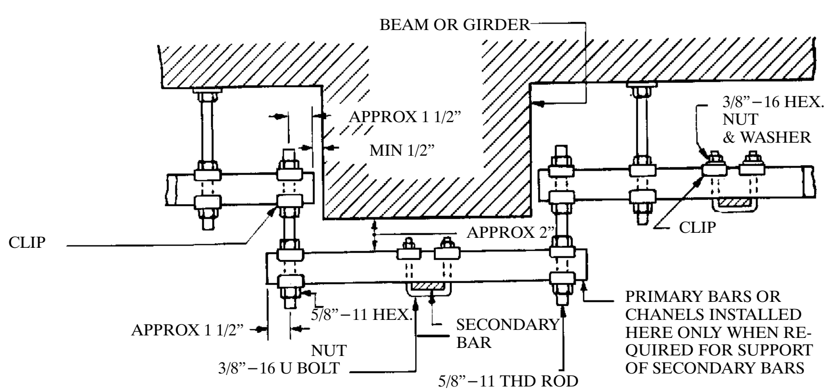


Figure 42 − Single Framing Under Beams Or Girders − Primary Bars Or Channels At Right Angles To Beams Or Girders

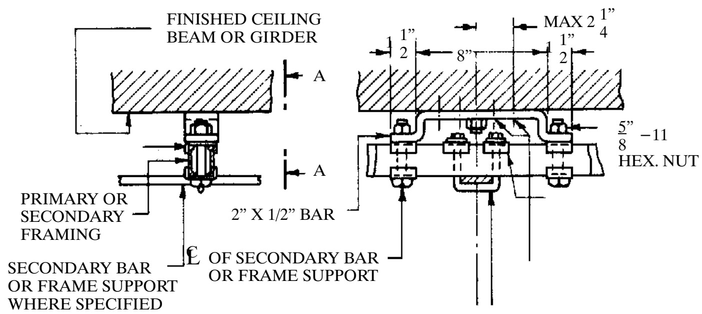


Figure 43 − Supporting Framing Where Hanger Rods Interfere With Other Attachments

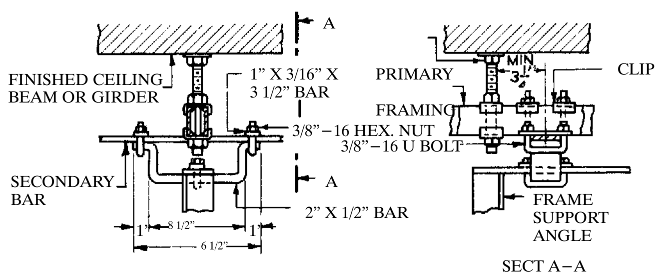


Figure 44 − Framing Bars Or Channels Attached At Frame Supports − Main Hanger Rod At Point Of Support

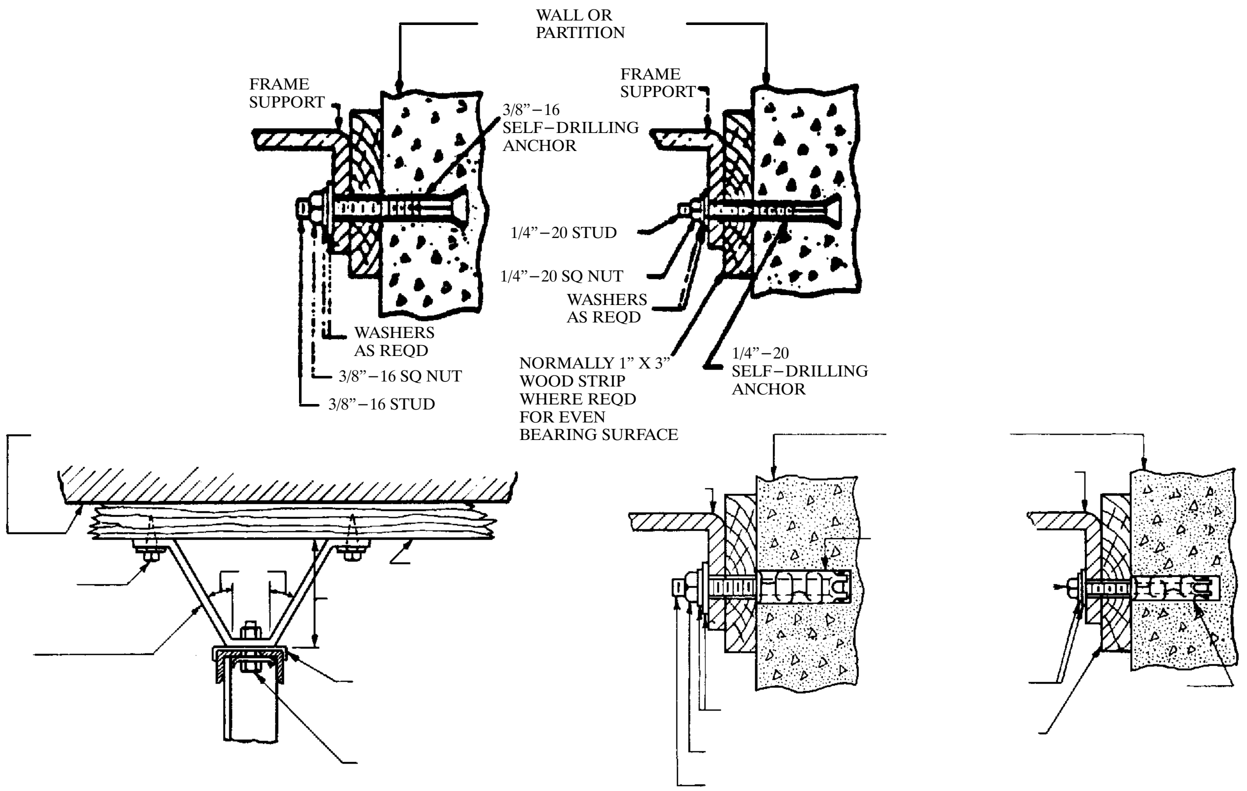


Figure 45 − Frame Support Attached To Cement Wall Or Partition

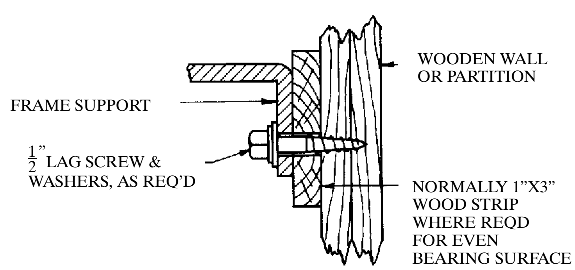


Figure 46 − Frame Support Attached To Wood Wall Or Partition

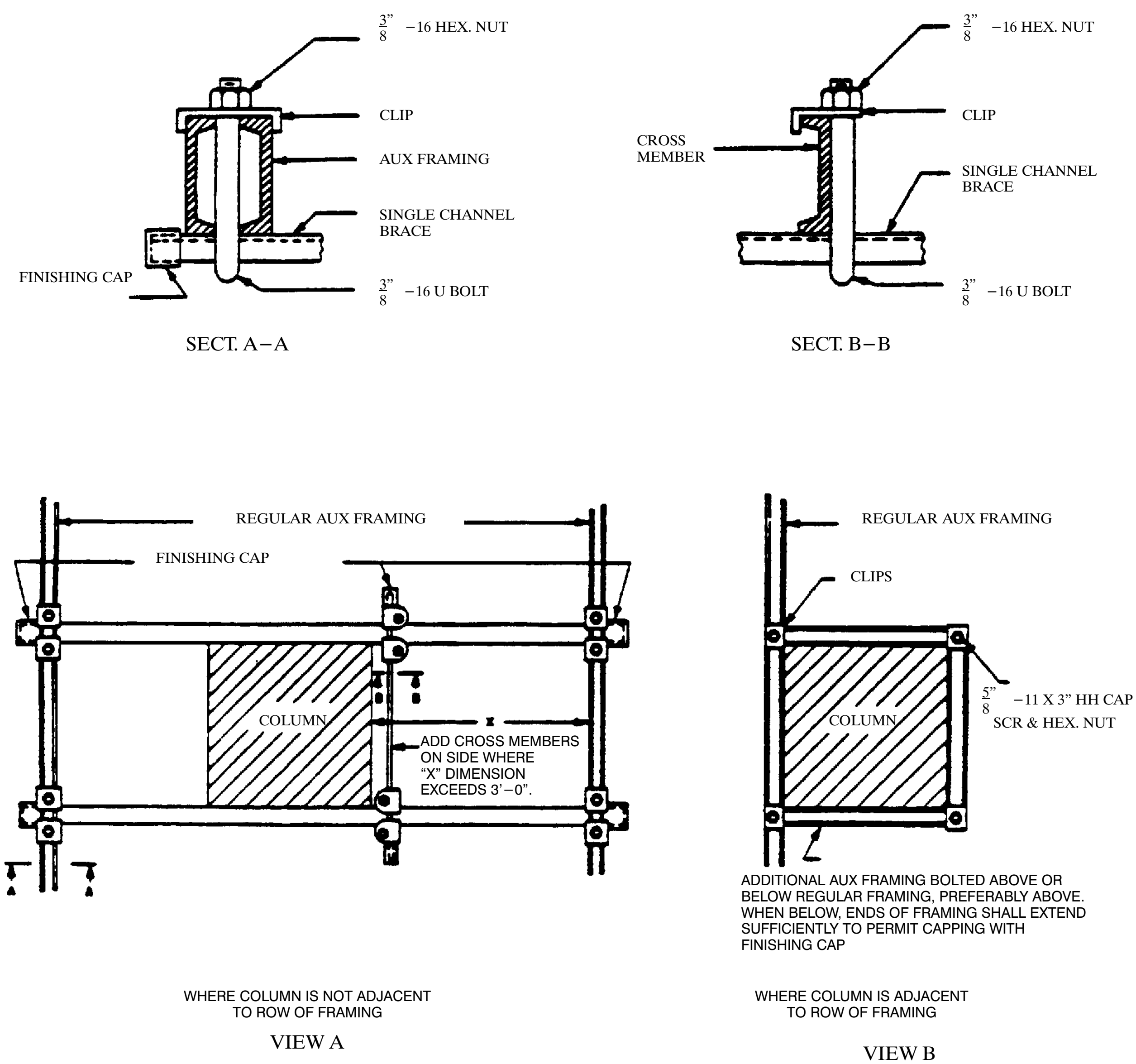


Figure 47 − Bracing Of Auxiliary Framing To Columns

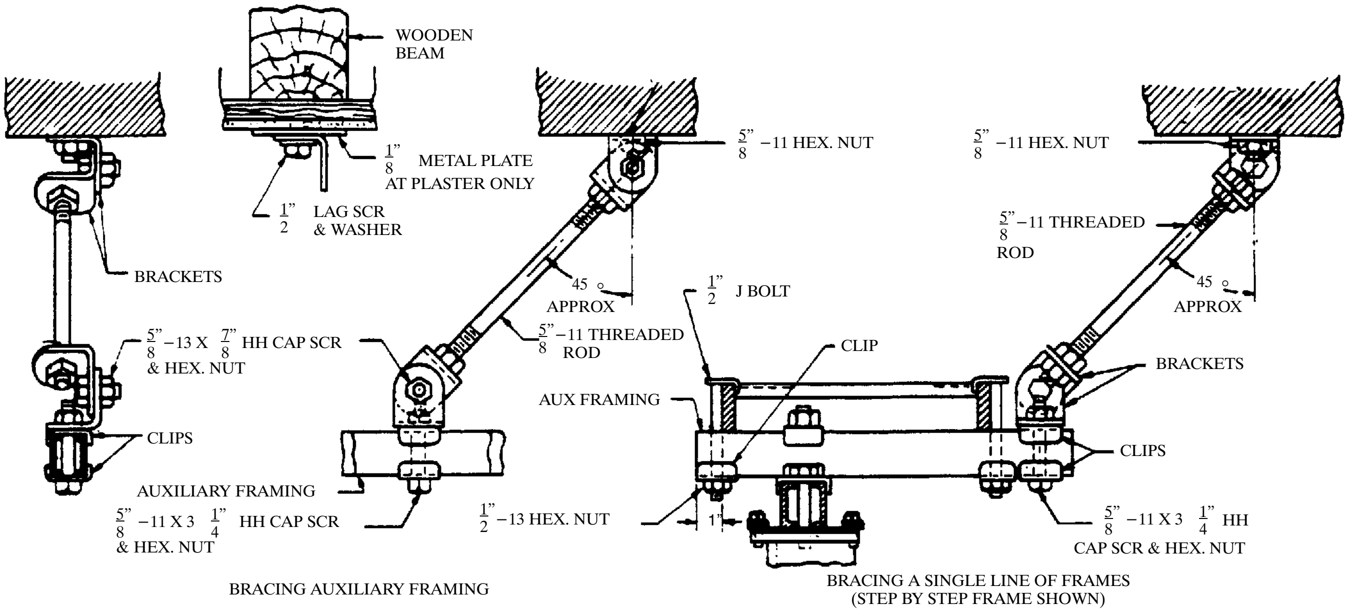


Figure 48 − Bracing Of Auxiliary Framing With Single−rod Braces

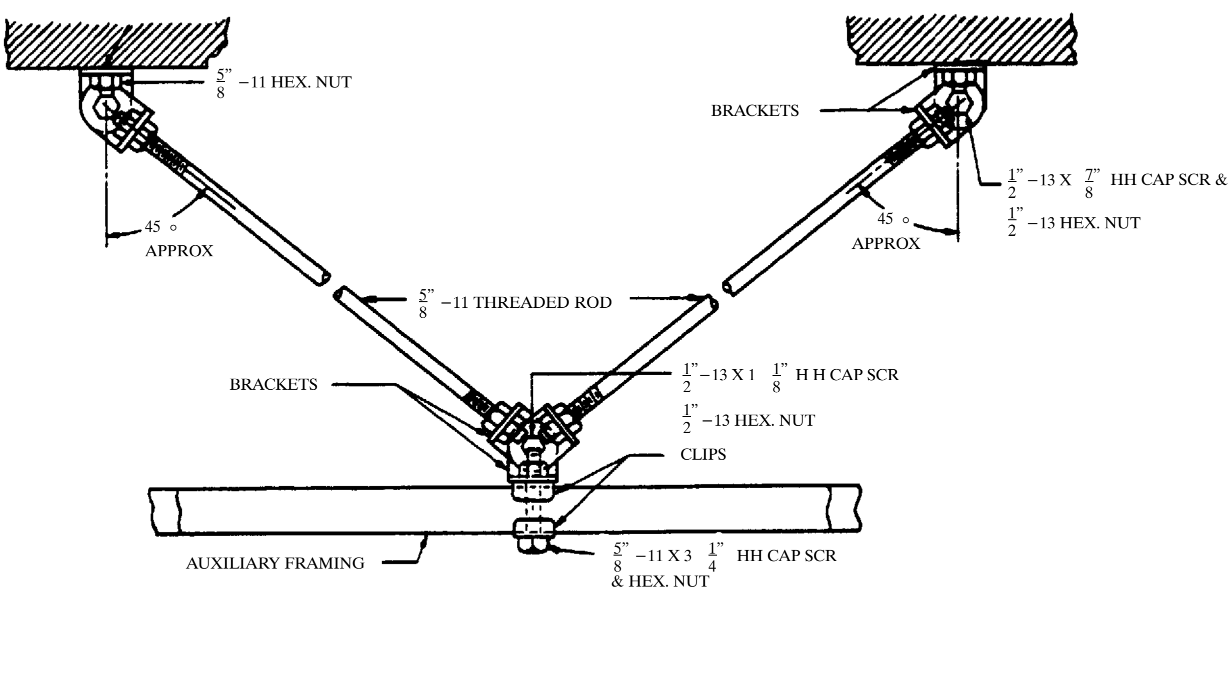


Figure 49 − Bracing Of Auxiliary Framing With Double−rod Braces

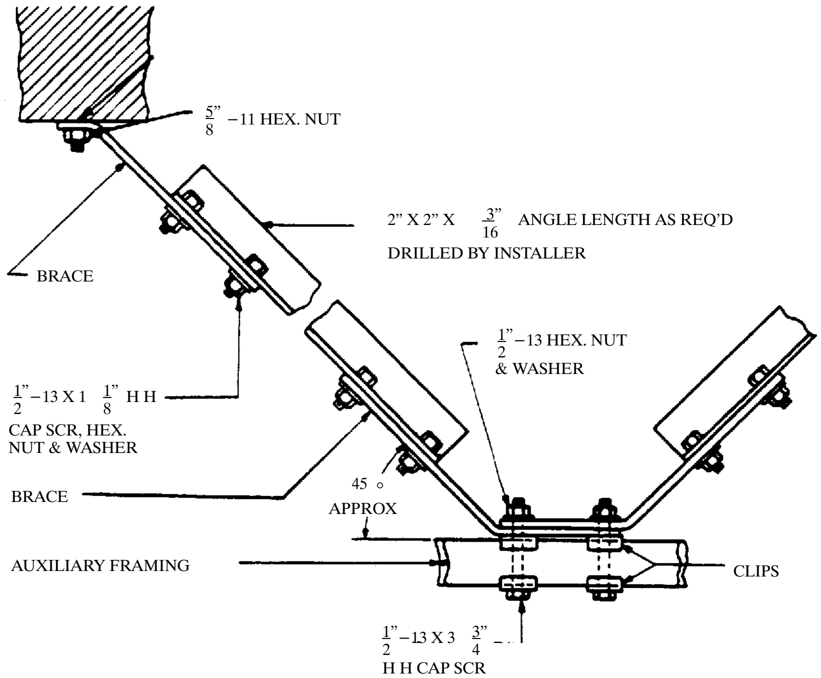
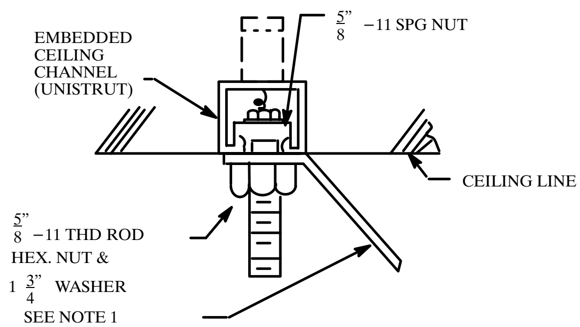


Figure 50 − Bracing Of Auxiliary Framing With Double Angle Braces



NOTES:

1. THE THREADED ROD SHALL BE TURNED INTO THE UNISTRUT NUT SO THAT AT LEAST THREE THREADS PROTRUDE BEYOND THE END OF THE NUT.

Figure 51 − Fastening Ceiling Hanger Rod To Embedded Ceiling Channel (Unistrut)

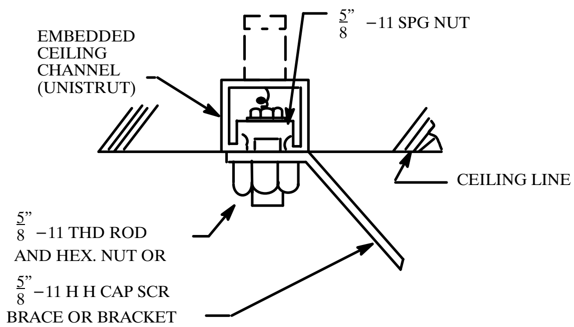


Figure 52 − Fastening Auxiliary Framing Brace To Embedded Ceiling Channel (Unistrut)

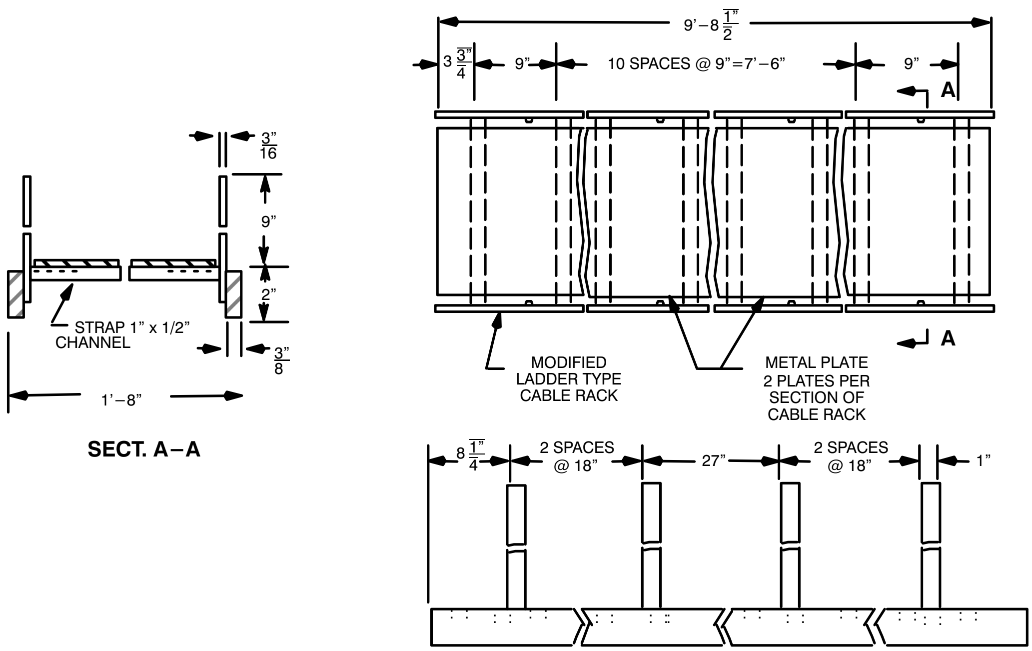


Figure 53 − Straight Sections − Modified Ladder−type Cable Rack For Unsecured Cabling

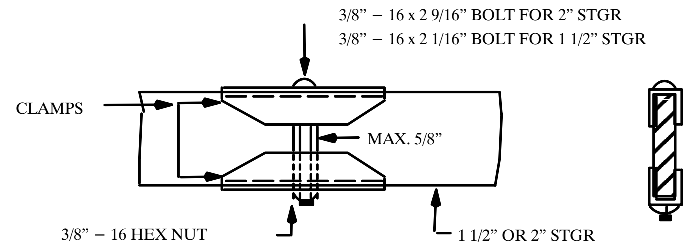


Figure 54 − Straight Clamp For Stringers Of Same Width

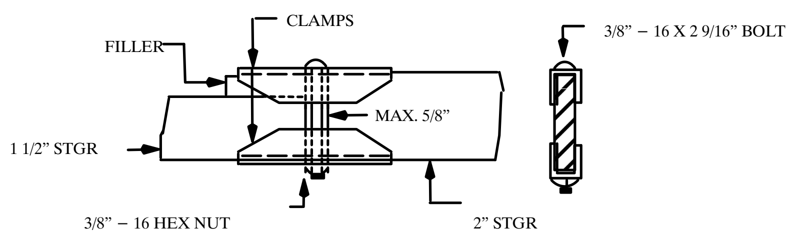


Figure 55 − Straight Clamp For Stringers Of Different Widths

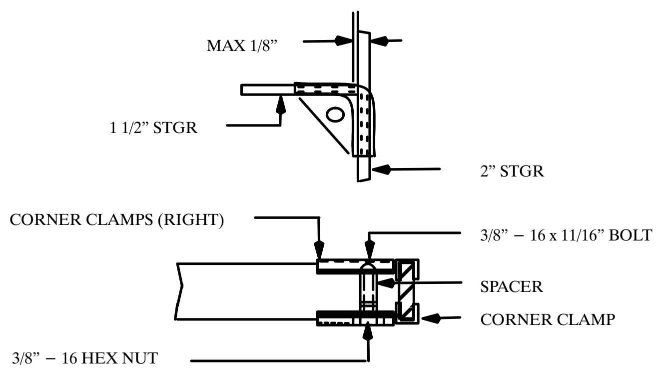


Figure 56 − Corner Clamp For Stringers Of Different Widths − Left

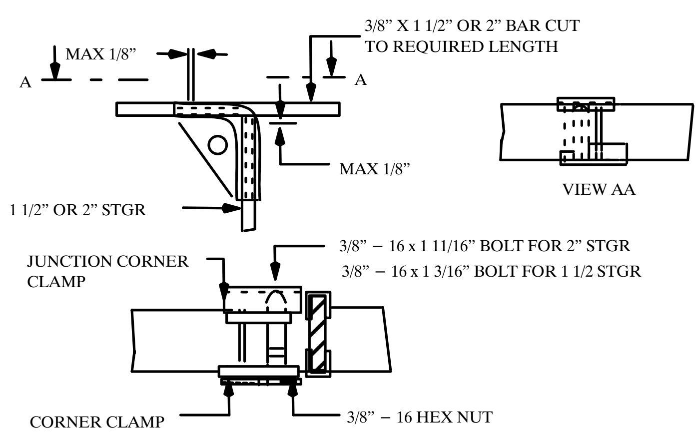


Figure 57 − Junction Corner Clamp For Stringers Of Same Width − Left

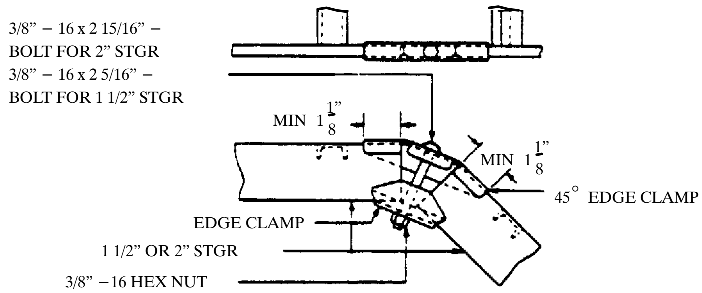


Figure 58 − 45 Degree Edge Clamp For Outside Turn

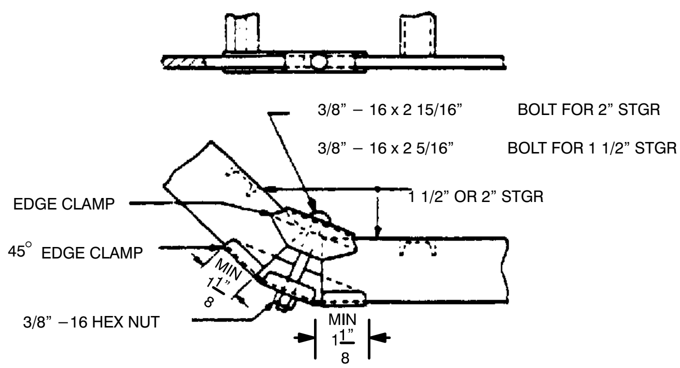
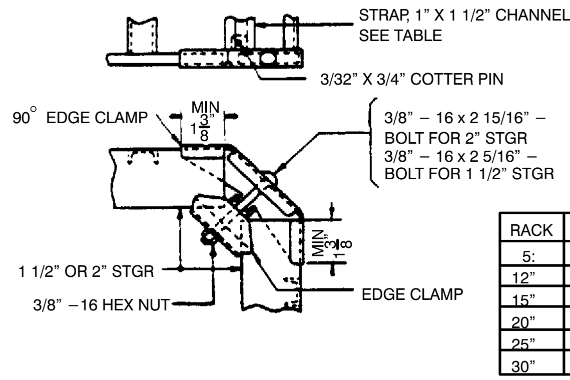


Figure 59 − 45 Degree Edge Clamp For Inside Turn



RACK	STRAP
5:	P−401752
12"	P−411736
15"	P−401754
20"	P−401755
25"	P−401756
30"	P−401757

Figure 60 − 90 Degree Edge Clamp For Outside Turn

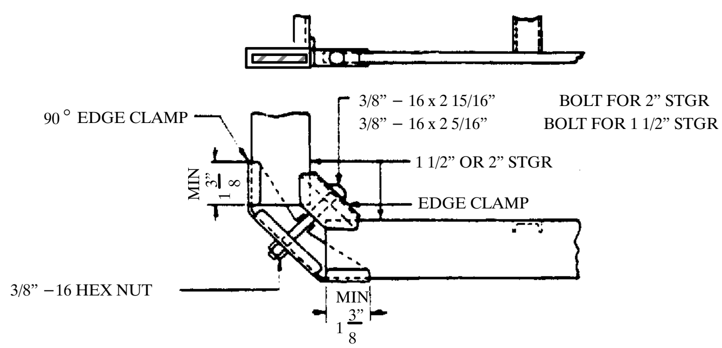
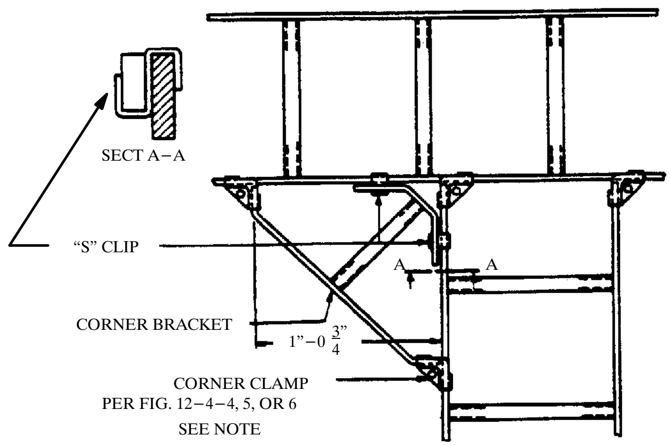


Figure 61 − 90 Degree Edge Clamp For Inside Turn



NOTE:

CORNER CLAMPS SHALL BE FASTENED TO BOTTOM OF CABLE RACK STRINGER WHEN THE STRINGER IS 2 INCHES.

Figure 62 − Corner Bracket At Turn Or Intersection

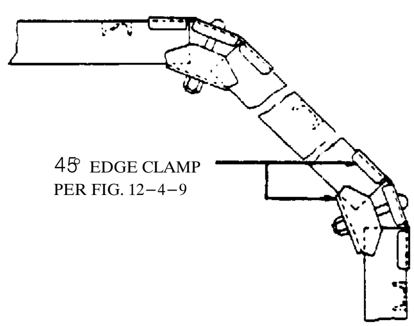


Figure 63 − 90 Degree Outside Turn For A Radius Of More Than 6 Inches

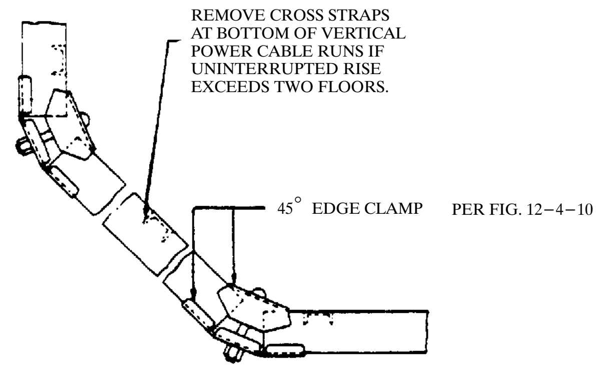


Figure 64 − 90 Degree Inside Turn For A Radius Of More Than 6 Inches

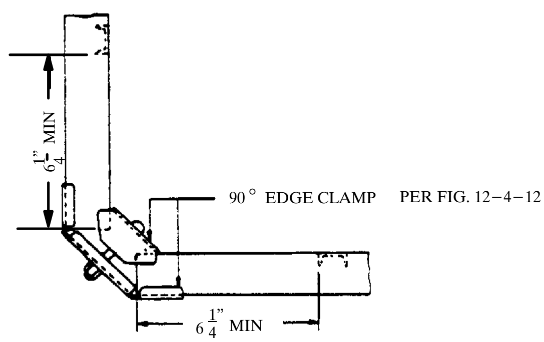


Figure 65 − 90 Degree Inside Turn For A Radius Of 6 Inches Or Less

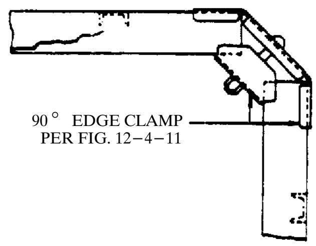


Figure 66 − 90 Degree Outside Turn For A Radius Of 6 Inches Or Less

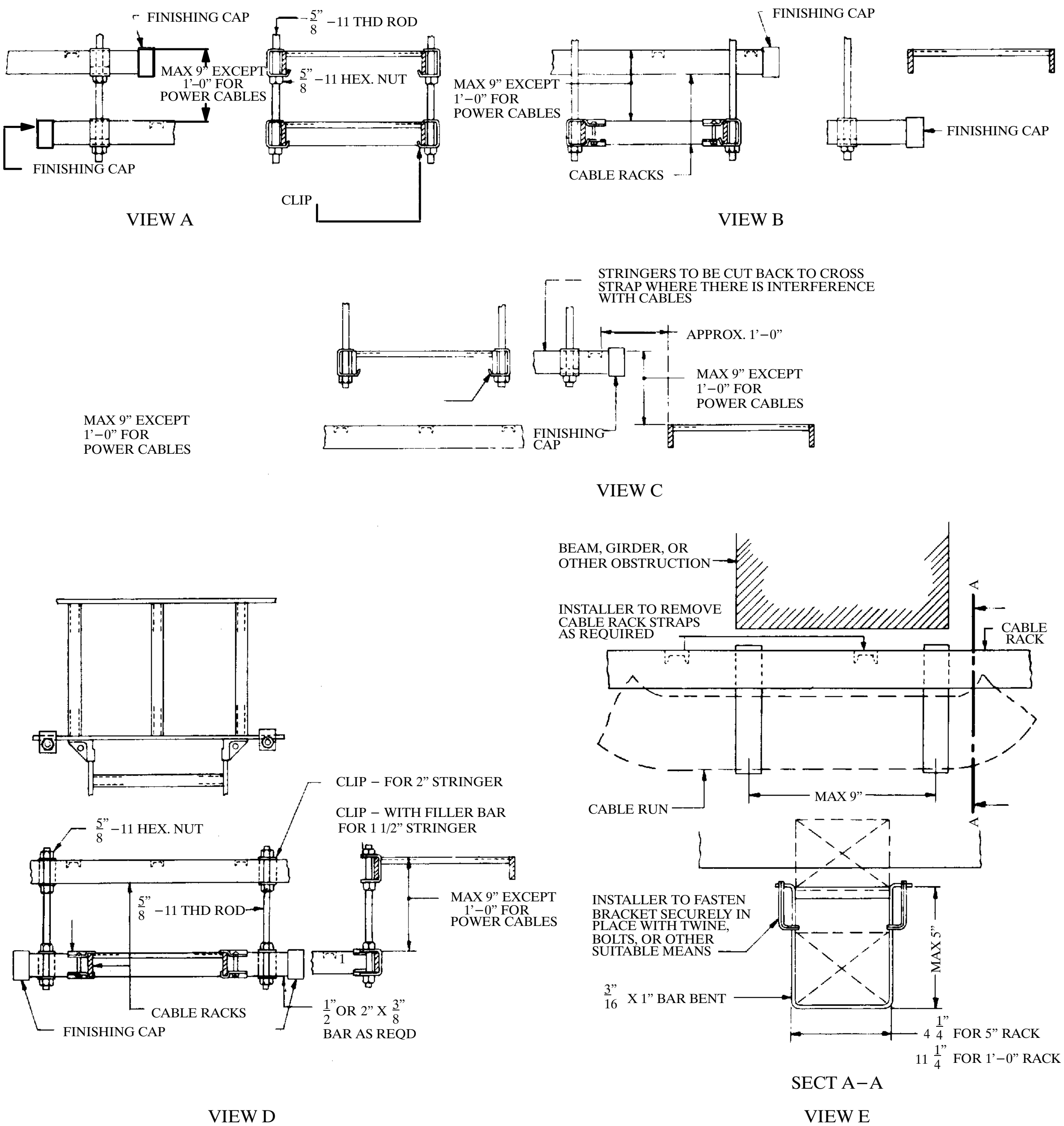


Figure 67 − Small Vertical Offsets In Horizontal Racks

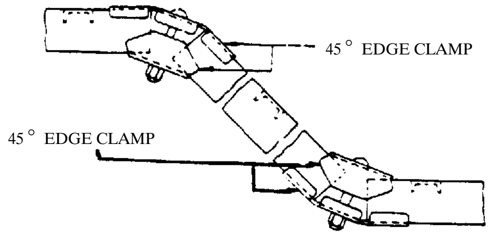


Figure 68 − Offset Greater Than 9 Inches In Parallel Planes Using 45 Degree Edge Clamps − Ladder−type Cable Racks

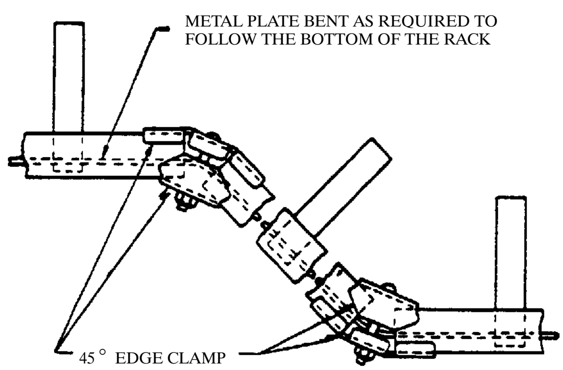


Figure 69 − Offset Greater Than 9 Inches In Parallel Planes Using 45 Degree Edge Clamps − Bar−type Cable Racks

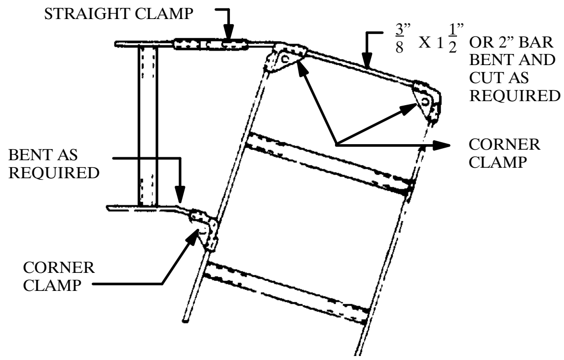


Figure 70 − Acute Angle Turn In Same Plane

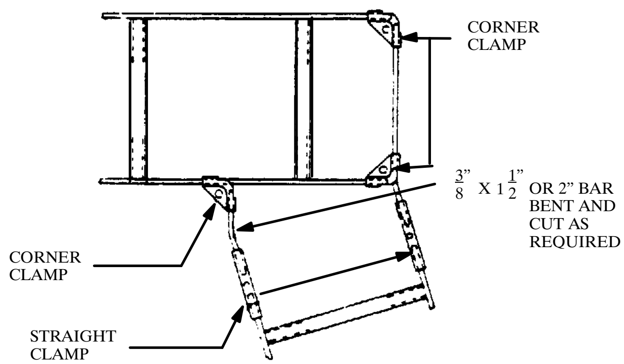


Figure 71 − Obtuse Angle Turn In Same Plane

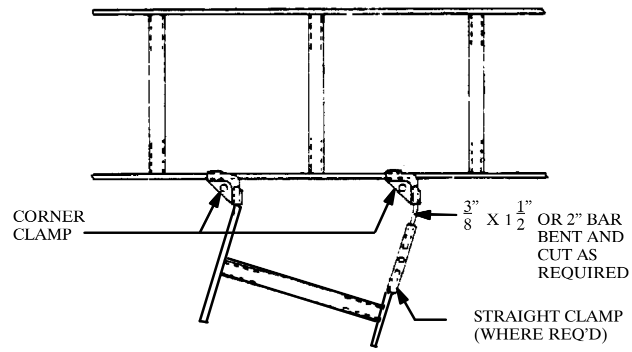


Figure 72 − Acute Or Obtuse Angle Intersection

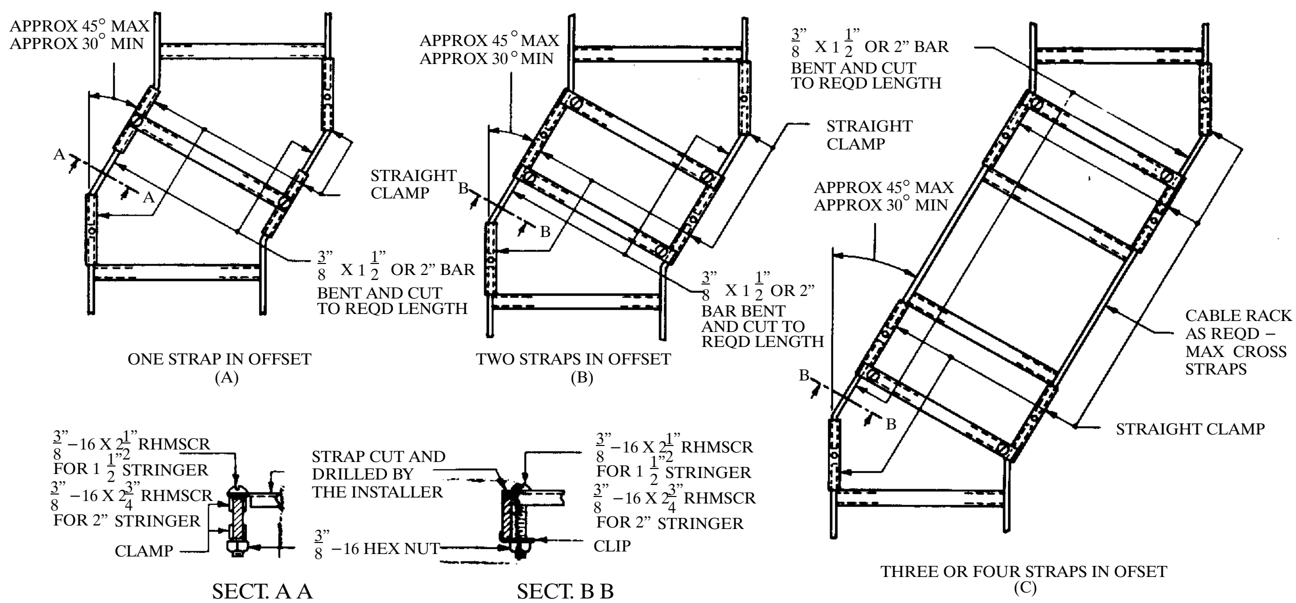
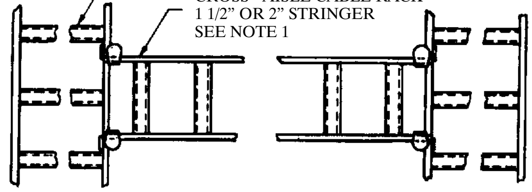
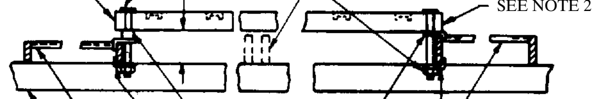


Figure 73 − Offsets In Exposed Vertical Cable Racks





NOTES:

1. CROSS−AISLE CABLE RACKS LONGER THAN 12 INCHES SHALL HAVE AT LEAST TWO CROSS STRAPS.

2. PVC PROTECTION SHALL BE PROVIDED ON THE ENDS OF CROSS−AISLE CABLE RACK STRINGERS.

Figure 74 − Cross−aisle Cable Racks Run Non−continuously Over−aisles At Higher Level Than Over−frame Racks

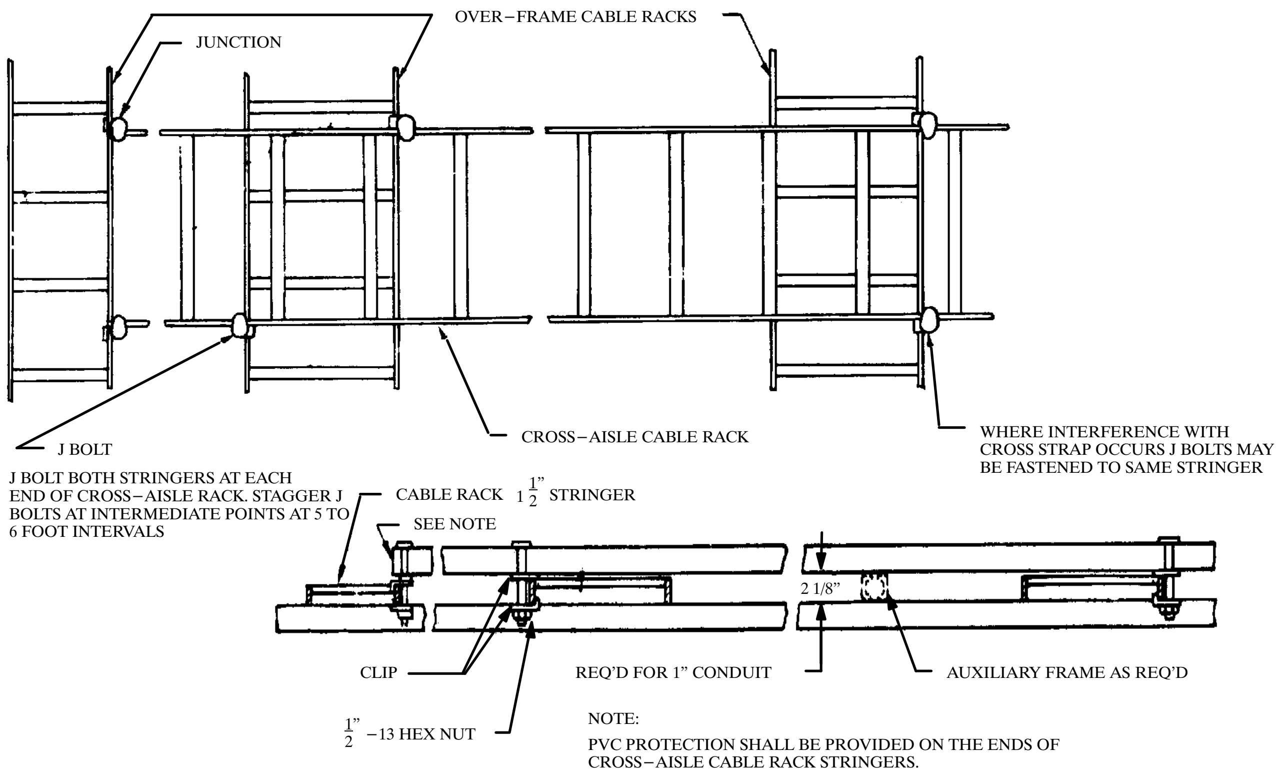
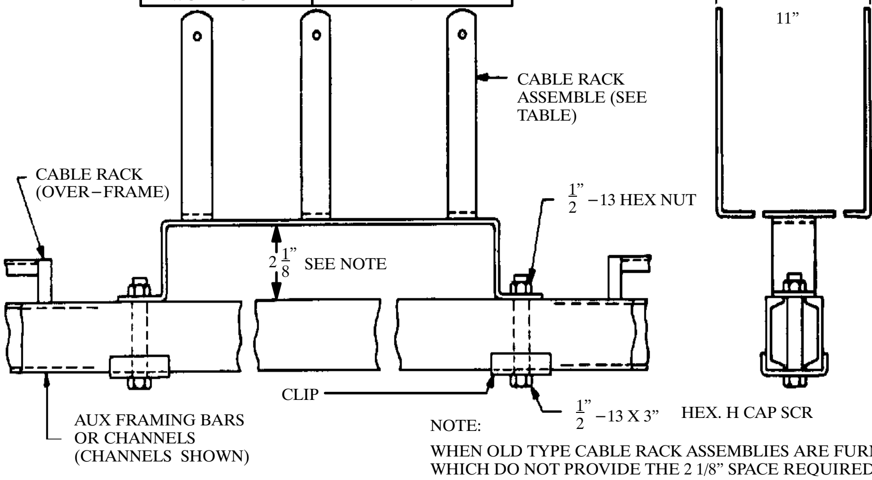


Figure 75 − Cross−aisle Cable Racks Run Continuously Over Aisles At Higher Level Than Over−frame Racks

ASSEMBLY	STANDARD LENGTH
THREE BRACKET	2’ − 1 1/2”
TWO BRACKET	1’ − 0”



NOTE:

WHEN OLD TYPE CABLE RACK ASSEMBLIES ARE FURNISHED WHICH DO NOT PROVIDE THE 2 1/8” SPACE REQUIRED FOR 1” CONDUIT, THIS SPACE CAN BE OBTAINED IF NEEDED BY USING 1/2” −13 X 3 3/4” CAP SCREWS AND AS MANY .574 X 1.125 X .080” WASHERS AS REQUIRED.

Figure 76 − Cable Racks Over Aisles Where Cable Is Not Exceptionally Heavy

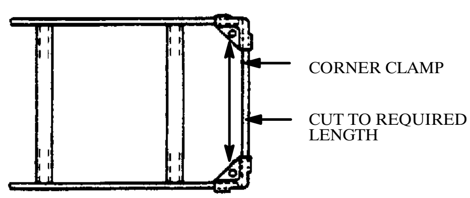


Figure 77 − Closing Ends Of Ladder−type Or Bar−type Cable Rack At Junctions And Offsets Only − Ladder−type Shown

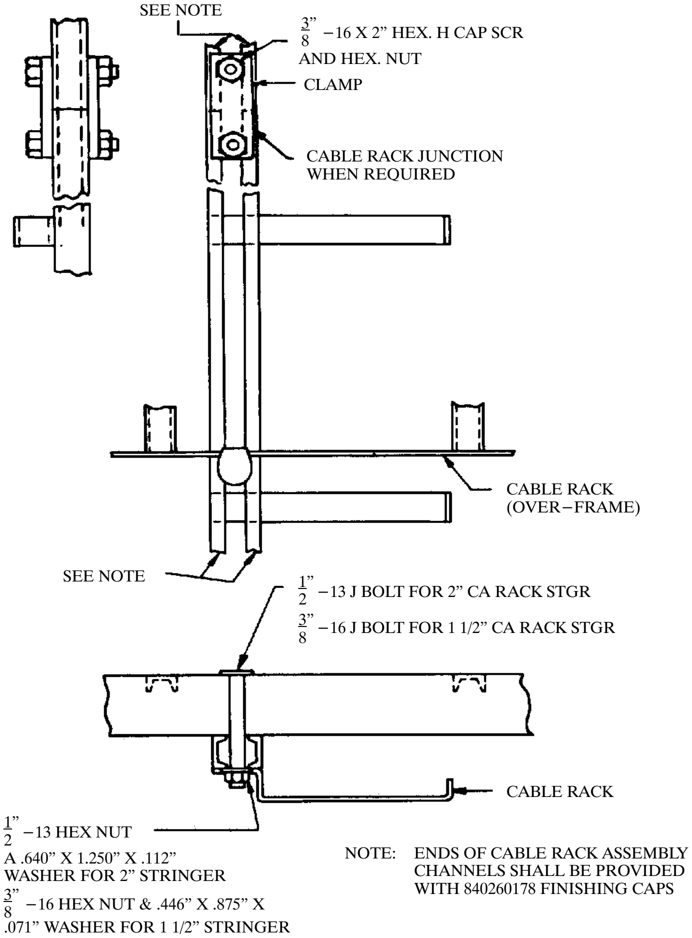


Figure 78 − Cable Rack For Power Cables Without Main−aisle Or End−aisle Cable Rack − Additions Only

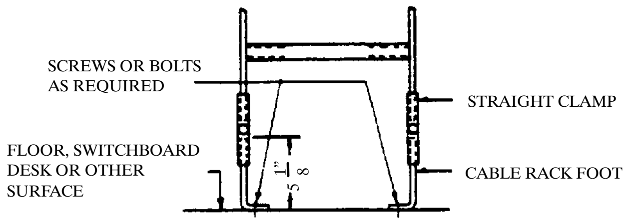
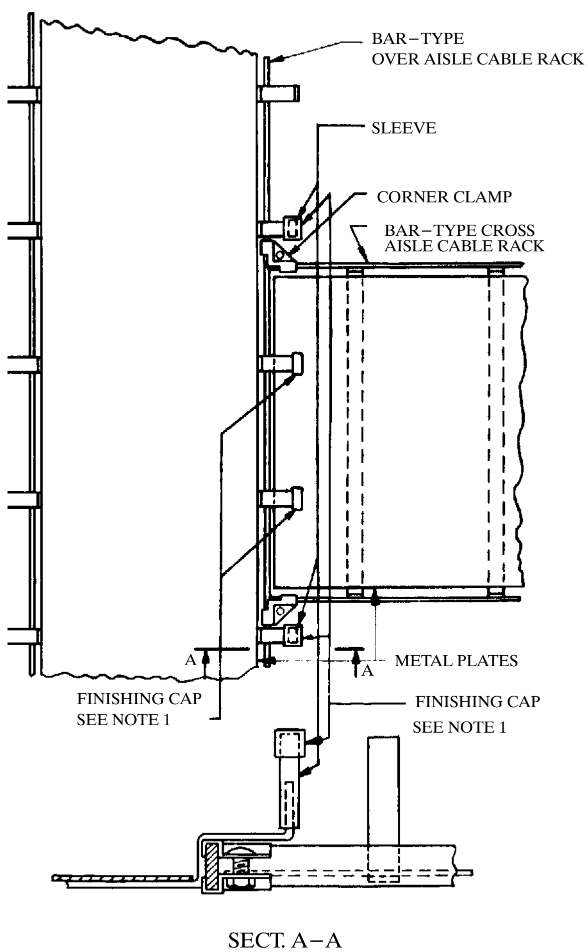


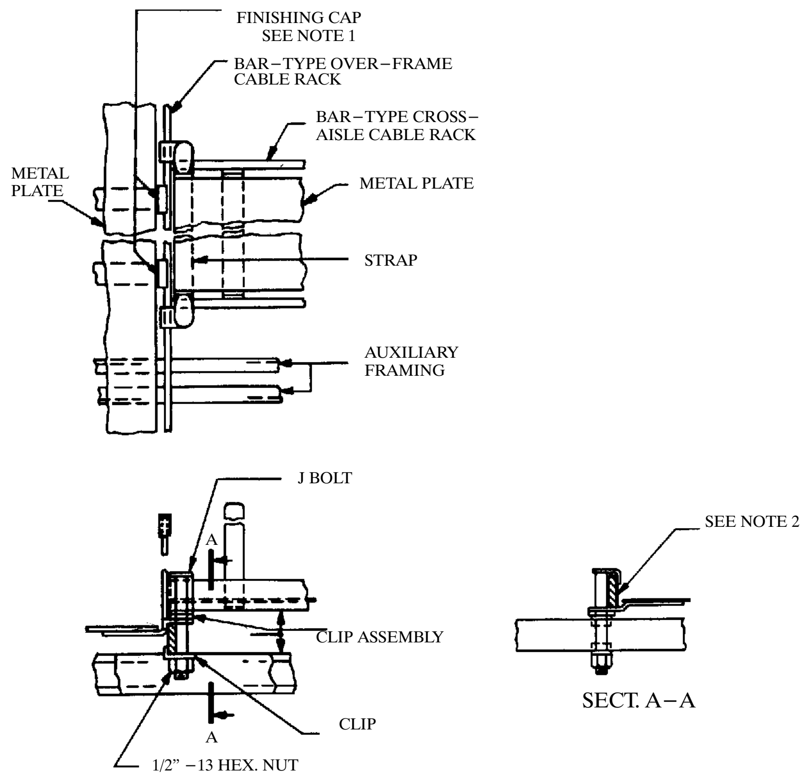
Figure 79 − Securing End Of Vertical Rack



NOTE 1:

FINISHING CAPS, SHALL BE SECURED TO THE CABLE RACK HORNS (WITHIN THE T−INTERSECTION) AND SLEEVES, RESPECTIVELY, BY COATING THE INSIDE OF THE CAPS WITH ADHESIVE, PRIOR TO PLACING ON THE HORNS AND SLEEVES.

Figure 80 − T−intersection − Bar−type Over−aisle To Bar−type Cross Aisle Cable Rack − Same Level

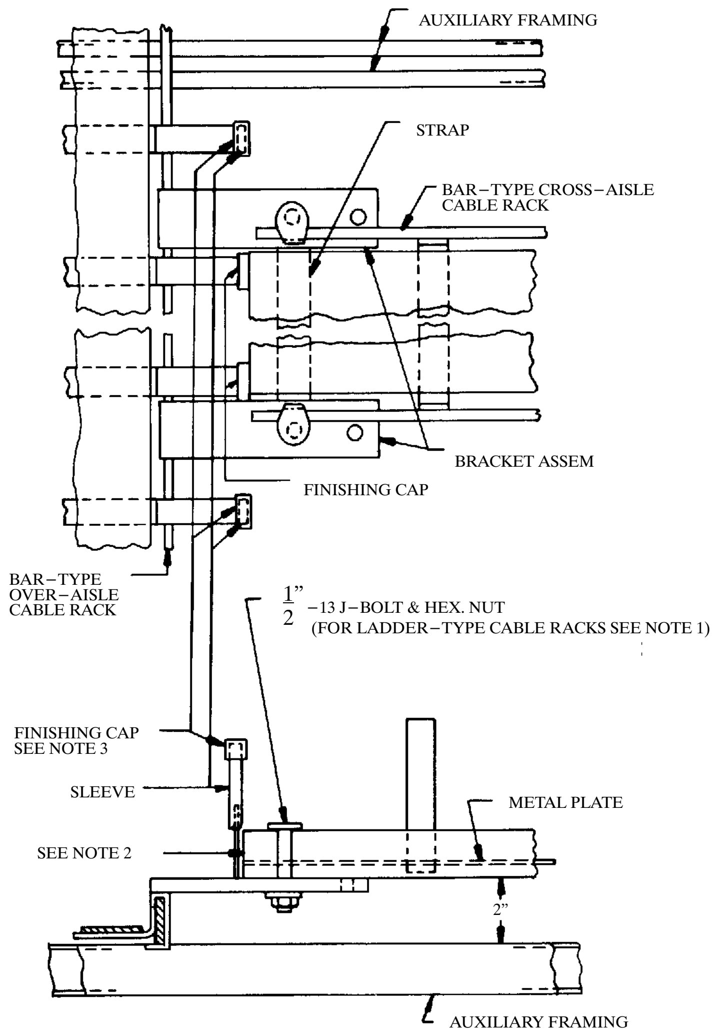


NOTES

1. FINISHING CAP SHALL BE SECURED TO THE CABLE RACK HORNS BY COATING THE INSIDE OF THE CAP WITH ADHESIVE PRIOR TO PLACING ON THE HORN.

2. PVC PROTECTION SHALL BE PROVIDED ON THE ENDS OF THE CROSS−AISLE CABLE RACK STRINGERS.

Figure 81 − T−intersection − Bar−type Over−frame To Bar−type Cross−aisle Cable Rack − Cross−aisle Cable Rack Raised 2 Inches To Clear Conduit And Lighting Fixtures



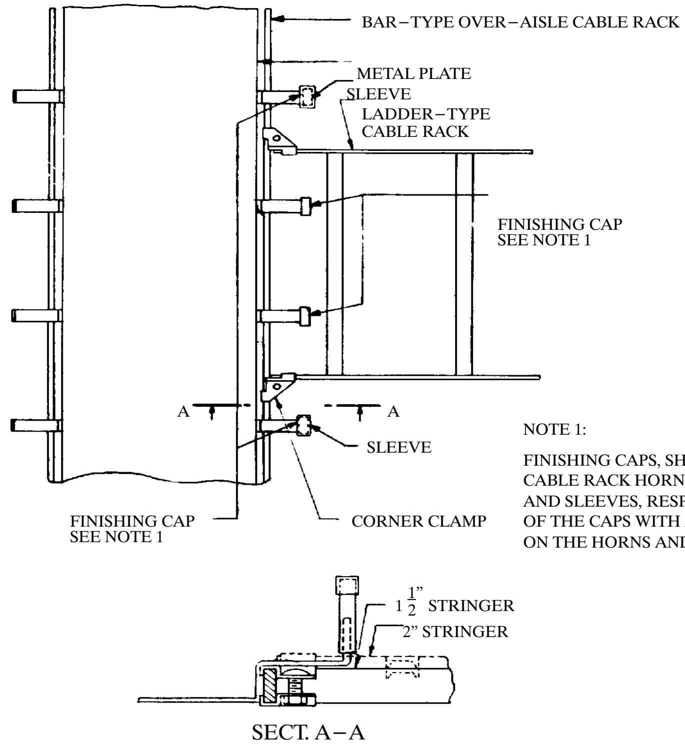
NOTES

1. ONLY ONE J−BOLT PER ADAPTER IS REQUIRED, WHEN A CROSS STRAP PREVENTS J−BOLT BEING USED IN THE HOLE SHOWN, USE THE OTHER HOLE OF THE ADAPTER. WHEN CROSS AISLE CABLE RACK IS USED, OMIT THE STRAP AND USE THE J−BOLT AND HEX NUT IN THE OTHER HOLE OF THE ADAPTER.

2. PVC PROTECTION SHGALL BE PROVILDED ON THE ENDS OF THE CROSS−AISLE CABLE RACK STRINGERS.

3. FINISHING CAP SHALL BE SECURED TO THE CABLE RACK HORNS BY COATING THE INSIDE OF THE CAP WITH ADHESIVE PRIOR TO PLACING ON THE HORN.

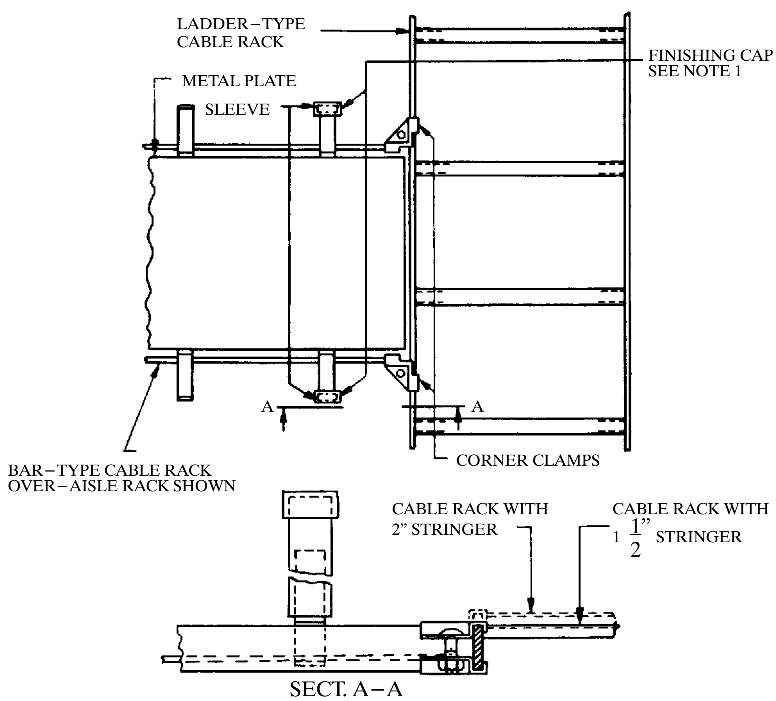
Figure 82 − T−intersection − Bar−type Over−aisle To Bar Or Ladder−type Cross−aisle Cable Rack − Cross−aisle Cable Rack Raised 2 Inches To Clear Conduit And Lighting Fixtures − Full Length Plates − Bar−type Cable Rack Shown



NOTE 1:

FINISHING CAPS, SHALL BE SECURED TO THE CABLE RACK HORNS (WITHIN THE T−INTERSECTION) AND SLEEVES, RESPECTIVELY, BY COATING THE INSIDE OF THE CAPS WITH ADHESIVE, PRIOR TO PLACING ON THE HORNS AND SLEEVES.

Figure 83 − T−intersection − Bar−type Over−aisle To Ladder−type Cable Rack



1. FINISHING CAP SHALL BE SECURED TO THE CABLE RACK HORNS BY COATING THE INSIDE OF THE CAP WITH ADHESIVE PRIOR TO PLACING ON THE HORN.

Figure 84 − T−intersection − Ladder−type To Bar−type Cable Rack

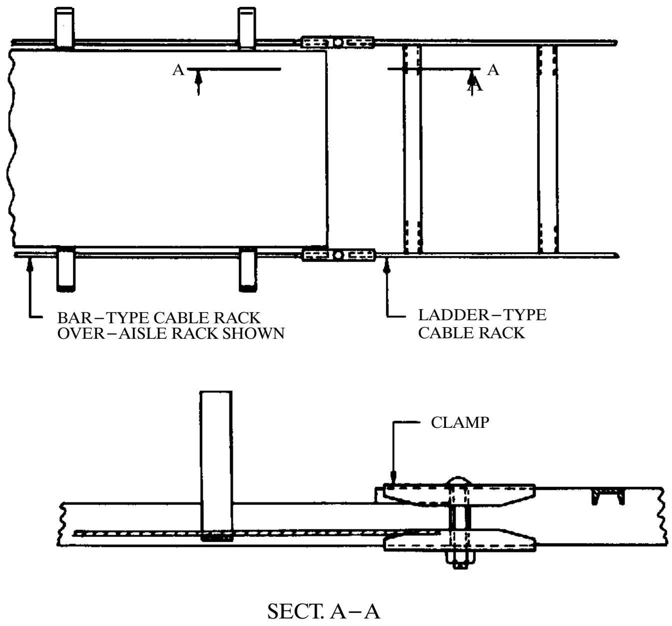


Figure 85 − Joining Bar−type To Ladder−type Cable Rack Of The Same Width

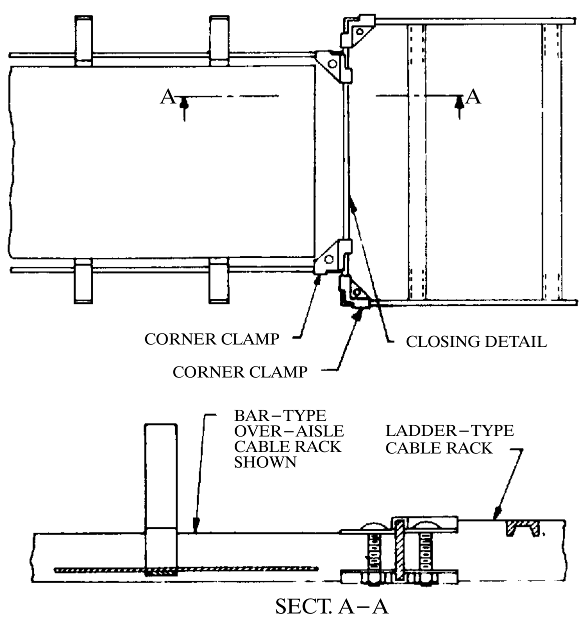


Figure 86 − Joining Bar−type To Wider Ladder−type Cable Rack

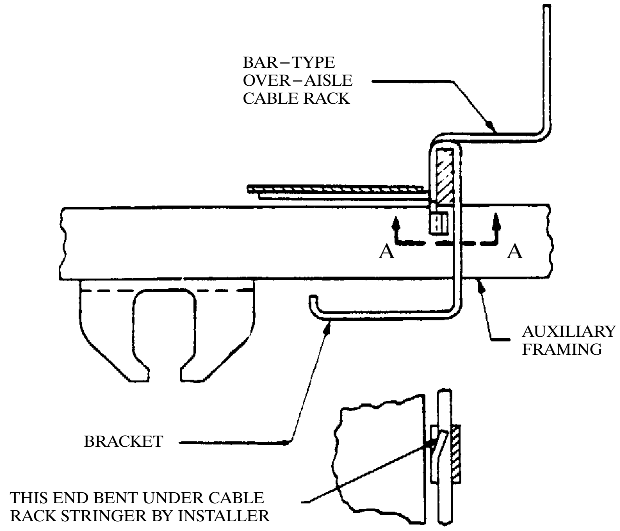


Figure 87 − Power Cable Bracket Attached To Bar−type Over−aisle Cable Rack

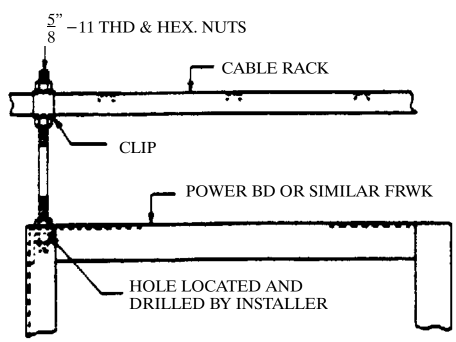


Figure 88 − Cable Rack Attached To Power Board Or Similar Framework

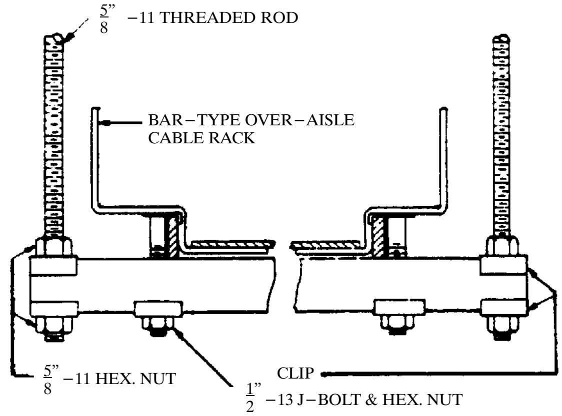
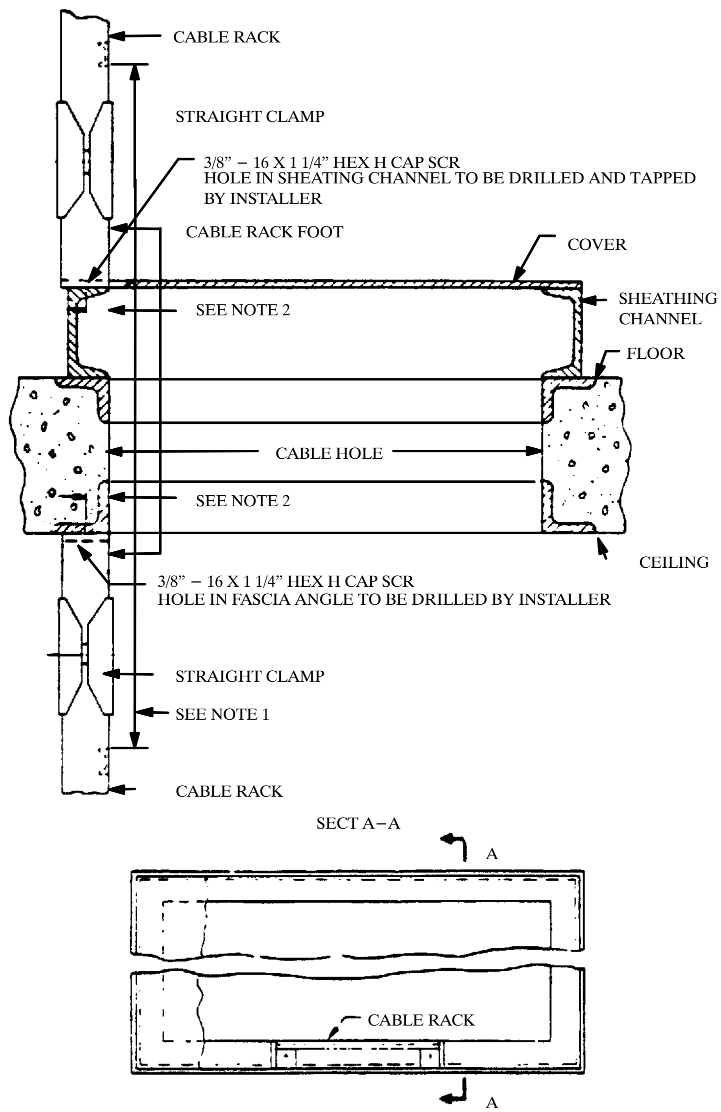


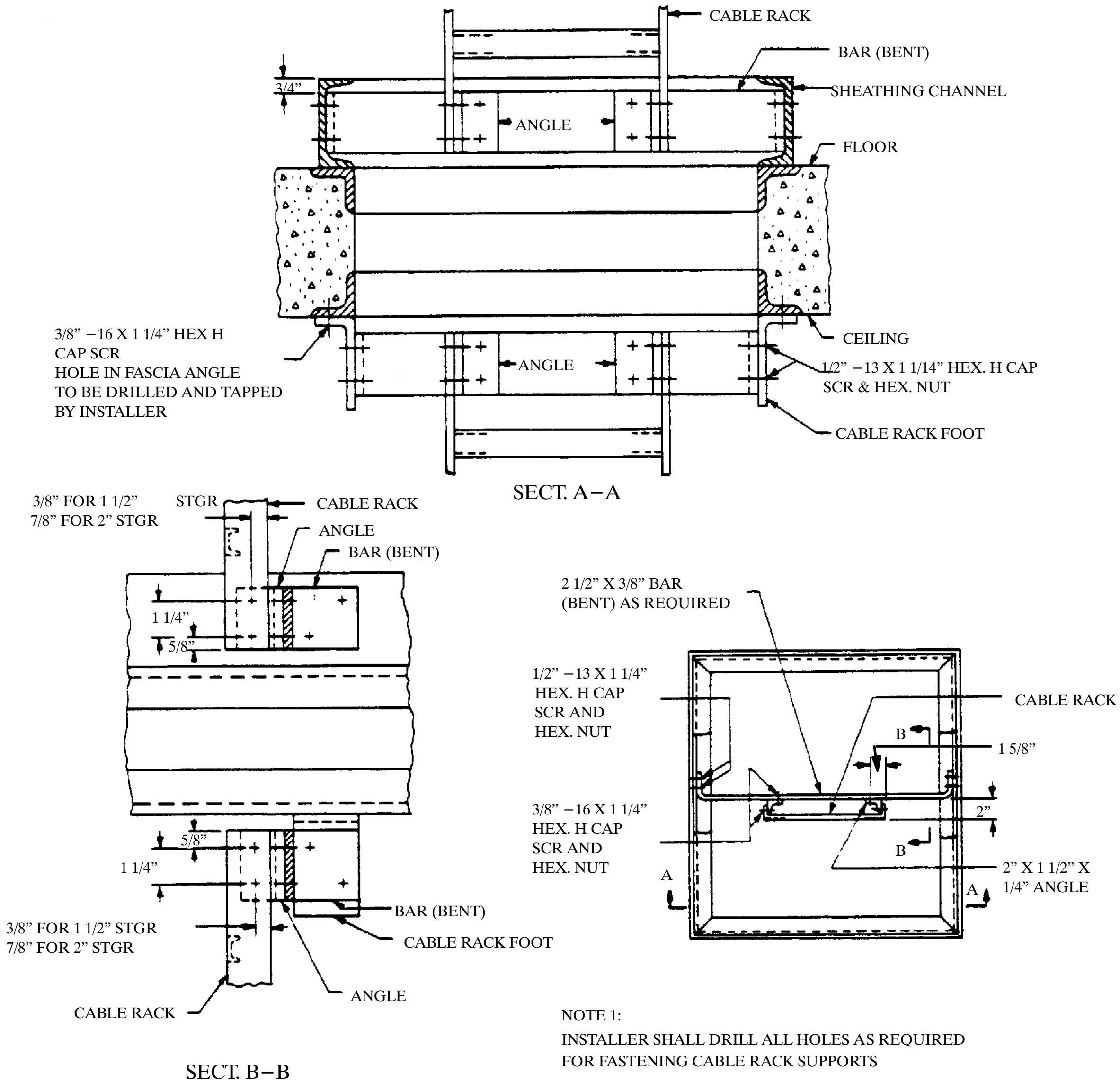
Figure 89 − Support Bar−type Over−aisle Cable Rack With Hanger Rods



NOTES:

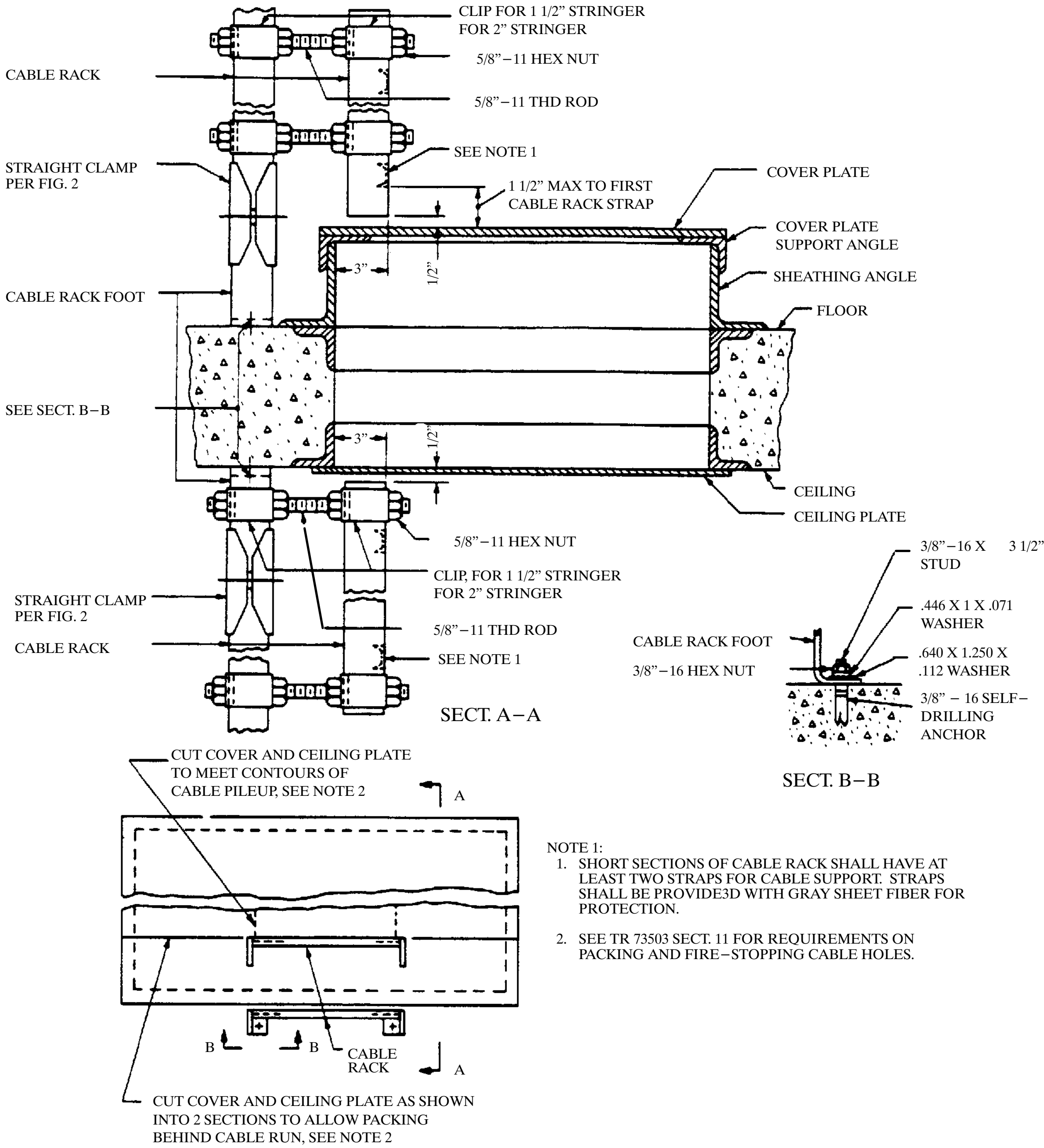
1. WHEN THE DISTANCE BETWEEN THE FIRST AND LAST SUPPORTS FOR THE CABLES EXCEEDS THE ALLOWABLE 4'−0" MAXIMUM, THE INSTALLER SHALL CUT OFF PART OF THE CABLE RACK FEET OR THE ENDS OF THE CABLE RACK AS REQUIRED.
2. CABLE RACK FOOT SHALL BE FLUSH WITH INNER EDGE OF SHEATHING CHANNEL AT THE FLOOR AND FASCIA ANGLE AT THE CEILING.

Figure 90 − Terminating Vertical Cable Rack At Cable Hole − Channel Type Sheathing



NOTE 1:
INSTALLER SHALL DRILL ALL HOLES AS REQUIRED
FOR FASTENING CABLE RACK SUPPORTS

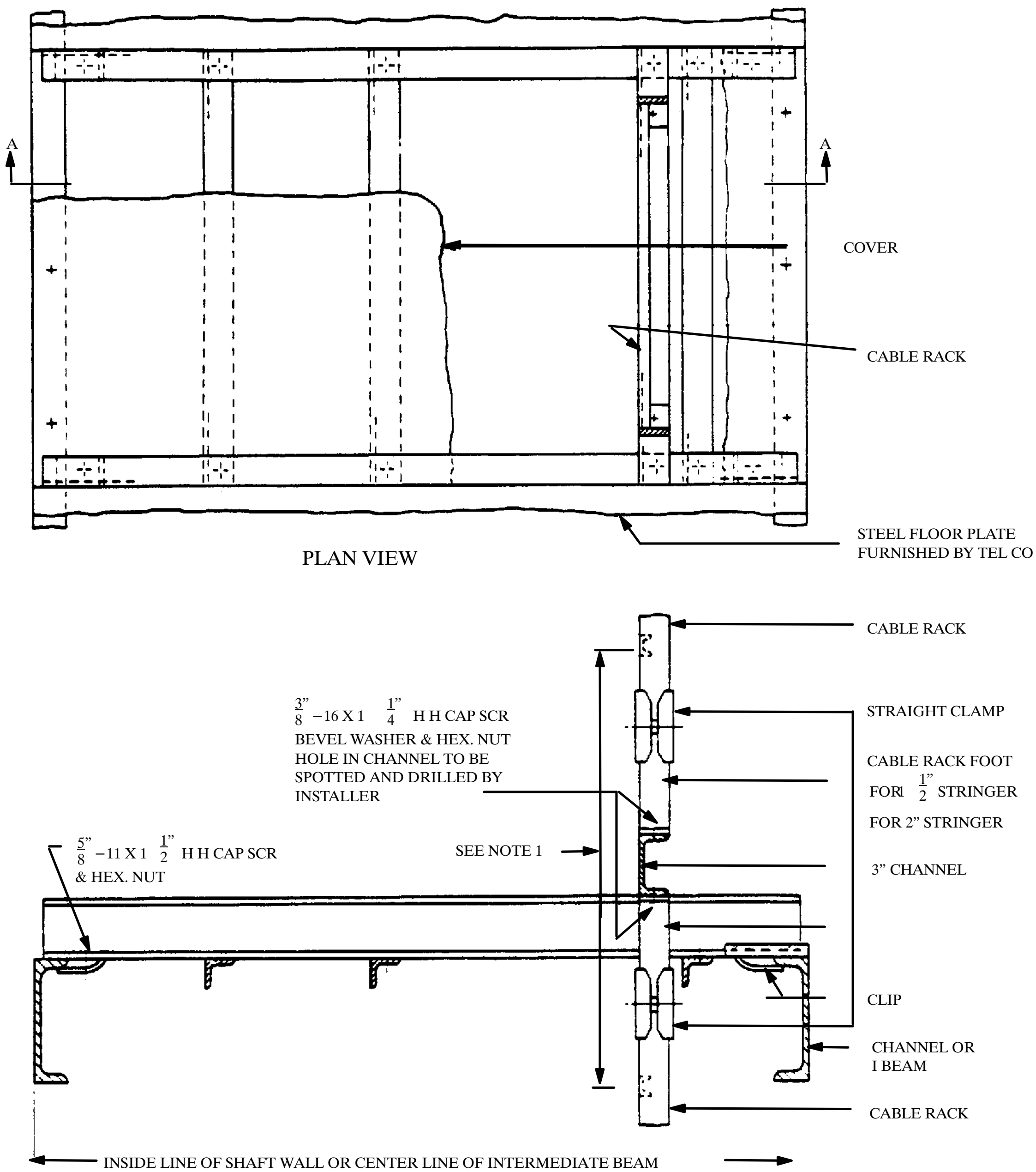
Figure 91 − Typical Support Of Cable Rack Under Switchboard Or Desk Cable Turning Section



NOTE 1:

1. SHORT SECTIONS OF CABLE RACK SHALL HAVE AT LEAST TWO STRAPS FOR CABLE SUPPORT. STRAPS SHALL BE PROVIDE3D WITH GRAY SHEET FIBER FOR PROTECTION.
2. SEE TR 73503 SECT. 11 FOR REQUIREMENTS ON PACKING AND FIRE−STOPPING CABLE HOLES.

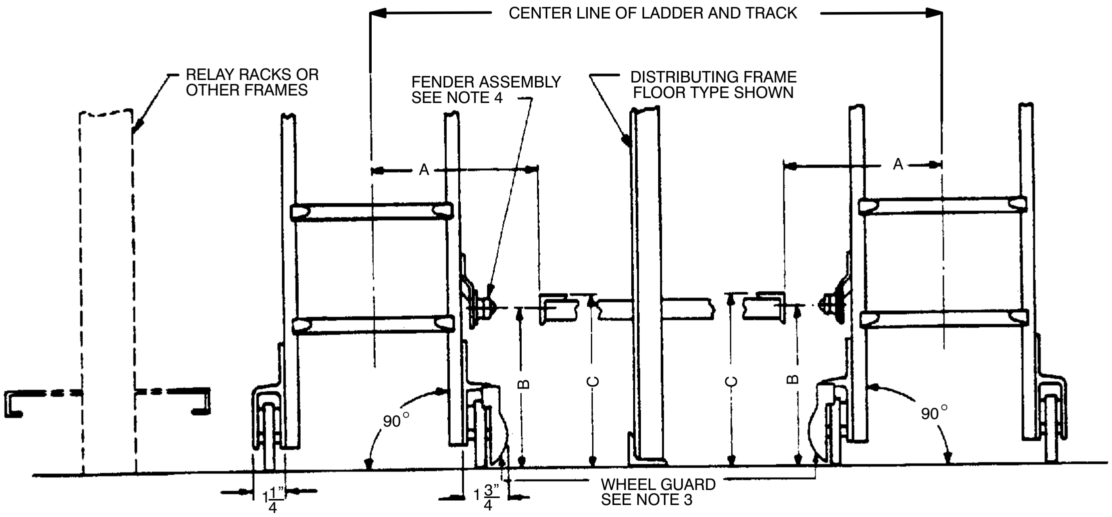
Figure 92 − Terminating Vertical Cable Rack At Cable Hole − Angle−type Sheathing − Additions Only



NOTES:

1. WHEN THE DISTANCE BETWEEN THE FIRST AND LAST SUPPORTS FOR THE CABLES EXCEEDS THE ALLOWABLE 4'−0" MAX, THE INSTALLER SHALL CUT OFF PART OF THE CABLE RACK FEET OR THE ENDS OF THE CABLE RACK AS REQUIRED.

Figure 93 − Typical Support Of Cable Rack In Cable Shaft



FRAME	B	C
FLOOR TYPE DISTRIBUTING OR GROUPING FRAMES WITH ANGLE IRON GUARD RAILS	10 1/4"	11"
WALL TYPE DISTRIBUTING FRAME	1'−1 1/8"	1'−1 7/8"
DISTRIBUTING OR GROUPING FRAMES WITH SHEET METAL BASE	SEE NOTE 1	

NOTES:

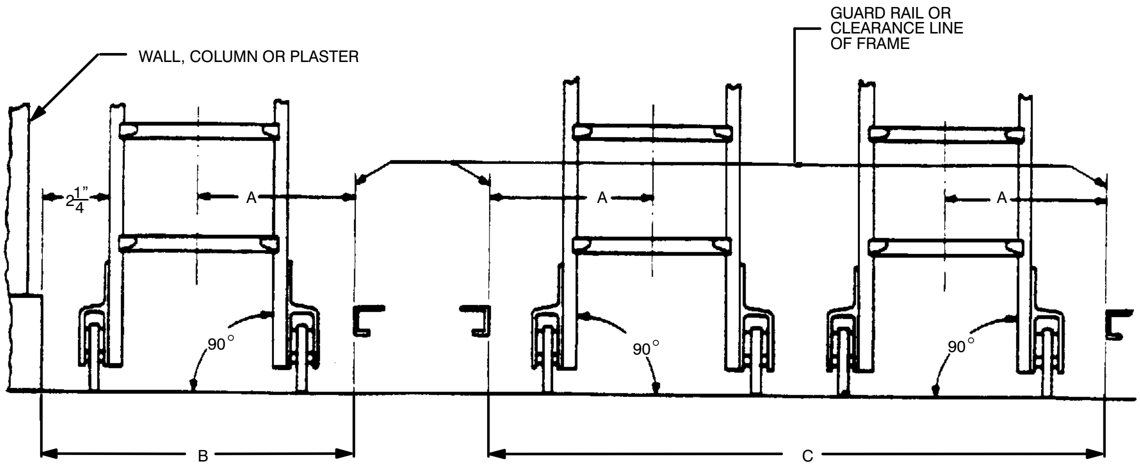
1. CERTAIN DISTRIBUTING AND GROUPING FRAMES HAVE A SHEET METAL BASE WITH GUARD RAIL 6" FROM THE FLOOR. LADDER FENDERS ARE THEREFORE NOT NECESSARY AT THESE FRAMES.
2. IN ORDER TO PREVENT JUMPER WIRE FROM BECOMING ENTANGLED WITH LOWER FIXTURE ASSEMBLIES A WHEEL GUARD SHALL BE FURNISHED ON THE FRAME SIDE OF ALL LADDERS AT DISTRIBUTING FRAMES IN ALL OFFICES.

3 THE FENDER ASSEMBLY SHALL BE LOCATED ON THE SIDE RAIL ADJACENT TO THE GUARD RAIL WITH THE CASTER CONTACTING THE CENTER OF THE GUARD RAIL.

	A	
LADDER	USUAL	MIN.
10"	8"	7 1/4"
12"	9"	8 1/4"
14"	10"	9 1/4"

(SEE NOTE 2)

Figure 94 − Location And Clearance For Ladders At Distributing Frames



NOTES:

1. WHERE THE "B" DIMENSION IS GREATER THAN THAT SHOWN THE LADDER SHALL BE CENTERED BETWEEN THE GUARD RAIL AND THE ℄ OF THE COLUMN, DEVIATING FROM THIS LOCATION ONLY TO THE EXTENT REQUIRED TO MAINTAIN THE NECESSARY 2 1/4" CLEARANCE BETWEEN THE LADDER SIDE RAIL AND THE BASE OF THE COLUMN. WHERE PRINT DISPLAY BOARDS ARE LOCATED ON THE ℄ OF THE COLUMN ROWS THIS 2 1/4" MINIMUM SHALL BE INCREASED TO 3" TO ALLOW A 5" CLEARANCE BETWEEN THE LADDER SIDE RAIL AND THE DISPLAY BOARD LIGHTING FIXTURE.

LADDER	A	B	C
10"	7 1/4"	1'−2 1/2"	2'−5 3/4"
12"	8 1/4"	1'−4 1/2"	2'−9 3/4"
14"	9 1/4"	1'−6 1/2"	3'−1 3/4"

Figure 95 − Minimum Clearances For Single And Double Lines Of Ladders

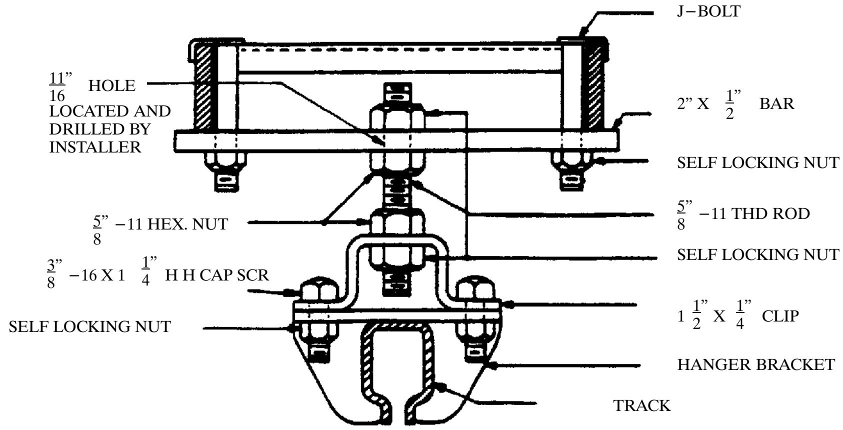
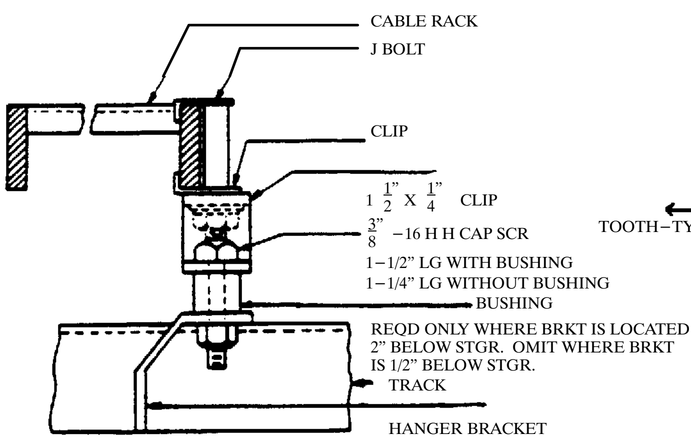


Figure 96 − Track Supported With Extension Rods From Cable Rack



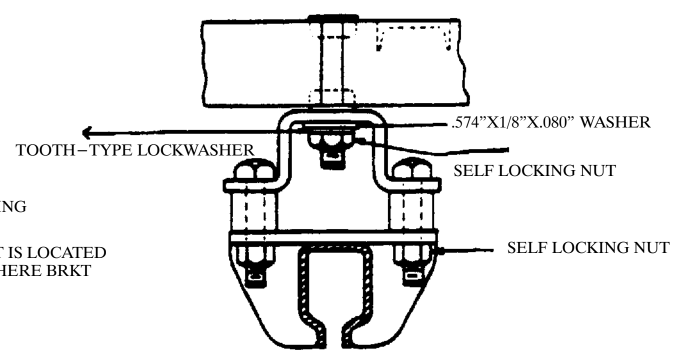


Figure 97 − Track Supported Below And At Right Angles To Cable Rack

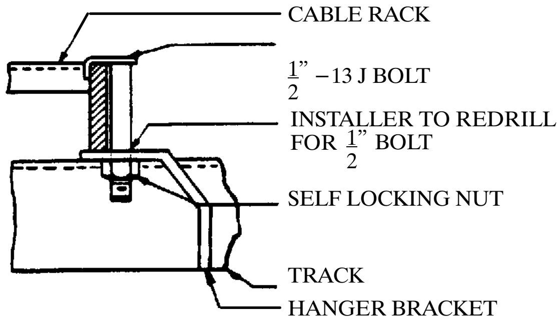


Figure 98 − Track Supported Directly From And At Right Angles To Cable Rack

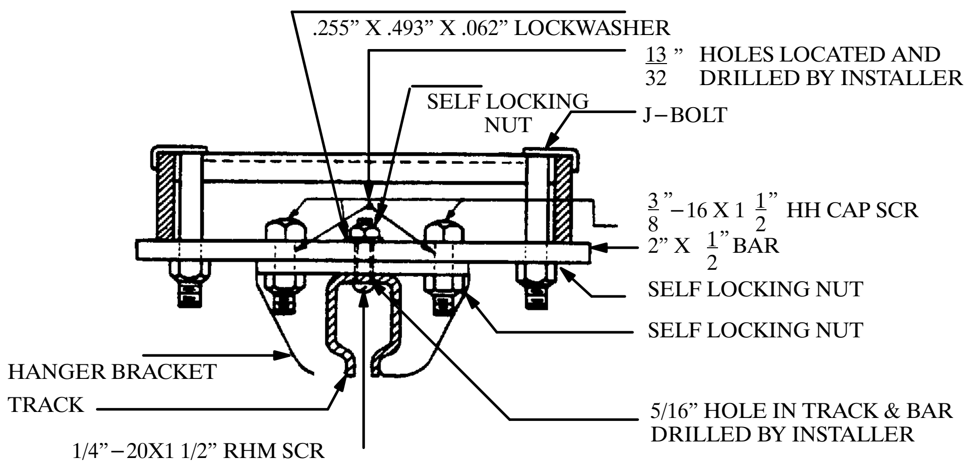


Figure 99 − Track Supported With Single Bar Directly From Cable Rack
2 Feet 1 Inch Or Less Wide

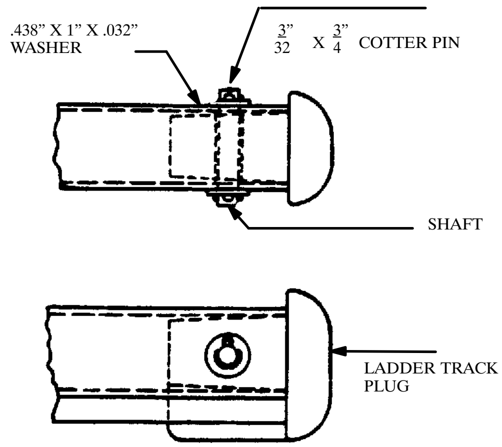


Figure 100 − Ladder Track Plug

EARTHQUAKE AND DISASTER BRACING FOR CENTRAL OFFICE EQUIPMENT – INSTALLATION PROCEDURES

CONTENTS

EARTHQUAKE AND DISASTER BRACING FOR CENTRAL OFFICE EQUIPMENT – INSTALLATION PROCEDURES

1. General

1.1 This section contains recommended supplementary measures to be followed by the installer in the support and fastening of telephone equipment in areas subject to earthquake shocks.

A. Method Of Ordering

1.2 The recommendations that follow relate to the "Bell System Earthquake Zoning Map" shown in Figure 43. As indicated, the BellSouth region encompasses four seismic zones shown on the map: Zone 3 encompasses the most active earthquake prone areas which occur in the Mississippi Valley; Zones 2 and 1 are the lowest risk regions of the earthquake−prone areas of the country. When the Capacity Manager determines that special earthquake or disaster bracing is required, he or she will so advise in their job specifications, editing the note in the following manner.

Special Bracing: Conditions in this area are such as to require that special bracing precautions be taken. The Job Specification will list these precautions and they shall be followed.

1.3 Additional precautions, if required, shall be covered in detail in the telephone company job specification immediately following the above note.

B. Basic Principles

1.4 Where the number of hold−down bolts normally supplied with a frame, cabinet, bay, etc., is not considered adequate, additional bolts are to be provided by the installation supplier.

1.5 Ends of auxiliary framing bars or channels are to be rigidly bolted together into continuous lines. For some types of equipment, more positive attachments of frame structure to superstructure are used. Extra details are provided to prevent horizontal resting cable racks from sliding. Tooth−type lockwashers are used under nuts of "friction" fastenings where the possibility of one ironwork member sliding on another exists, as, for example, under the nut of a J bolt used to secure a length of cable rack to auxiliary framing.

2. New Installations

A. Auxiliary Framing Over 11−1/2 Foot Equipment

2.1 **Bracing:**

(a) For fastening the braces at the ceiling, a 3 inch, 5−pound channel shall be provided, bolted to a row of ceiling inserts as shown in Figure 44. Where beams running at right angles to the channels project below the ceiling slab, the channels should be cut to lengths that permit them to be placed at the ceiling slab.

(1) As an alternative to using short lengths of channels, the braces may be fastened to the ceiling by 5/8−11 expansion shields, threaded rods, hexagonal nuts, and washers. These anchors must be located directly over the row of auxiliary framing to which the brace is attached.

(a) Whenever practicable, the braces at the ends of the framing shall be located at the row of ceiling inserts nearest the wall. In some cases, it will be necessary to use the second row of inserts in order to avoid interference between the lower end of the braces and cable racks, ladder tracks, etc. When the second row of inserts is used, the braces may be slanted in either or both directions as required. It will also be permissible to change the angle of slope of the braces slightly when necessary to facilitate fastening.

(b) Where double braces are used, it will usually be more practicable to slant the braces in both directions from a common point at the ceiling as shown in Figures 44 and 46. However, braces slanted from a common point at the framing, as shown in Figure 49 of Section 25 covering low−type auxiliary framing, may also be used where it appears desirable.

(c) Where auxiliary framing is so located that it can be rigidly fastened to columns as shown in Figure 47, the intermediate braces on column spacings may be omitted from that particular line of framing.

2.2 **Supplementary Stiffening Framing:** Where a row of frames is omitted, the regular framing shall be stiffened by a pair of supplementary framing bars or channels fastened at right angles to them. This supplementary framing must be located under a row of ceiling inserts approximately over the location of the future row of frames as shown in Figure 1. The bars or channels must be braced at each end with standard threaded rod braces as shown in Figures 1 and 3. Where ceiling inserts are not available in a suitable location, 5/8−11 expansion shields, threaded rods, hexagonal nuts, and washers shall be used to fasten the braces to the ceiling.

(a) Ladder−type cable racks over a row where frames are omitted may serve as stiffening in place of supplementary bars or channels provided the rack is suitably braced. One brace must be attached as shown in Figure 47 or 48, at each end of the cable rack, and they must slope in opposite directions. The two braces may be attached to the same cable rack stringer or to opposite stringers. The braces shall be fastened to ceiling inserts or to 5/8−11 expansion shields in the ceiling as shown in Figure 2.

(1) A bar−type cable rack over a row where frames are omitted shall not serve as stiffening in place of supplementary bars or channels.

2.3 **The ends of auxiliary framing bars or channels,** in buildings having flat ceilings that permit the use of braces as shown in Figure 2, shall in no case be supported to the walls. Where ceiling inserts are not available for support of the framing, 5/8−11 expansion shields must be used in the ceiling.

(a) In buildings without ceilings suitable for the attachment of braces, such as unattended carrier stations, the major auxiliary framing crosswise to the equipment shall be continuous double bars or channels extending from wall to wall. At the wall lines, the bars or channels shall be bent at right angles and bolted to the wall with 3/8−inch lag screws in boards provided at approximately the 11−foot 6−inch level for that purpose. This construction shall be used, rather than to allow the framing to rest on wall angles, and clamped with friction clamps. In buildings greater than 20 feet in width where splicing of the auxiliary framing is required, the bolted splice shall be used as shown in Figure 3 (A&M Only) or Figure 4. In wider buildings which require spliced bars or channels, both bars or channels shall be bent at right angles and bolted at the wall lines. For 20−foot buildings, in order to avoid splices, the bars or channels of a pair may be allowed to telescope on each other, only one being bent over and bolted to the wall. Both bars or channels, however, shall extend as near the wall lines as a 20−foot stock length will permit, in order to provide maximum stiffness.

2.4 **Splices in Framing Channels:** The lengths of 2 by 9/16 by 3/16−inch channels used for the continuous auxiliary framing at right angles to the frames shall be spliced together by means of approved splice bars and 3/8−16 by 5/8 HH cap screws as shown in Figure 4. Separation of splices in adjacent pairs of channels by at least an aisle as required in Section 25 is not necessary because the channels are positively bolted together at the splices.

(a) Where 11−foot 6−inch and 11−foot 8−inch auxiliary framing are, junctioned, an approved splice plate shall be used to bolt the two levels of framing together as shown in Figure 7.

(b) Where two levels of auxiliary framing with 1−inch height difference are junctioned, an appropriate offset splice plate shall be used to bolt the two levels of framing together as shown in Fig 6.

(c) Where 11−foot 8−inch and 11−foot 9 1/2 inch auxiliary framing are junctioned, an appropriate offset splice plate shall be used to bolt the two levels of framing together as shown in Figure 5.

B. Support Of Cable Racks Over 11 1/2 Foot Equipment

2.5 The following practices for cable rack support shall be used for locations within Zone 3 of Figure 43.

2.6 **Perpendicular Bracing:** Where perpendicular bracing is required, the braces shall be fastened to the ceiling as shown in Figure 49.

2.7 **Ladder−and bar−type cable racks attached directly to auxiliary framing shall be bolted to the framing** bars or channels with two bolts, one at each cable rack stringer, using lockwashers under the nuts.

2.8 **Antislip Details:** Where ladder– or bar–type cable racks are used for supporting isolated frames or frames that extend more than 2 feet 6 inches beyond the last framing bars through or in brackets or through short pairs of framing bars or channels, antislip details as shown in Figure 8 shall be bolted to the adjacent regular auxiliary framing at each side of such supports. Where short pairs of framing bars or channels are used, antislip details shall also be installed at the location where the short pairs are fastened to the cable rack. (The purpose of the antislip details is to prevent the cable–rack fastenings from slipping.)

(a) When, in the case of cable–rack–supported frames, the framing is located directly over and attached to the frame uprights, the L or U frame support details and the antislip details shall be omitted at this upright.

2.9 The standard arrangement of the L and U bracket fastenings between the frames and cable rack shall be used, except that U brackets shall be used, at each end of each single–sided frame.

2.10 "Studded–up" cable racks, that is, cable racks supported by hanger rod studs from cable racks below as shown in Section 25, are not considered good practice in earthquake areas and shall not be used except as follows.

(a) Where double–level cable racks are required due to separation of wiring, and ceiling heights do not permit the installation of high–level framing, "studded–up" cable racks are permissible and shall be braced downward to the lower level framing bars or channels.

C. Mounting Apparatus

2.11 Multiplate Equipment Units Using 189A Mounting Plates: Where multiplate equipment units consisting of two to five mounting plates are assembled using mounting plate clips, each unit mounting plate must be fastened to the frame uprights with two screws, one in the top hole at each end of each plate. This requirement applies to both shop–mounted units and units that are shipped separately and mounted on frames by the installer.

D. Fastening Equipment To Floor

2.12 The following practices for fastening equipment to the floor must be used in locations within Zone 3 unless otherwise specified.

Floor–Supported Frames and Cabinets

2.13 Floor–supported cabinets, located within Zone 3 as shown in Figure 43, must be fastened to the floor in the standard manner by 3/8–16 expansion shields and studs. An expansion shield and stud shall be installed at every hole in the cabinet base, but no additional anchors and studs will be necessary.

2.14 Seven–foot high Electronic Switching System (ESS), Uniframe, and unequal flange (UF) frames shall be fastened to the floor as follows. (See Table A.)

(a) Earthquake Zone 1−All Floors: Use two standard 3/8−inch expansion shields and studs for each 2−foot 2−inch and 3−foot 3−inch equipment bay employing a staggered arrangement along the base of equipment. A minimum of two anchors and studs per frame are required.

Note: For detailed information on ESS type frames and for Uniframe frames see vendor documentation and specific drawings. Where toll bays (unequal flange) are used within an ESS lineup and where toll bays (unequal flange) are used in other than ESS lineups, it will be necessary to consult the proper vendor documentation. To serve as structural tie struts, cross−aisle cable racks or bus troughs shall be used with a minimum spacing of 5 feet 0 inch along the lineups.

(b) **Earthquake Zone 2−Ground/First−Floor Installations:** Use two 1/2−inch expansion shields and studs to secure each 2−foot 2−inch or 3−foot 3−inch equipment bay at diagonally opposite corners, or four 3/8−inch expansion shields and studs, one at each corner of the 2−foot 2−inch or 3−foot 3−inch equipment bay. [See note following paragraph (a).]

(c) **Earthquake Zone 2−Installations on Second Floor or Above:** Use two 1/2−inch expansion shields and studs to secure each 2−foot 2−inch or 3−foot 3−inch equipment bay at diagonally opposite corners, or four 3/8−inch expansion shields and studs, one at each corner of the 2−foot 2−inch or 3−foot 3−inch equipment bay. [See note following paragraph (a).]

(1) Equipment groupings whose average equipment and cable weight exceeds 650 pounds require four 1/2−inch expansion shields and studs, one at each corner of 2−foot 2−inch or 3−foot 3−inch equipment bays. The average equipment and cable weight is defined as the weight of all equipment, cable, equipment frameworks, and cable racks (as determined from floor plan data sheets) divided by the total number of 2−foot 2−inch and 3−foot 3−inch wide framework bay modules in the system. A system comprises an integral set of equipment frameworks such as might be contained in an entity or other such equipment grouping that is clustered together. If the cable weight center of gravity is above the 8−foot level, reduce the 650−pound decision point indicated above to 600 pounds.

(d) **Earthquake Zone 3−Ground/First Floor Installations:** Use four 1/2−inch expansion shields and studs to secure each 2−foot 2−inch or 3−foot 3−inch equipment bay, one at each corner. [See note following paragraph (a).]

(e) **Earthquake Zone 3−Installations on Second Floor or Above:** Use four 1/2−inch expansion shields and studs (one at each corner) to secure every 2−foot 2−inch or 3−foot 3−inch equipment bay. [See note following paragraph (a).]

(1) Equipment groupings whose average equipment and cable weight exceeds 850 pounds require overhead bracing (as shown in vendor documentation), and four 1/2−inch expansion shields and studs for each 2−foot 2−inch or 3−foot 3−inch equipment bay. The average equipment and cable weight is defined as the weight of all equipment, cable, equipment frameworks, and cable racks, as determined from floor plan data sheets, divided by the total number of 2−foot 2−inch and 3−foot 3−inch wide framework bay modules in the system. A system comprises an integral set of equipment frameworks such as might be contained in an entity or other such equipment grouping that is clustered together. If the cable weight center of gravity is above the 8−foot level, reduce the 850−pound decision point indicated above to 800 pounds.

(f) All cable racks, with the exception of via racks, must be supported by 7−foot frame works. For ESS lineup racks, and for cableway and cross−aisle racks, use the appropriate vendor's documentation.

2.15 Distributing frames and protector frames must be fastened to the floor as follows:

(a) COSMIC Distributing Frame, Low Profile Conventional Distributing Frame (LPCDF), ESS Modular Distributing Frame use Vendor Documentation.

(b) Low Profile Double−Sided Protector Frame, ESS Modular Protector Frame see Vendor Documentation.

Frames Supported by Auxiliary Framing
Frames supported by auxiliary framing shall be fastened at the top as follows for all zones.

11'−6"	BAY − MINIMUM TOP SUPPORT	2
9'	BAY − MINIMUM TOP SUPPORT	2
7'	BAY − MINIMUM TOP SUPPORT	2

IF JUNCTIONED TO ADJACENT BAY, THE LINE−UP SHOULD BE SECURED AT FIVE−FOOT INTERVALS. IN AN ESS TYPE ENVIRONMENT WHERE THE CABLE TROUGHS REST ON TOP OF FRAMEWORK, THIS WOULD NOT BE REQUIRED. IN OTHER TOLL AREAS WHERE AUX. FRAMING AND CABLE RACK ARE NOT RESTING ON FRAMEWORK, THE BAYS SHALL BE SUPPORTED AS ABOVE.

2.16 Frames supported by auxiliary framing shall be fastened to the floor in the standard manner using 3/8−16 or 1/2 −13 expansion shields and studs. For any frames or racks for which additional studs are not specified herein, the regular number of holding−down studs will be adequate. The installer shall drill for and provide extra expansion shields and studs on the following basis.

(a) **Distributing Frames and Protector Frames:** As a matter of reference Table B indicates distributing frames and protector frames requiring additional 3/8−16 expansion shields and studs or floor fastenings, and the number required in each case. The extra studs shall be of the same type as the regular studs and shall be spaced approximately midway between the regular studs. Additional fastenings shall be used as required when the base angles are attached to cable slot fascia angles. Frames 9 feet 0 inch high or less require no additional studs.

(1) On single−sided distributing frames having 10−inch wide frame bases, two 1/2 inch expansion shields and studs shall be used in each framework unit instead of one for approximately each twelve verticals as usually provided.

(b) **Relay Racks**

(1) For channel relay racks, two 3/8−16 expansion shields and studs per bay must be used in the holes already provided in the base angle.

(2) Bulb−angle relay racks in a line−up must be fastened to the floor with two 3/8−16 expansion shields and studs per bay. Two 3/8−16 expansion shields and studs must be used for an isolated bay.

(c) Fuse Bays: Each bay shall be fastened with two 3/8−16 drop−in anchors and studs located in the regular holes in the base angle.

TABLE A
EQUIPMENT SUPPORT STANDARDS

EARTH QUAKE ZONE	FLOOR LOCATION OF EQUIPMENT	AVERAGE EQUIPMENT CABLE WEIGHT*	OVERHEAD BRACING REQUIREMENTS	FLOOR ANCHOR REQUIREMENTS
0 &1	All	All	No	Two 3/8−inch expansion shields per 2−foot, 2−inch module (diagonally placed)
2	Ground or 1st	All	No	Two 1/2−inch expansion shields per 2−foot, 2−inch module (diagonally located)
	Second and Above	650 lbs or Less	No	Two 1/2−inch expansion shields per 2−foot, 2−inch module (diagonally located)
		More Than 650 lbs	No	Four 1/2−inch expansion shields per 2−foot, 2−inch module (in each corner)
3	Ground or 1st	All	No	Four 1/2−inch expansion shield per 2−foot, 2−inch module (in each corner)
	Second and Above	850 lbs or Less	No	Four 1/2−inch expansion shield per 2−foot, 2−inch module (in each corner)
		More Than 850 lbs	Yes	Four 1/2−inch expansion shield per 2−foot, 2−inch module (in each corner)

* The average equipment and cable weight is defined as the weight of all equipment, cable, equipment frameworks, and cable racks within one building bay, as determined from floor plan data sheets, divided by the total number of 2−foot 2−inch and 3−foot 3−inch wide frames or bays.

$ If frames are not junctioned, a minimum of two 3/8−inch expansion shields diagonally placed per frame are required.

TABLE B
DISTRIBUTING FRAME AND PROTECTOR FRAME FASTENING

	TYPE OF FRAME	VERTICALS PER UNIT 1	2	3	5	6	9	10	11	20	21
MDF	per ED 10802–01	0	–	–	0	1	–	2	2	–	–
CDF	per ED–60321–01 (A&M Only)	–	–	–	0	0	–	2	–	–	–
CDF	per ED–60585–01	–	–	–	0	0	–	2	–	–	–
TOLL DR	per ED–61936–73	0	–	0	–	–	0	–	–	–	2
CDR	per ED–62000–71	0	–	–	0	0	–	2	–	–	–
MDF	per ED–90074–01 (A&M Only)	0	0	0	2	–	–	2	2	3	4
MDF	per ED–90141–01 (A&M Only)	0	0	0	0	–	–	2	2	3	4
PROT F	per ED–90274–01	0	0	0	0	–	–	2	2	4	4
ROT F	per ED–90275–01	0	0	0	0	–	–	2	2	3	4
MDF	per ED–90279–01 (A&M Only)	0	0	0	0	–	–	2	2	3	4
MDF	per ED–90280–01 (A&M Only)	0	0	0	0	–	–	2	2	3	4
IDF	per ED–90284–01 (A&M Only)	–	–	–	0	1	–	2	2	3	4
CDF	per ED–90427–01 (A&M Only)	0	–	–	0	0	–	2	–	–	–
TDF	per ED–90663–73	–	–	–	0	0	–	2	2	3	4
MDF	per ED–91001–73	0	0	0	0	–	–	2	2	3	4
MDF	per ED–91006–78	0	0	0	1	–	–	2	2	3	4
IDF	per ED–91021–72	–	–	–	0	1	–	2	2	3	4
MDF	per ED–91023–73	0	0	0	0	–	–	2	2	3	4
MDF	per ED–91235–78	0	0	0	1	–	–	2	2	3	4
DJG	per ED–91252–72	0	0	0	0	0	–	2	2	–	–
DCF	per ED–91420–01 (A&M Only)	–	–	–	0	0	–	2	–	–	–
MDF	per ED–91670–76	0	0	0	2	–	–	2	2	3	4
CDF	per ED–91670–73	0	–	–	0	0	–	2	–	–	–
CDF	per ED–91676–73	0	–	–	0	0	–	2	–	–	–
PROT F	per ED–92976–71	0	0	0	0	–	–	2	2	3	4

Order from AT&T Co. Telephone Number 1–800–352–0904.

NOTE: * (see vendor documentation).

(d) Cable Duct–Type Frames: These frames have 5–inch wide steel channel uprights with unequal flanges and sheet–steel base construction. Single and double bay frames are provided in 7–foot, 9–foot, 10–foot 6–inch, and 11–foot 6–inch heights. Except for the floor supported 7–foot frame, these frames are supported by auxiliary framing and shall be fastened to the floor in the standard manner using two 3/8–16 expansion shields and studs with expansion bolt plate per bay.

2.17 Customer Premise Equipment: Requirements for earthquake bracing of customer premise equipment, are covered in vendor documentation.

E. Fastenings At Tops Of Frames

2.18 The following practices for fastening at the tops of frames shall be used for locations within Zones 2 and 3 of Figure 43.

2.19 **Miscellaneous Equipment Type Frames:** The top angles and auxiliary framing shall be rigidly fastened together as shown in Figure 9. In other toll offices where the framing is at 11 foot 6 inch height, for any frames or racks provided with twin top angles the clip, T−bolt, nut, and the tooth−type lockwasher shall be used instead of the bracket assembly. (See vendor documentation.)

(a) On additions, where the original frames were grouted and auxiliary framing is located approximately 3 inches above the tops of the frames, and frames are to be installed under the existing auxiliary framing, the fastening between the auxiliary framing and the frame top angles shall be made as shown in Figure 10.

(b) Adjacent frames shall be fastened together at the top as shown in Figure 17, using the 4−bolt clip and four 5/8−11 T−bolts.

(c) Where the junctions between frames occur under or adjacent to the regular auxiliary framing so that there would be interference between the junction plate and bracket assemblies per Figure 9 or 10, the frame tops shall be junctioned in the usual manner. The support bracket assembly shall then be located adjacent to one of the junction plates and attached to the frame cable rack with a pair of short auxiliary framing bars or channels. In this case, antislip details, described previously in this section, shall be used to prevent slippage of the fastenings.

(d) Framework Junctions: Adjacent frames in a line−up shall be fastened together at the top using the 4−bolt junction plate, four 5/8−11 HH cap screws, auxiliary framing bars, lockwashers,and hexagonal nuts.

2.20 Bulb−Angle Relay Racks: Adjacent bulb−angle−type relay racks shall be fastened together at the top as shown in Figure 18 using the 4−bolt junction plate and four 5/8−11 T−bolt bolts.

2.21 Bulb−angle frames with two top angle in a high framing area where the framing is more than 1 foot 6 inches above the frames shall be supported with angle−type braces as shown in Figure 20.

2.22 Cable−duct−type frames junctioned at the top with pipe shall have tooth−type lockwashers under the nuts of V and U bolts. V and U bolts fastening cable duct−type frames to auxiliary framing shall have tooth−type lockwashers under the nuts of the V and U bolts.

2.23 Distributing Frames and Protector Frames: Distributing frames and protector frames 11 feet 6 inches high shall be braced in an endwise direction. Provide a brace at each end and at about 40−foot intervals along the frame as shown in Figure 16.

2.24 DMS−10 and Other Small Capacity Offices: These equipments, which use cable racks (without auxiliary framing) to support the frames and which may be installed in areas not provided with ceiling inserts, shall be braced as indicated in Figure 11 to 15, inclusive. The following recommendations apply to Zones 3 of Figure 43.

(a) Braces extending to the wall shall be used where the ceiling is unsuitable for the termination of braces. Braces terminating at the wall shall be attached to 2 by 6−inch timbers extending the full length of the equipment, where practicable, as shown in Figures 12 and 13. The recommended minimum number of wall braces for an entire community dial office (CDO), or for any of its parts, where its grouping of equipment obviously will respond independently from the rest of the equipment in the office, can be determined by the following rules:

(1) Count the existing number of wall braces supporting the equipment attached to and along walls parallel to the equipment lineups and with span distances less than 14 feet. Cross aisle cable racks should be considered the equivalent of two angle braces, and attachments to battery stands and interior partitions should not be counted. Ceiling braces which restrict motion perpendicular to the direction of the equipment lineup also may be counted as wall braces if the ceiling structure is sufficiently strong to withstand the thrust of the brace.

(2) Add wall (or ceiling) braces to the common distributing frame (CDF), if necessary, so that the average spacing is less than 3 feet.

(3) For other lineups along walls, add braces so that the average spacing is less than 6 feet and the maximum distance from the end of the lineup to the first brace is less than three feet.

(4) To determine the size of the CDO (or part of a CDO), use an “equivalent length” of lineup. “Equivalent length” is defined as the length of the CDF frame multiplied by a factor of four, plus the total length of the remainder of the equipment, including future frame gaps within lineups.

(5) Use Figure 21 to determine the minimum number of wall braces required. If this number is greater than the total brace count after satisfying conditions 2 and 3, install additional wall braces. Try to place approximately the same number of these additional wall braces on each longitudinal wall side.

(6) If it is not possible to use wall braces where additional bracing is required, because of large spans (greater than 14 feet) or interference due to the location of interior partitions and/or battery stand, install ceiling braces as recommended below.

(7) Use double braces (angles back−to−back) for additional support when the span is more than 7 feet. Use a vertical support for such braces so that the vertically unsupported length of the braces is always less than 7 feet. Never allow additional braces to span more than 14 feet.

(b) Braces to the ceiling shall be attached to 2 by 6−foot timbers lagged to the ceiling as shown in Figure 14.

(c) Junctions between frame cable racks and cross−aisle cable racks at the same level shall be made with bolted angle brackets as shown in Figure 15 instead of with corner clamps.

F. Power Equipment

2.25 The following practices for power equipment shall be used for locations within Zone 3 unless otherwise specified.

2.26 Power Boards: Install an expansion shield and a stud at every hole provided for floor bolts in the frame base. Box−type frameworks having an overall minimum depth of 23 inches at the floor require no bracing at the top. Other floor−supported power boards, more than 7 feet 0 inch high, shall be braced as required.

2.27 **Floor−mounted cabinet−type rectifiers,** shall be anchored to the floor with a 3/8−16 expansion shield and stud in each of the holes in the base as shown in Figure 19. In addition, four 3/16−inch steel plates shall be used at the corner holes to reinforce the corner weld joints in the base.

(a) When the rectifier cabinets occur adjacently, intercabinet junction plates shall be used along the tops of the cabinets to tie them together as shown in Figure 19.

(b) Spacers furnished with some type of the rectifiers shall be installed under each hole in the base before fastening to the floor.

(c) The 2017B transformer furnished with certain rectifiers shall be fastened to the floor inside the rectifier cabinet with four 3/8−16 expansion shields and studs located in the mounting holes of the two base angles.

(d) Some rectifiers shall be fastened to the floor with a 5/8−11 expansion shield and a stud in each of the four holes provided in the base. (See manufacturer's documentation.) Each rectifier must also be bolted to another rectifier. Adjacent rectifiers are joined using the four 5/8−11 eyebolt holes in the top corners of the unit. Junction plates shall be used for applications with two and four adjacent corners, respectively.

2.28 Machine tables shall be fastened to the floor as shown in Figure 22.

2.29 Machines on tables or shelves are normally mounted directly on the surface or on rubber vibration dampeners (Manhattan Rubber Co.) as shown in Figure 23.

(a) When Barry−modified type vibration dampeners and straps are used, they shall be fastened as shown in Figure 24.

(b) For block−rubber vibration dampeners which are not bolted to the subbase or table, use retaining details per manufacturer's documentation.

(c) Machines mounted directly on the surface shall be bolted to the surface. If there are no bolt holes in the subbase, use retaining angles. (See manufacturer's documentation.) Conduit nipples extended through the surface close to the ends or sides of the subbase may be relied upon instead of some of the angles.

2.30 Alternators, not otherwise fastened, when mounted on tables shall be held in place with angles as shown in Figure 26.

2.31 Earthquake protection shall be provided for gas turbine engine alternator, the remote control cabinet, and the start and control batteries as follows:

(a) **Engine Alternator:** The engine alternator set shall be secured to the floor as shown in the vendor's documentation.

(b) **Remote Control Cabinet:** The remote control cabinet shall be fastened to the floor in a manner similar to rectifier cabinets as shown in Figure 19, View A.

(c) **Engine Start and Control Batteries:** The securing details for the start and control batteries are shown in the vendor's documentation.

2.32 Engine–generator sets and separate radiator unit located on the floor, with or without rubber isolation pads, shall be held in place by angles as shown in Figure 25. Engine alternators with spring isolators, shall be fastened to the floor as shown in Figures 27 and 28, respectively.

(a) **Engines mounted on piers** shall have the pier secured in place by angles bolted to the floor with the vertical surface against the pier. In addition, the engine shall be held in place at each end with an angle or other detail as specified in the vendor's documentation. The engine shall also be held with one detail near each isolation pad at the sides. Angles and details shall be located with the vertical surface 1/4 inch from the engine subbase. Use 3/8–16 expansion shields and studs to secure the details.

(b) No additional bracing for engine exhaust piping is necessary other than the standard bracing required for auxiliary framing bars or channels that support the silencers.

(c) Floor supported control cabinets provided as part of engine alternators shall be fastened to the floor in a manner similar to rectifier cabinets as shown in Figure 19.

2.33 Spacers furnished with some cabinets shall be installed under each hole in the base before fastening to the floor.

(a) The static, if provided, on an engine alternator shall be fastened to the floor with four 3/8–16 expansion shields and studs located in the mounting holes of the two base angles.

2.34 Small floor mounted batteries shall be held in place as shown in Figures 29 and 30, respectively.

2.35 Batteries Mounted on Metal Stands: Earthquake protection measures must be used in varying degrees for the locations and stand/cell configurations shown in Table C.

2.36 The metal battery stand shall be provided with side rails and spacers and shall be secured to the floor and ceiling or auxiliary framing as shown in Figures 31, 32, 33, 34, 36, 37, 38 and 39. Each end battery stand foot shall be fastened to the floor with 1/2–13 expansion shield and stud. Each intermediate foot shall be fastened with two 1/2–13 expansion shield and studs.

(a) Stands 3 foot 0 inch or less in height need not be extended to the ceiling.

(b) Isolated battery stands, when supported by auxiliary framing as in unattended carrier stations, shall be supported by a minimum of three lines of bars or channels placed at right angles to the stand. If through bars or channels cannot be located so as to coincide approximately with the ends of the stand, additional short bars or channels shall be used at the ends extending out from the nearest wall.

(c) For isolated battery stands which must be supported by auxiliary framing, as in unattended carrier stations, battery stand posts (all posts of the rack) shall be extended to the auxiliary framing with 3–inch 4–pound channels as shown in Figure 34. At the top, running lengthwise to the stand, these channels shall be tied together with two 2 x 2 x 1/4 inch angles, one at each side. To brace the stand lengthwise, additional auxiliary framing should be provided extending to the wall. They shall be long enough for attachment to two pairs of main framing bars or channels and located centrally with respect to the stand.

(d) Battery stands by some vendors must have the uprights extended with channels (see Figures 31 and 32) and must be braced as follows:

For Parallel Rows of Stands

(1) Transverse Bracing: Earthquake braces of the size specified in Figure 38 should be placed to provide lateral support in the transverse (cross–aisle) battery stand direction, with one brace placed approximately every five feet along the stand. The braces should be attached diagonally between the top of the stand and the ceiling. These rows of braces should be repeated in the transverse direction at a spacing not to exceed 15 feet, as indicated in Figure 38. To prevent torsion effects, the last brace in a battery row must be located not more than 2 feet from the end of the row.

TABLE C
GUIDELINES FOR EARTHQUAKE BRACING
OF METAL BATTERY STANDS

EARTH−QUAKE ZONE	BATTERY CELLS (See Note)	LOCATION	BATTERY STAND ARRANGEMENT				
			2−TIER 1−ROW	2 TIER 2 ROW	3−TIER 1 ROW	3−TIER 2−ROW	4 TIER 2−ROW
1	All Cells	Ground & 1st Floor	NR	NR	NR	NR	R
		Above 1st Floor	OB	NR	OB	OB	R
2	All Cells	Ground & 1st Floor	OB	NR	OB	OB	R
		Above 1st Floor	EQS	EQS	R	R	R
3	All Cells	All Floors	EQS	EQS	R	R	R

Note
Batteries are Flooded Lead Acid Cell. For Round cells on metal stands, see Vendors Equipment Drawings and other Documentation.

Key
NR = No requirements for earthquake bracing. OB = Overhead or ceiling bracing only requirement.

R = Restricted − Do Not Use.
EQS = Earthquake−braced stand and battery cells. (Per Manufacturer's Equipment Drawings and/or overhead−braced per vendors equipment drawings.)

(2) **Longitudinal Bracing:** One pair of earthquake braces of the size specified in Figure 38 should be placed on each side, at both ends of each row of battery stands, in the lengthwise direction. In addition, for long rows of stands, intermediate longitudinal braces should be used so that spacing between braces is not greater than 20 feet, as shown in Figure 38.

For Isolated Single−and Multistands

(3) **Transverse Bracing:** One brace is required on each end of the stand, attached from the top of the stand to the ceiling, as shown in Figure 39. For multistands, intermediate transverse braces should be included so that the approximate spacing along the stand is a maximum of 10 feet, as shown in Figure 39.

(4) **Longitudinal Bracing:** Earthquake braces should be placed on each side, at one end of the stand, as shown in Figure 39. For multi stands, braces should be placed at both ends of the stand with intermediate longitudinal braces placed along the length so that spacing between braces is not greater than 20 feet, as indicated in Figure 39.

(e) In the case of exceptionally high ceilings with auxiliary framing between the ceiling and the battery stand, the battery stand shall be secured to the auxiliary framing which in turn shall be braced to the ceiling.

(f) Where battery racks are located in the basement adjacent and parallel to an outside wall and the ceiling height is such that bracing to the ceiling is difficult, the battery rack may be braced to the wall with framing bars or channels bent at right angles and fastened to the wall with two 3/8−16 expansion shields and studs or to wooden battens with lag screws.

(g) If different size cells are located on the same stand, the rails shall be blocked out as required for the smaller cells.

(h) Metal details, screws, nuts, bolts, and washers shall be given a No. 484A or 807 finish or three coats, one day apart, of gray acid−resistant enamel WL−5871, or equivalent.

(i) The fiber−covered rod between cells is satisfactory for preventing slip where the spacing is not greater than 1/2 inch between the spacing rod and cell. Where greater spacing exists, use 3/4−inch wood spacers wide enough to leave 1/4 to 1/2 inch between cell and spacer. Fasten spacers above the side rails with wood screws.

(j) If the ceiling is not of sufficient strength to take the bracing (such as in community dial offices, unattended repeater stations, or customer premises with large Huts or CEVs where ceiling braces are not usually permitted), the uprights of the metal battery stand shall be braced to the wall as shown in Figure 37.

(k) When round cells are used on Metal battery stands, they are considered as a direct replacement for the rectangular cells. Mounting hardware shown in manufacturer documentation must be utilized.

2.37 Metal battery stands shall be fastened to the floor with 1/2−13 expansion shields and studs, one bolt at each end upright foot and two bolts at each intermediate upright foot, as shown in Figure 33. The Metal battery stand can be used as a self−supporting structure or braced to auxiliary framing.

2.38 For the assembly of round cells on modular type polyester glass battery stands in all earthquake zones, the manufacturer's documentation should be followed and adhered to.

2.39 **Flexible−type connectors** as shown in Figure 36 shall be used when connecting emergency cells on stands to bus bars.

2.40 Rigid−type connectors (CK−05499) can be used for all intercell connections.

2.41 **Floor−mounted battery cabinets** shall be anchored to the floor with a 3/8−16 expansion shield and stud in each corner as shown in Figure 41. Where placed against a column or outside wall, the cabinets shall also be fastened at the top with 3/8−16 expansion shields and studs as shown in Figure 41.

2.42 **Batteries on relay−rack−type shelves** shall be blocked with wooden strips and polystyrene sheets around and between the cells as shown in Figure 42 to prevent movement of more than 1/4 inch. The polystyrene sheets shall be at least 1/4 inch higher than the battery jars.

2.43 **Cable−rack−mounted battery filters**, shall have tooth−type lockwashers at all cable−rack fastenings.

2.44 **Relay−rack−mounted battery filters,** shall have tooth−type lockwashers at all cable−rack fastenings.

2.45 **Large Batteries:** For large cells (all floors) and Zone 2 (ground and first floor), supported directly on the floor, use standard installation procedures. Large batteries in Zone 2 (upper floors) and Zone 3 (all floors) located on the floor and composed of single or double rows of a maximum of 12 cells per row shall be supported by a close−fitting enclosure, 3 feet 0 inch high, fastened to the floor with 1/2−13 expansion shields and studs as shown in Figure 40. The enclosure is to fit the particular lineup of cells with the cells held in place with wooden blocks and metal brackets. Intermediate braces between cells are provided 2− or 3−cell intervals as shown in Figure 40. Where it is necessary to have more than 12 cells in a line, a minimum space of 12 inches shall be provided between the two halves (lengthwise) of the lineup, thus making it possible to support each set of cells independently. The 12−inch space is also necessary between a lineup of 12 regular cells and the emergency cells if in the same line−ups. Angles, bolts, nuts, etc., shall be given a No. 484A or 807 finish or three coats, one day apart, of gray acid−resistant enamel WL−58751, or equivalent, if finished by the installer. Wood blocks and spacers shall be given three coats of No. 7247 VitaVar Corp gray gloss enamel.

(a) Where the free space between the sides of a cell and the side rails of the enclosure for a single line of cells or the side rail and the wooden spacer between a double row of cells totals more than 1/2 inch, wood blocking shall be used. Such blocking, when required, shall be fastened with wood screws to the vertical face of the top enclosing angles and to the spacer between double rows of cells. Wood blocking shall also be used at the floor.

(b) Specific earthquake bracing details for Exide floor−mounted batteries are covered on ED82537−50.

(c) Specific earthquake bracing details for C & D and Gould floor−mounted batteries are covered on ED−82536−50.

2.46 Choke coils resting on H beams on the floor shall be securely bolted to the H beams and the H beams bolted to the floor. Choke coils resting on the floor shall be bolted to the floor.

2.47 Numerous vendors provide Batteries and Battery stands that are used in BellSouth. Only those that are on the approved products list should be used. However if there are existing battery stands in seismic zones that require additional anchoring and/or bracing the manufacturer should be contacted for the proper method of adding adequate anchoring and/or bracing. If their products are to be used in a seismic zone that requires earthquake and disaster bracing, they should be adequate for the seismic zone in which they are to be installed.

(a) Some figures that apply to specific vendor products are listed herein, but this is not a complete list and does not cover all vendors who are contacted to supply batteries and stands (for batteries) to BellSouth. Manufacturer Documentation should be used only when it has been certified as adequate to meet the requirements, of Uniform Building Code (UBC), for the Seismic Zone in which the equipment is to be installed.

(b) Floor anchoring, if not specified by the vendor, should be provided as required for the seismic zone in which the equipment is being installed. Some vendors specifically state this in their documentation as the buyer's responsibility.

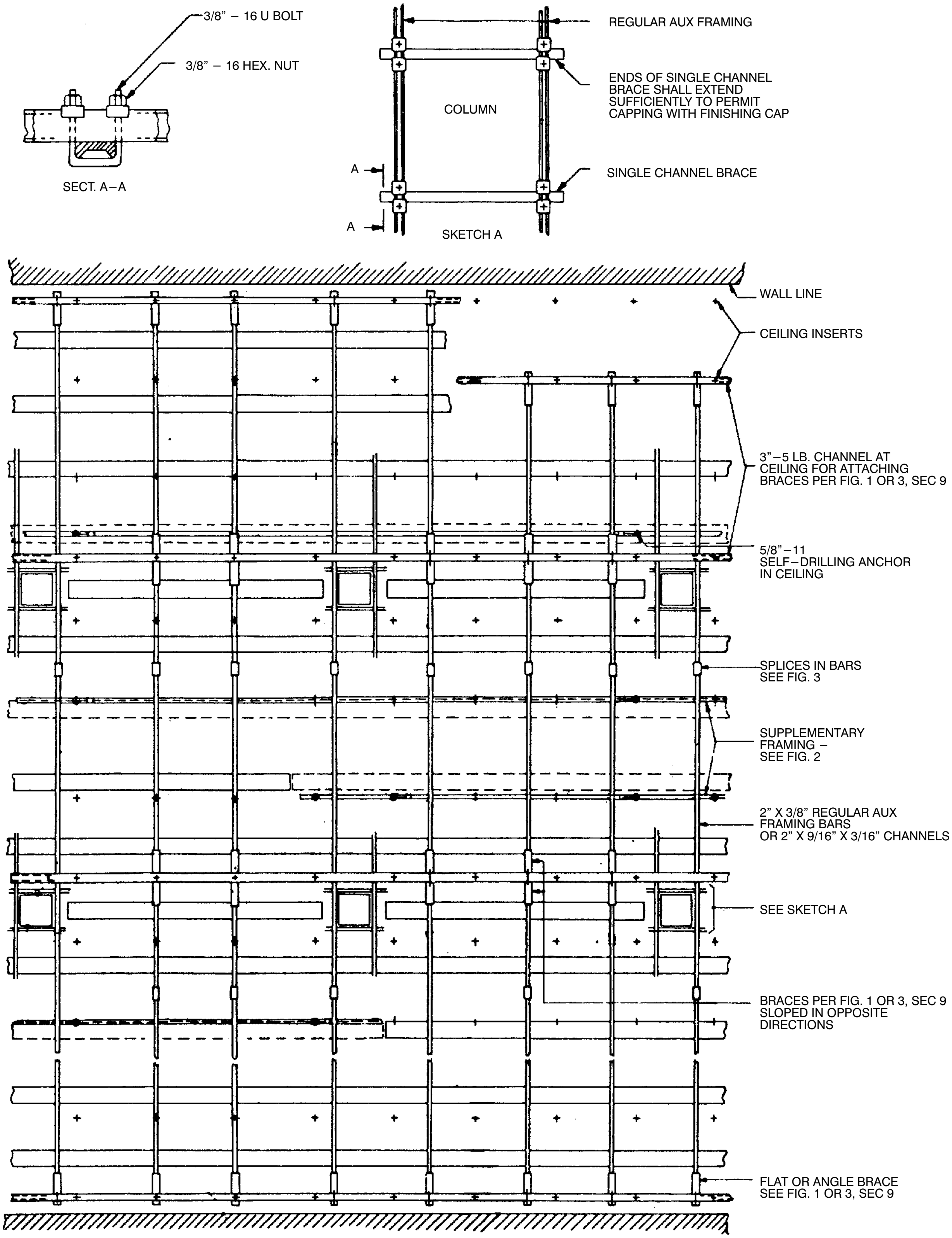
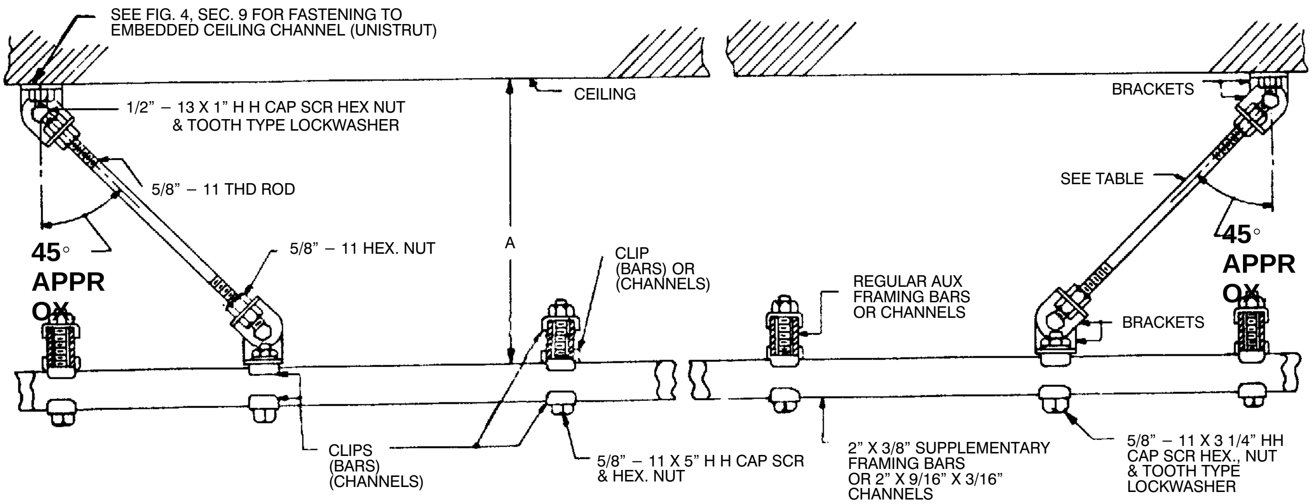


Figure 1 – Typical Auxiliary Framing Arrangement



A	TYPE OF BRACE
1'−6" OR LESS	5/8" THREADED ROD AS SHOWN
OVER 1'−6"	ANGLE BRACE SIMILAR TO FIG. 2, SEC. 9

Figure 2 − Supplementary Framing And Braces At Unequipped Rows Of Frames

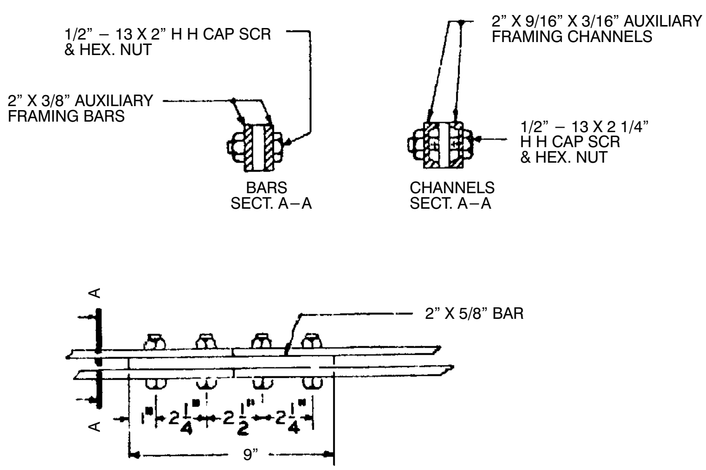


Figure 3 − Auxiliary Framing Splices−−Same Level (A & M Only)

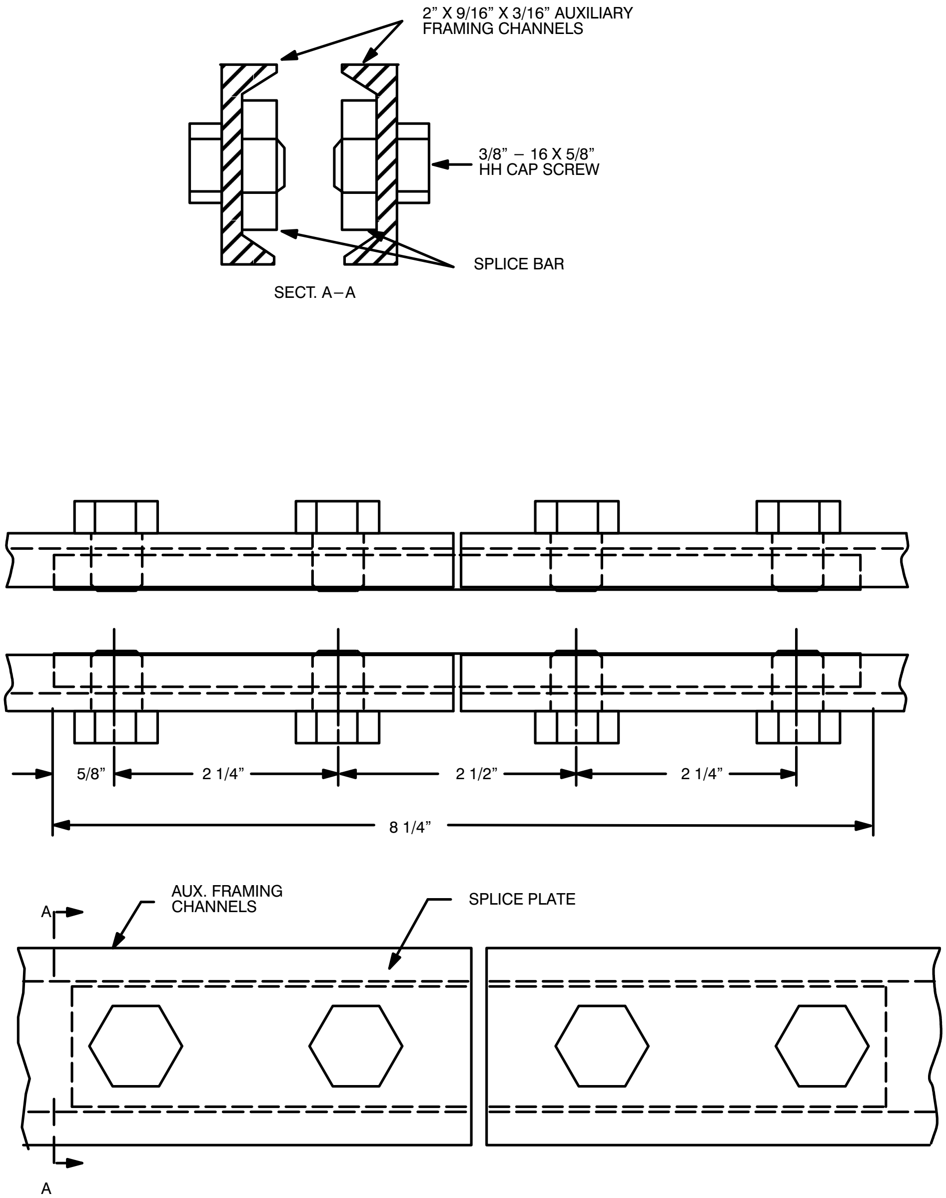


Figure 4 − Auxiliary Framing Splices − Same Level

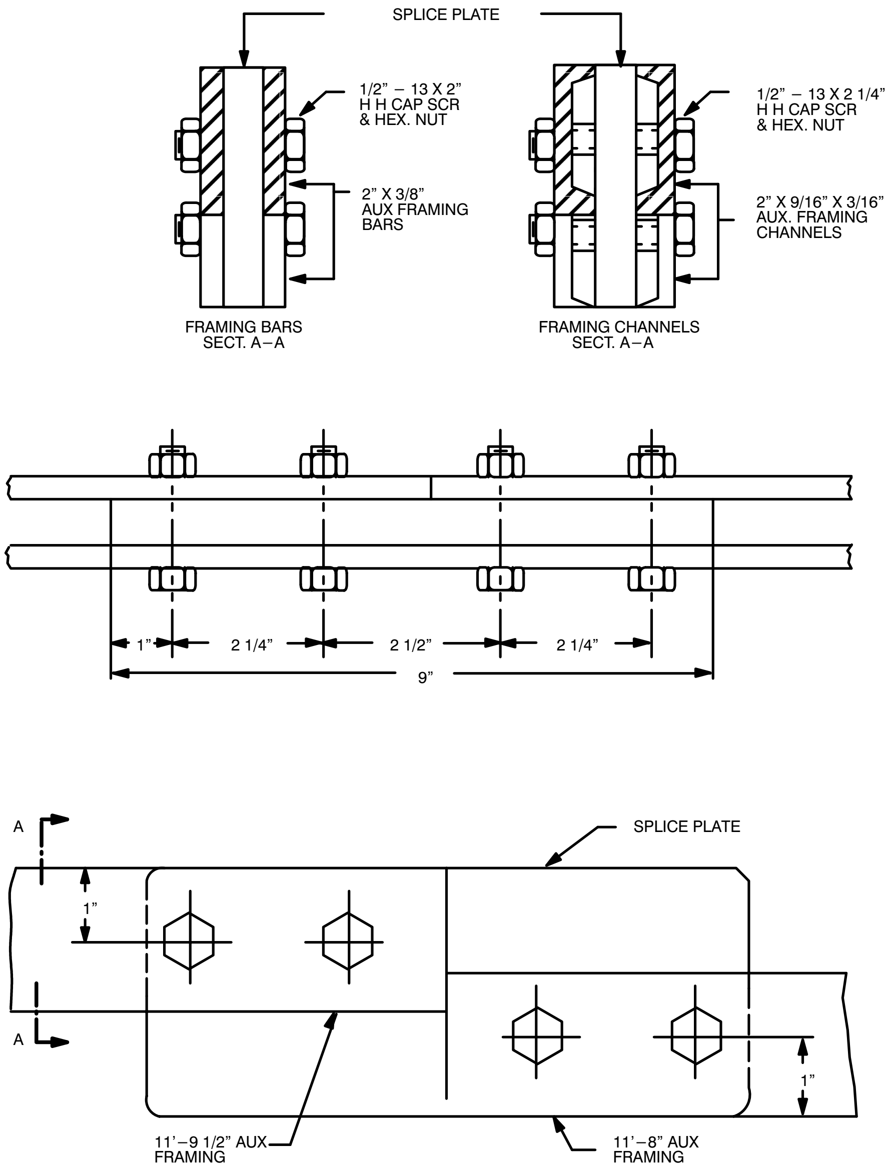


Figure 5 − Auxiliary Framing Splicing − 11−Foot, 8−Inch And 11−Foot, 9 1/2−Inch Framing

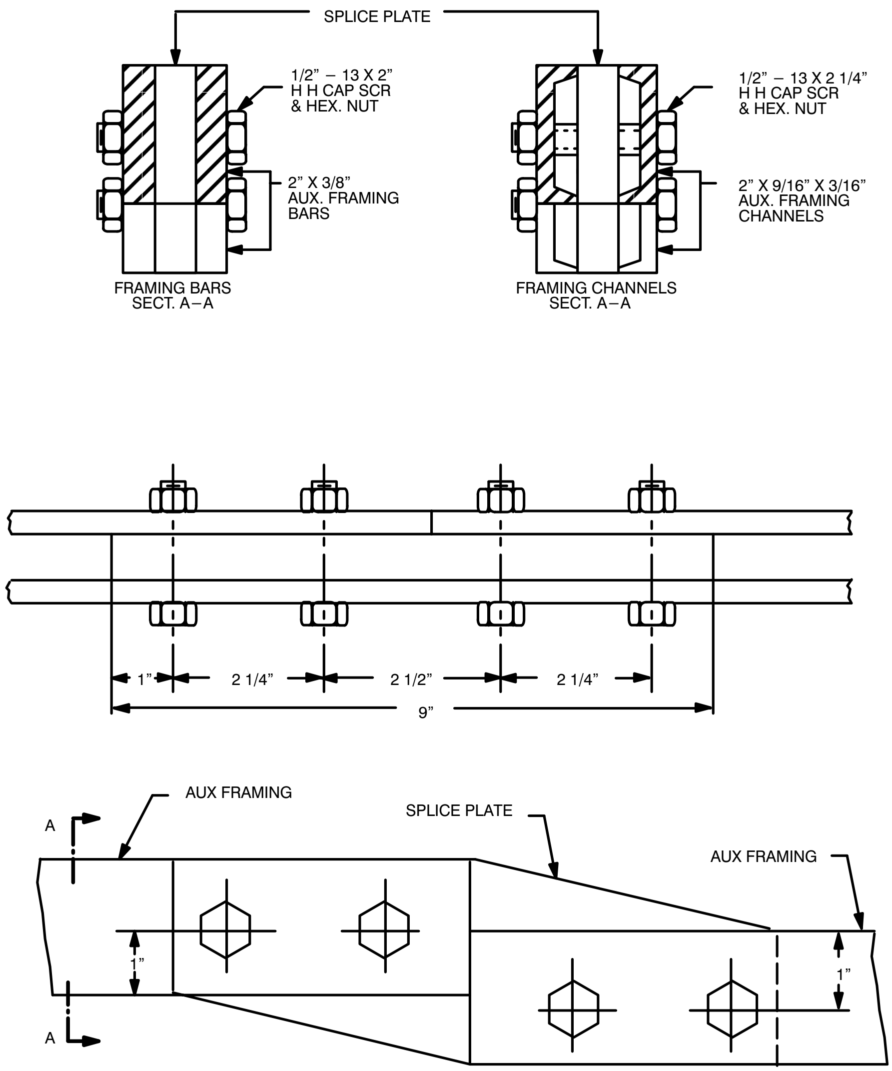


Figure 6 − Auxiliary Framing Splices − 1−Inch Difference In Framing Levels

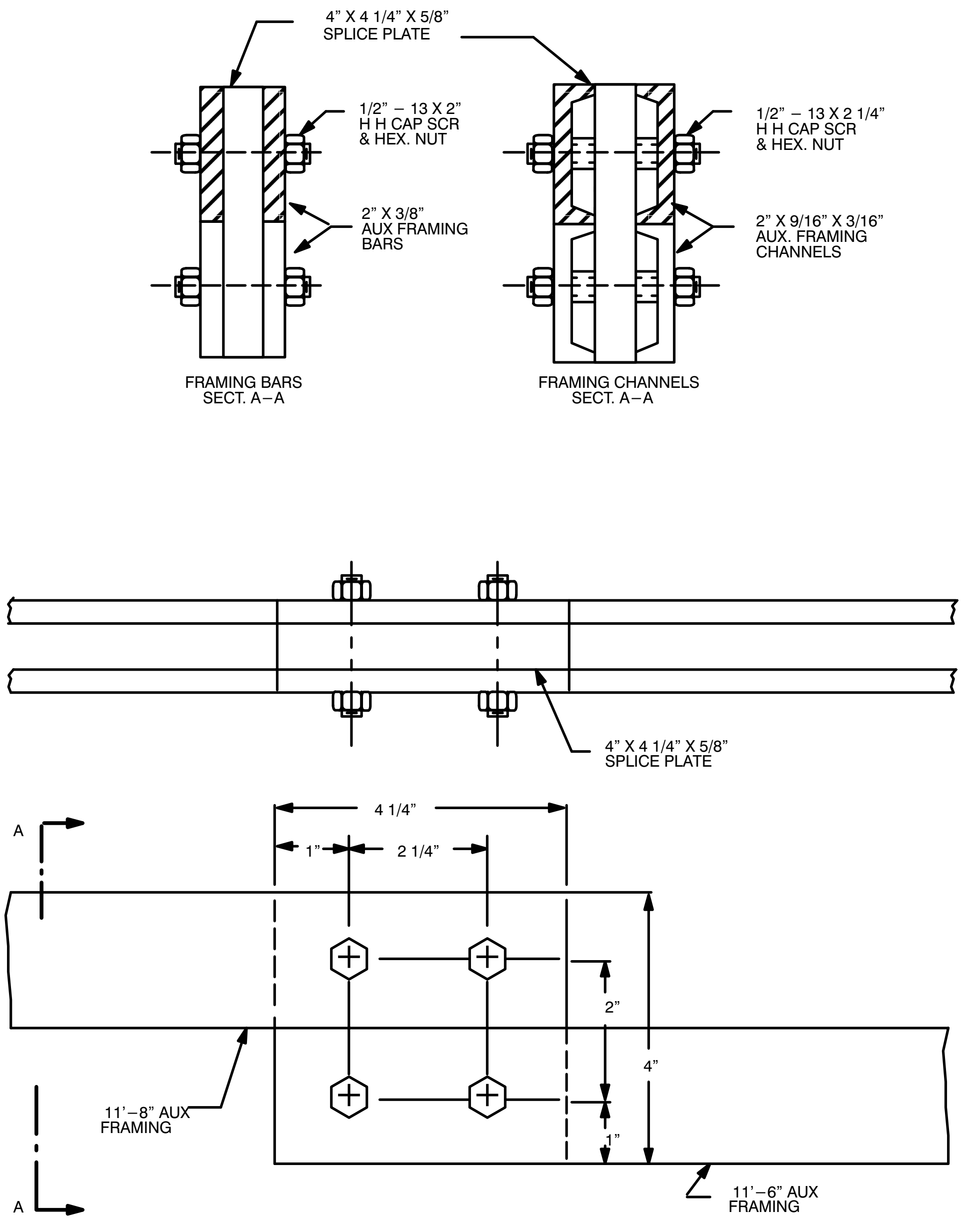
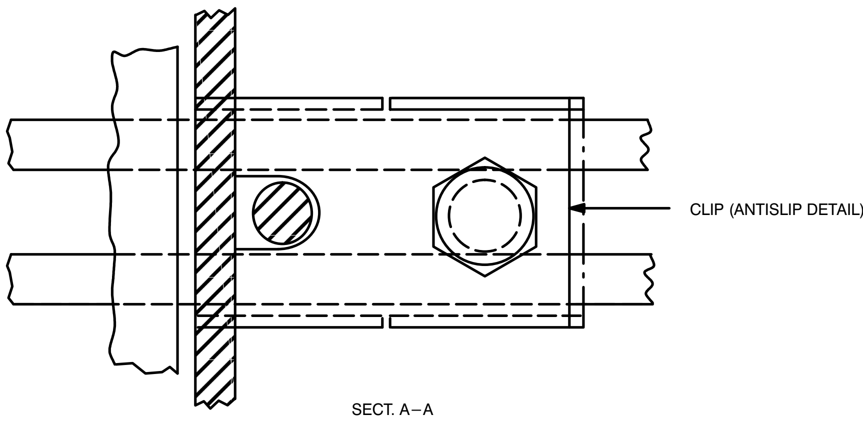


Figure 7 − Auxiliary Framing Splices − 11−Foot, 6−Inch And 11−Foot, 8−Inch Framing



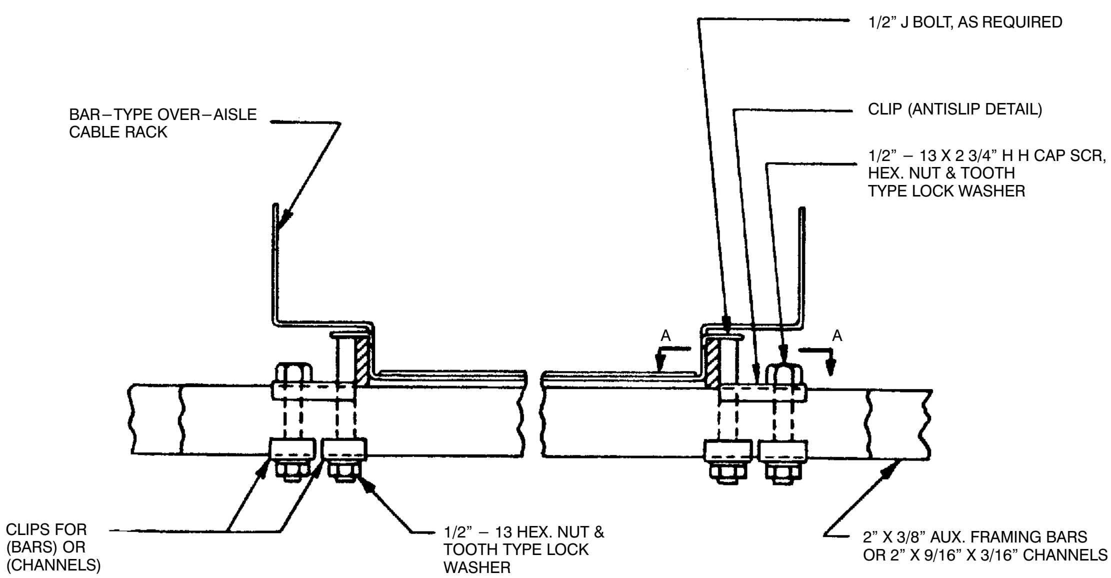


Figure 8 − Fastening Of Ladder−Or Bar−Type Cable Racks To Auxiliary Framing Where Cable Racks Support Frames−Use Of Antislip Details−Bar−Type Over−Aisle Cable Rack Shown

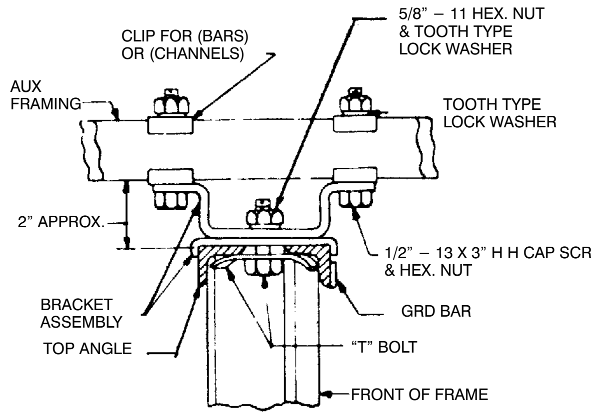


Figure 9 − Auxiliary Framing Fastened To The Tops Of Bulb−Angle Frames

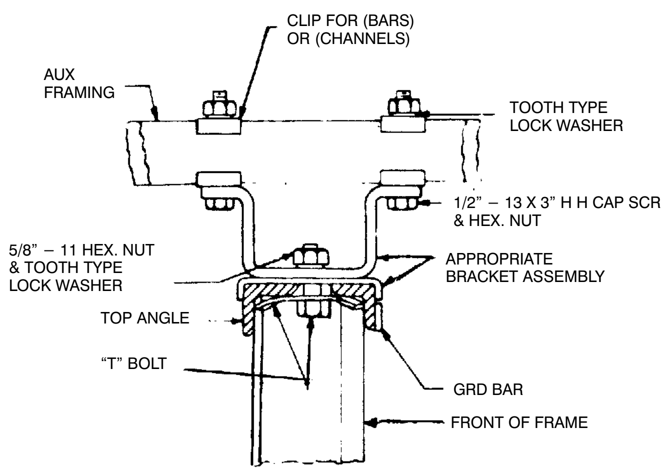


Figure 10 − Additions Where Auxiliary Framing Is Fastened 3 Inches Above Top Angles Of Existing Bulb−Angle Frames

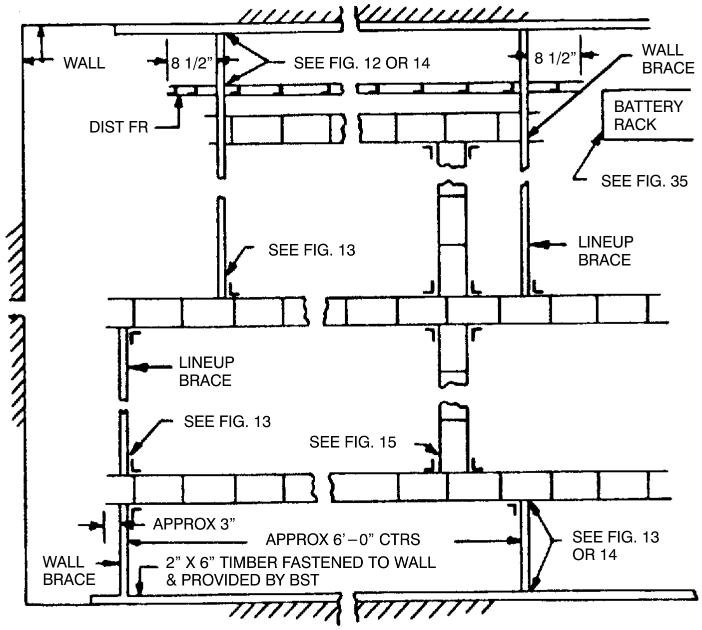
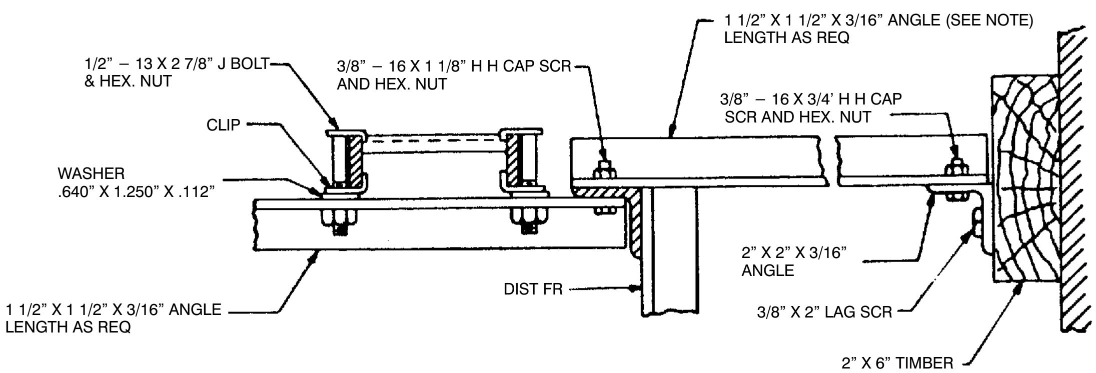
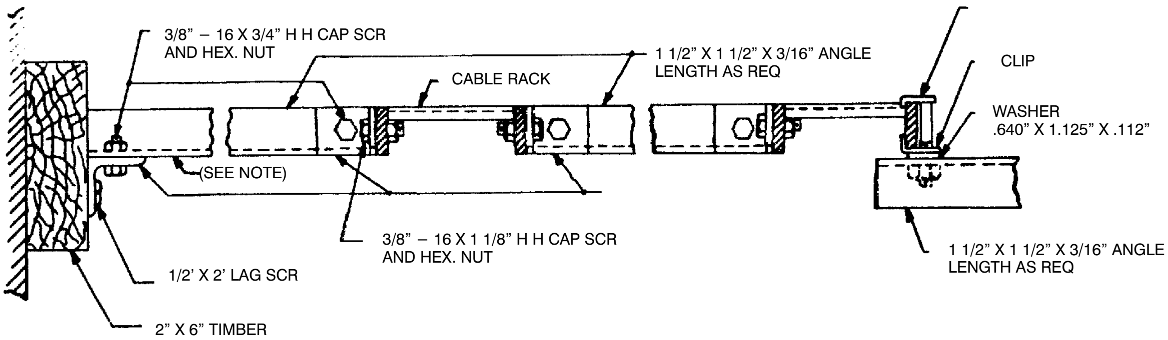


Figure 11 − Typical Arrangement Of Ladder−Type Cable Racks And Braces For A Small Capacity Office



NOTE:
SINGLE BRACE SHALL BE USED FOR DISTANCES UP TO 7'−0". WHERE DISTANCE TO WALL EXCEEDS 7'−0", A DOUBLE BRACE (TWO 1 1/2" X 1 1/2" X 3/16" ANGLES BACK TO BACK) SHALL BE USED. EACH BRACE SHALL BE FASTENED TO THE WALL AND DIST FR AS SHOWN.

Figure 12 − Wall Braces For Small Capacity Distributing Frame



NOTE:
SINGLE BRACE SHALL BE USED FOR DISTANCES UP TO 7'−0". WHERE DISTANCE TO WALL EXCEEDS 7'−0", A DOUBLE BRACE (TWO 1 1/2" X 1 1/2" X 3/16" ANGLES TOE TO TOE) SHALL BE USED. EACH BRACE SHALL BE FASTENED TO THE WALL AND CABLE RACK USING P−429637 ANGLES AS SHOWN.

Figure 13 − Wall Braces For Small Capacity Office Frame Cable Racks

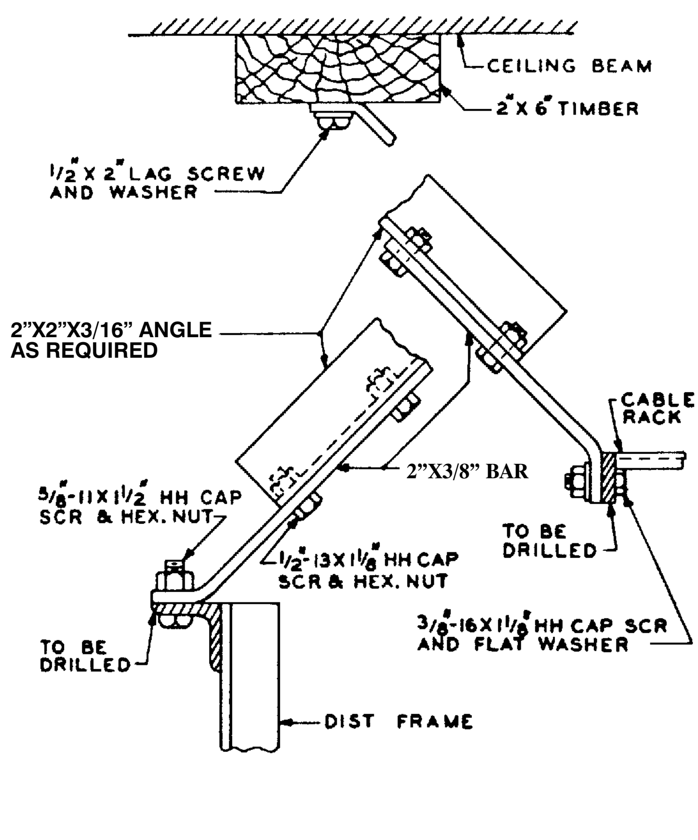


Figure 14 − Ceiling Braces For Small Capacity Office Distributing Frame And Cable Racks

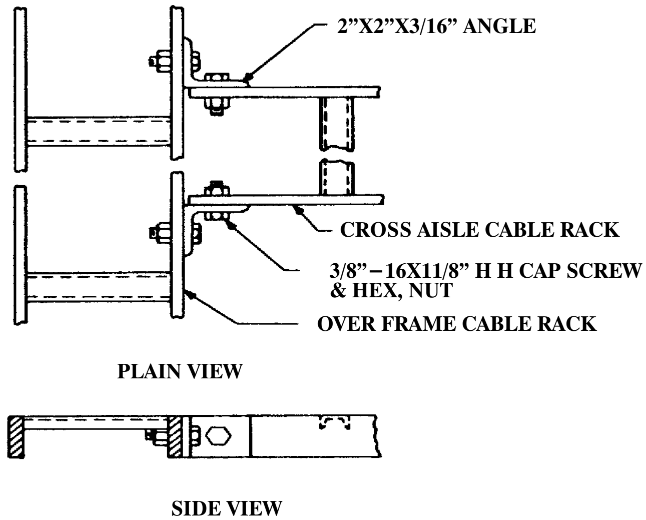
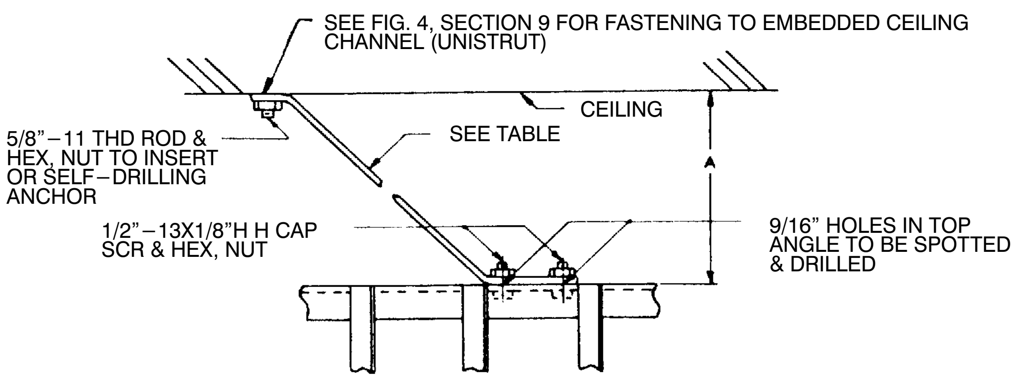


Figure 15 − Fastening Ladder−Type Cross−Aisle Cable Rack To Over−frame Cable Rack For Small Capacity Offices



A	TYPE OF BRACE
OVER 5" & LESS THAN 10"	2"X3/16" BAR AS REQUIRED
10" TO 1'−6" INCLUSIVE	2"X3/8" BAR AS REQUIRED
OVER 1'−6"	2"X3/16" ANGLE AS REQUIRED WITH 2"X3/8" BAR AT TOP AND BOTTOM RESPECTIVELY

Figure 16 − Endwise Bracing Of Distributing Frames And Protector Frames

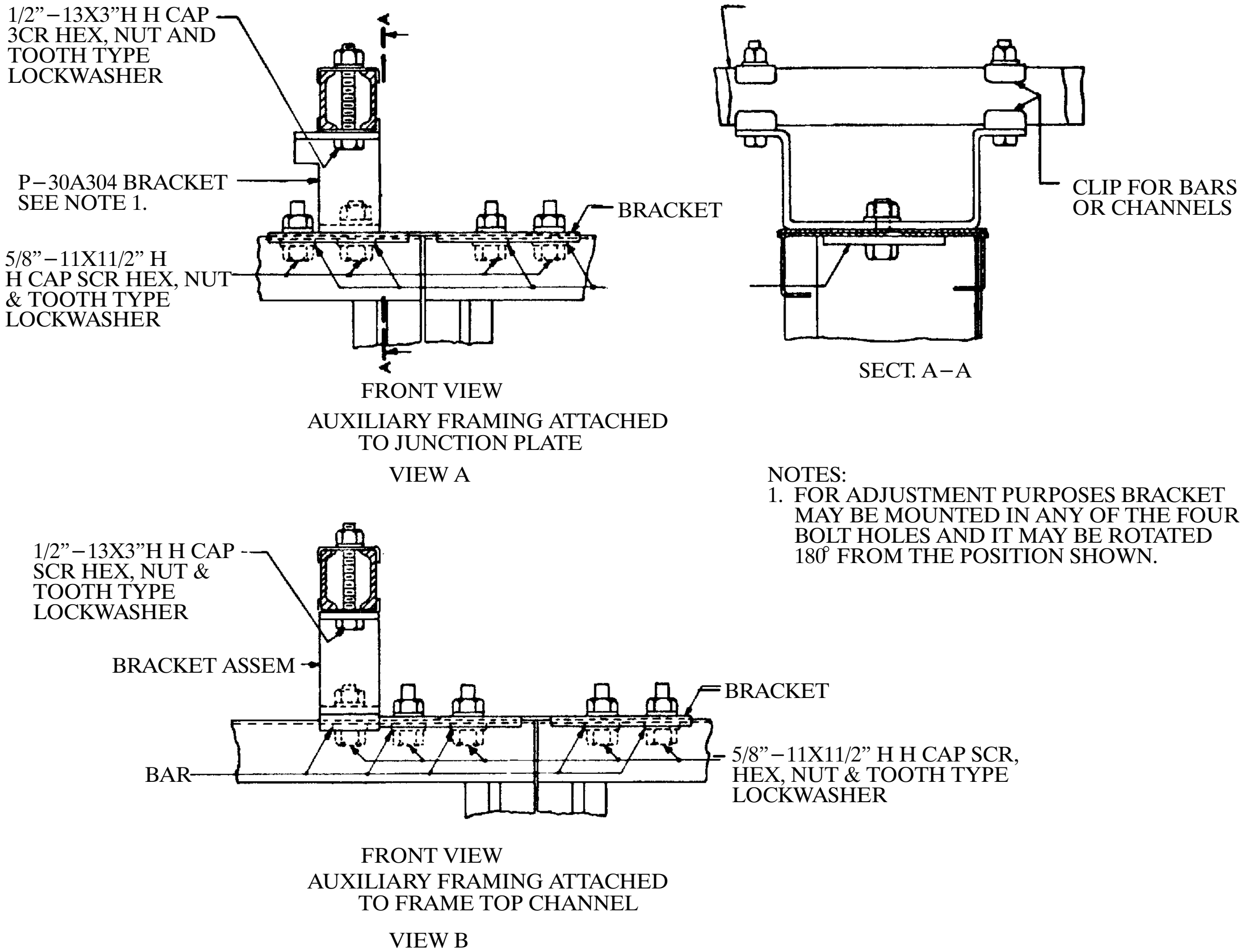


Figure 17 − Fastening Of Tops Of Miscellaneous Frames

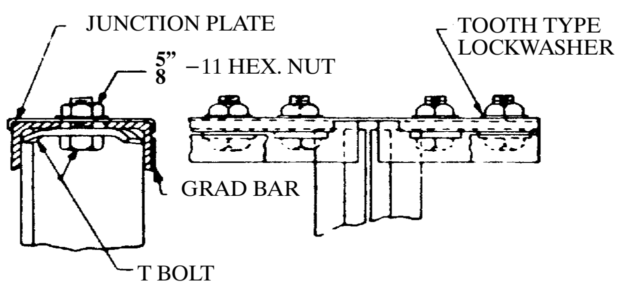


Figure 18 − Junctioning Top Angles Of Adjacent Bulb−Angle Frames

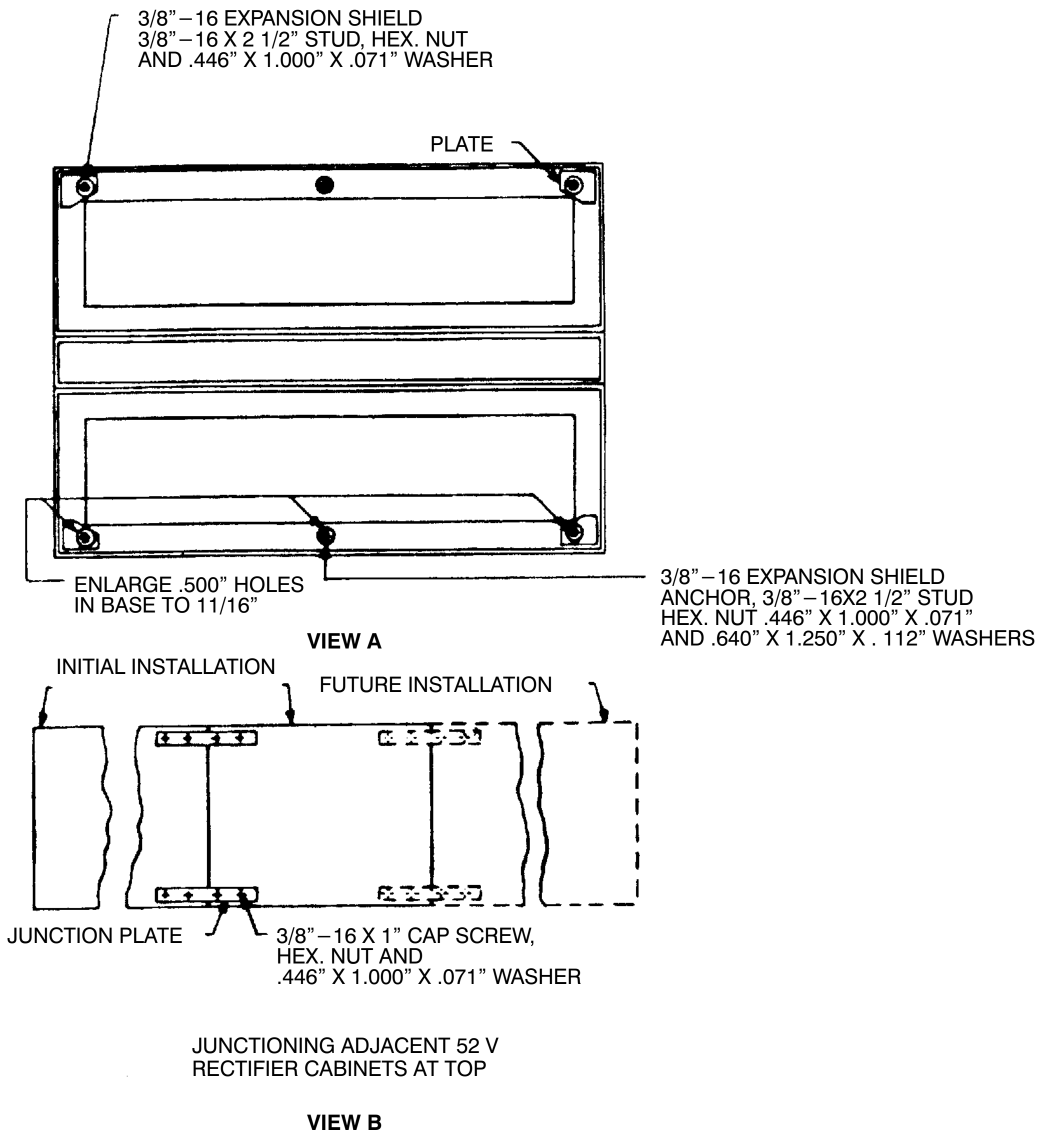


Figure 19 – Floor–Supported Rectifier Cabinets–Floor And Top Fastenings

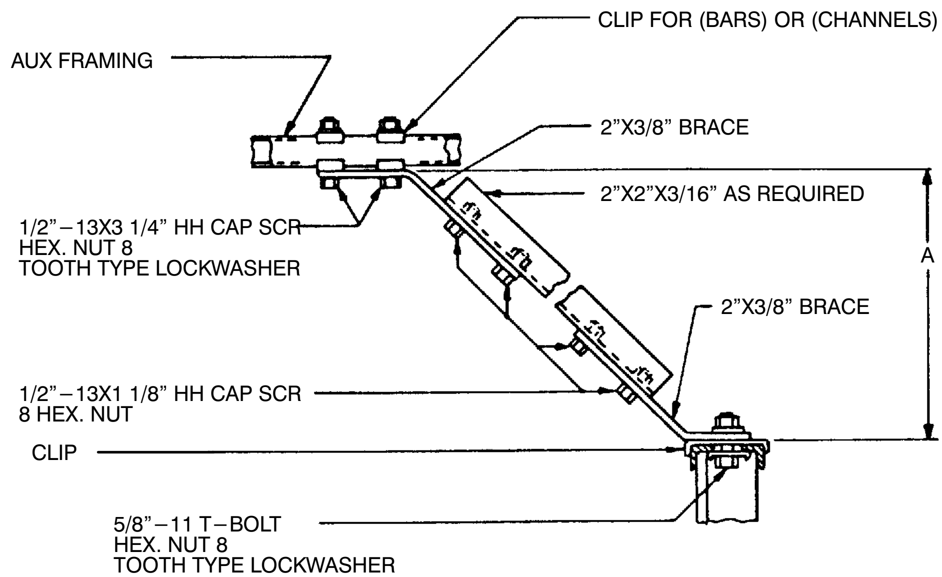


Figure 20 − Fastening Angle−Type Frames To High−Type Auxiliary Framing Where “A” Is Over 1 Foot 6 Inches

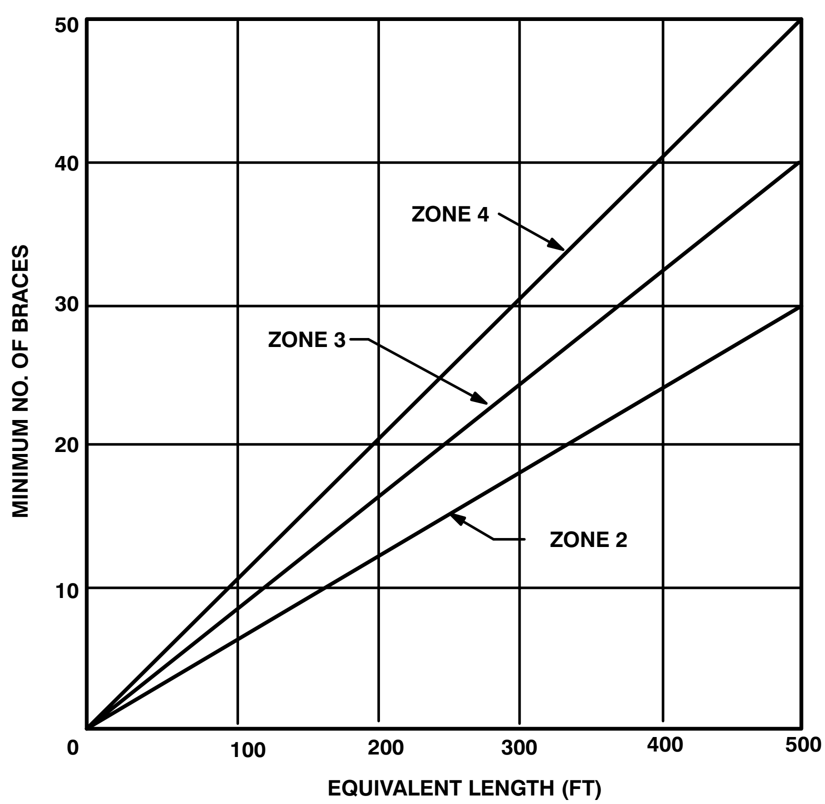


Figure 21 − CDO Wall Brace Requirements For Zones 2, 3, And 4

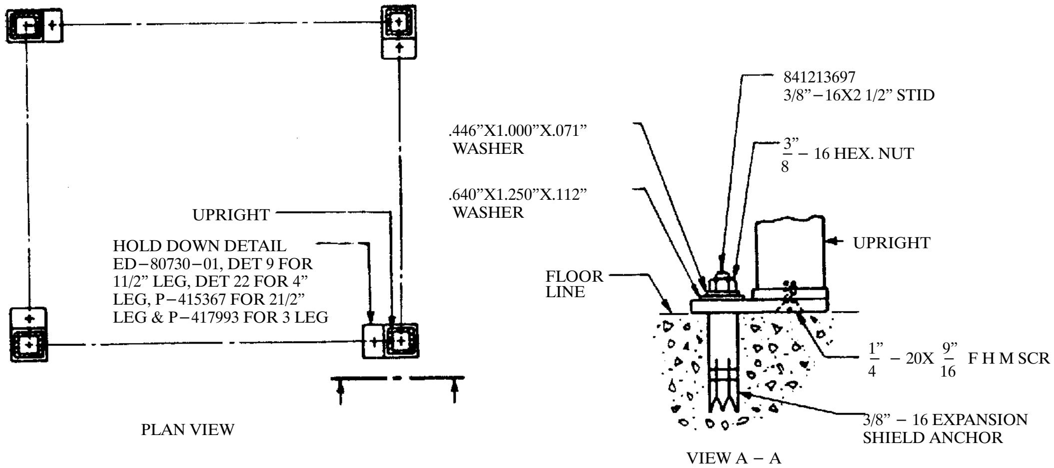


Figure 22 − Floor Fastenings For Machine Tables With Welded Bearing Plates

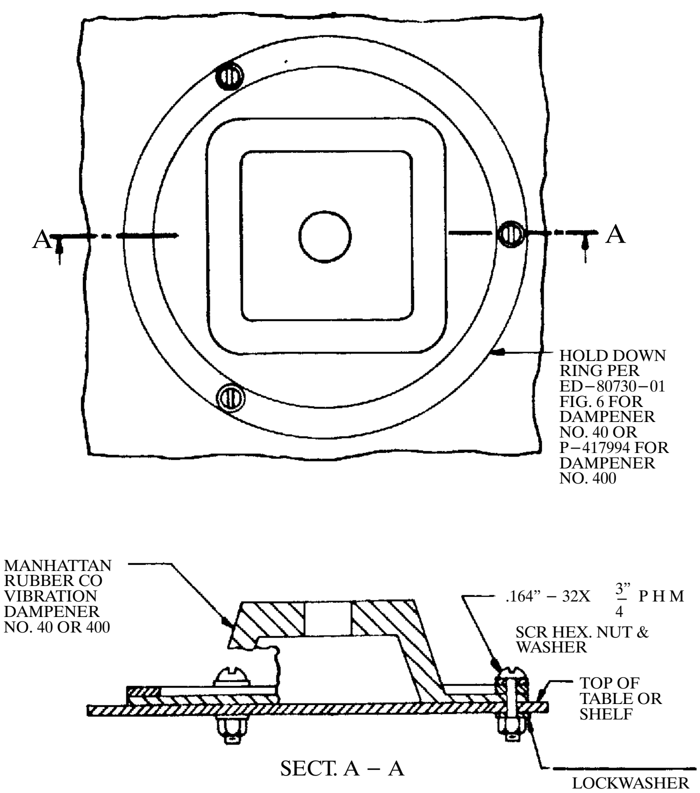


Figure 23 − Fastening Machines Mounted On Vibration Dampeners (Manhattan Rubber Co.) To Machine Tables

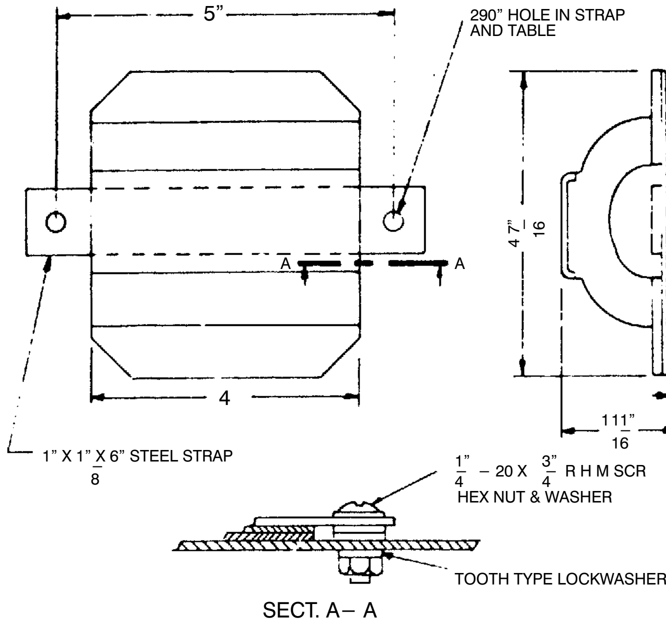
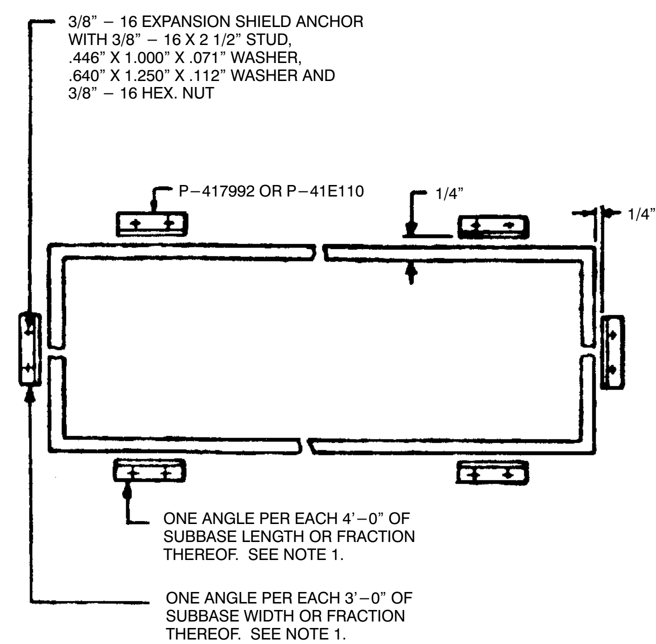


Figure 24 − Fastening Machines Mounted On Vibration Dampeners (Barry Type) To Machine Tables



NOTES:
1. ANGLES ON THE SIDES SHALL BE SPACED SO AS NOT TO INTERFERE WITH ISOLATION PADS THAT EXTEND BEYOND THE SUBBASE.

Figure 25 − Fastening Engine−Generator Sets, Motor−Generator Sets, Or Separate Radiator Units To Floor

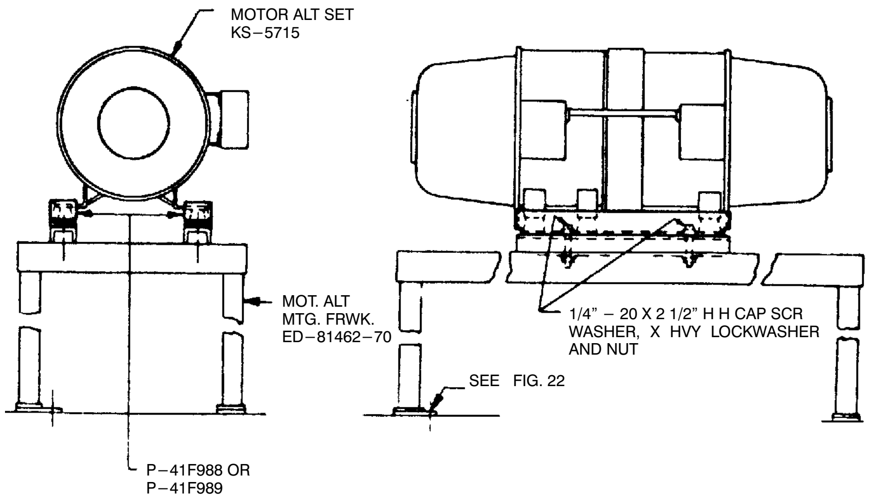


Figure 26 − KS−5715 Alternators Fastened To Tables

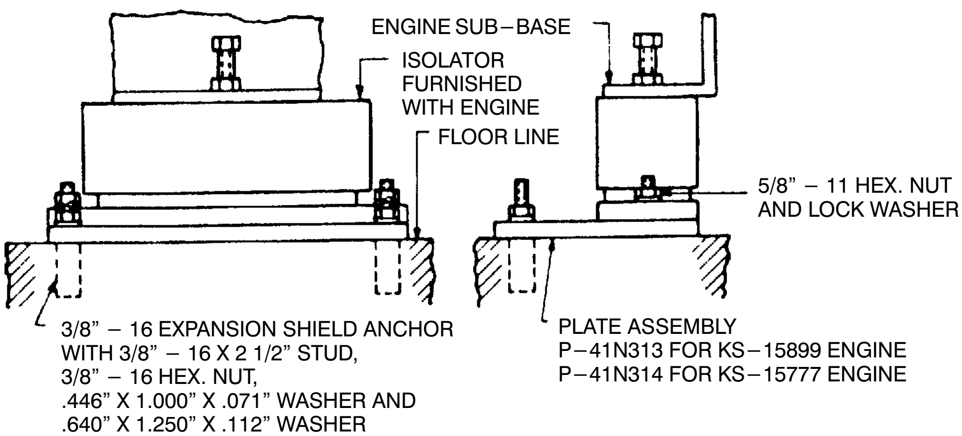


Figure 27 − Floor Fastenings For KS−15777 Or KS−15899 Engine−Alternators Mounted On Spring Isolators

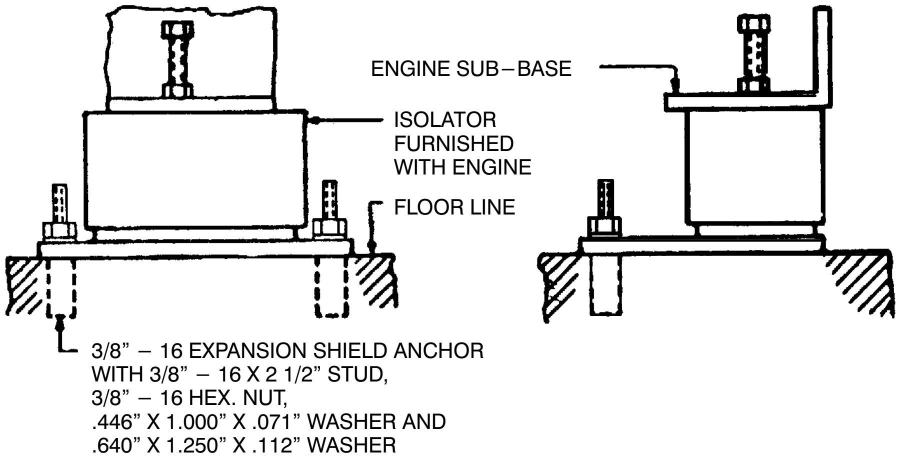


Figure 28 − Floor Fastenings For KS−15884, KS−15890, Or KS−15929 Engine−Alternators Mounted On Spring Isolators

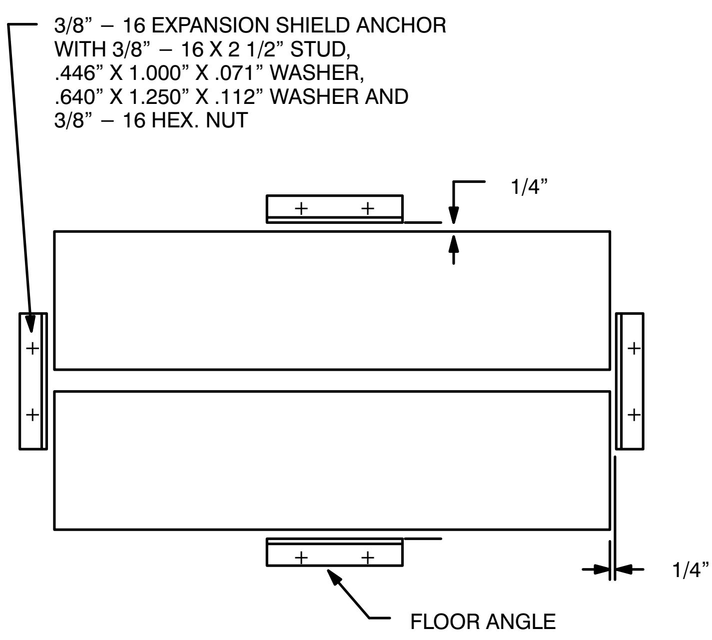


Figure 29 − Securing KS−15578 L5w Or L6W Batteries Mounted On Floor

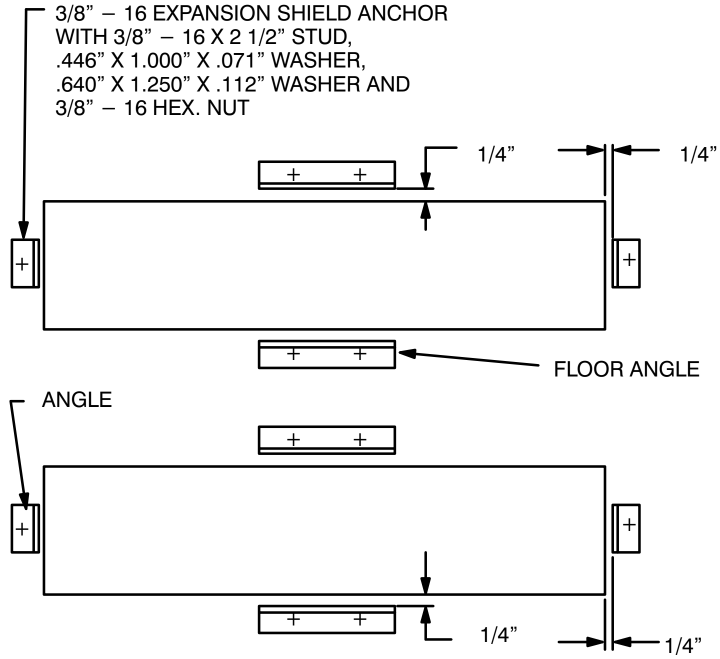
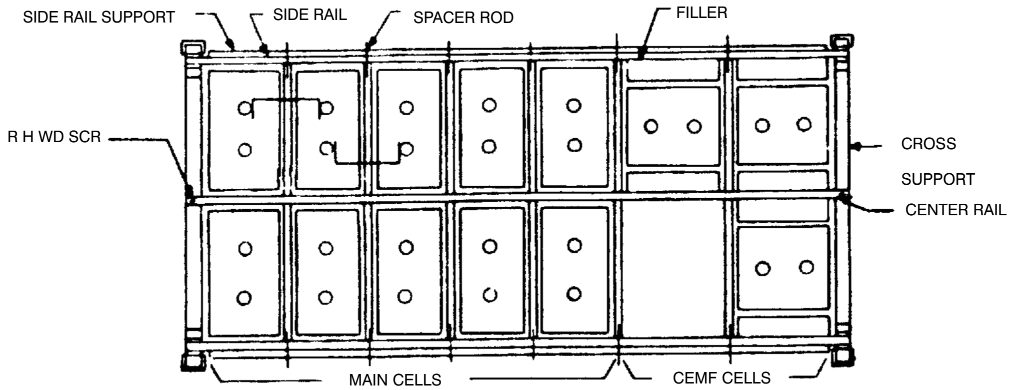
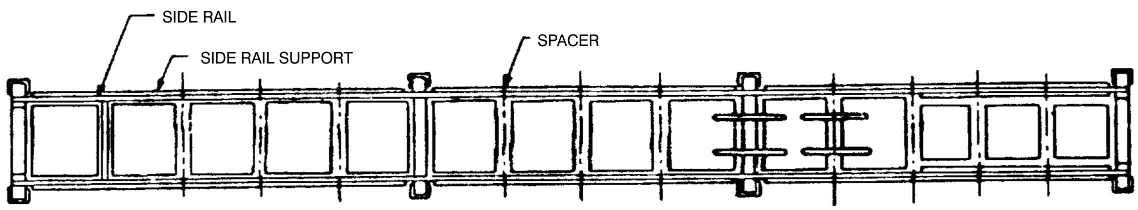


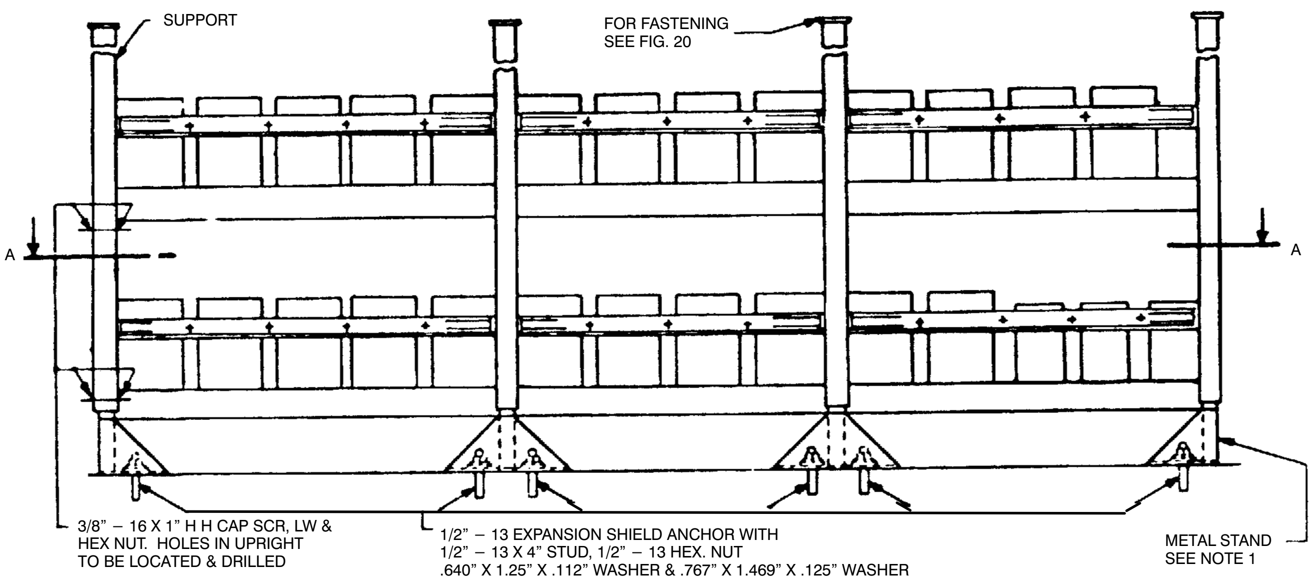
Figure 30 − Securing KS−15577 L5 Batteries Mounted On Floor



TYPICAL ASSEMBLY OF MAIN AND CEMF CELLS
2T2R STAND
BOTTOM TIER SHOWN



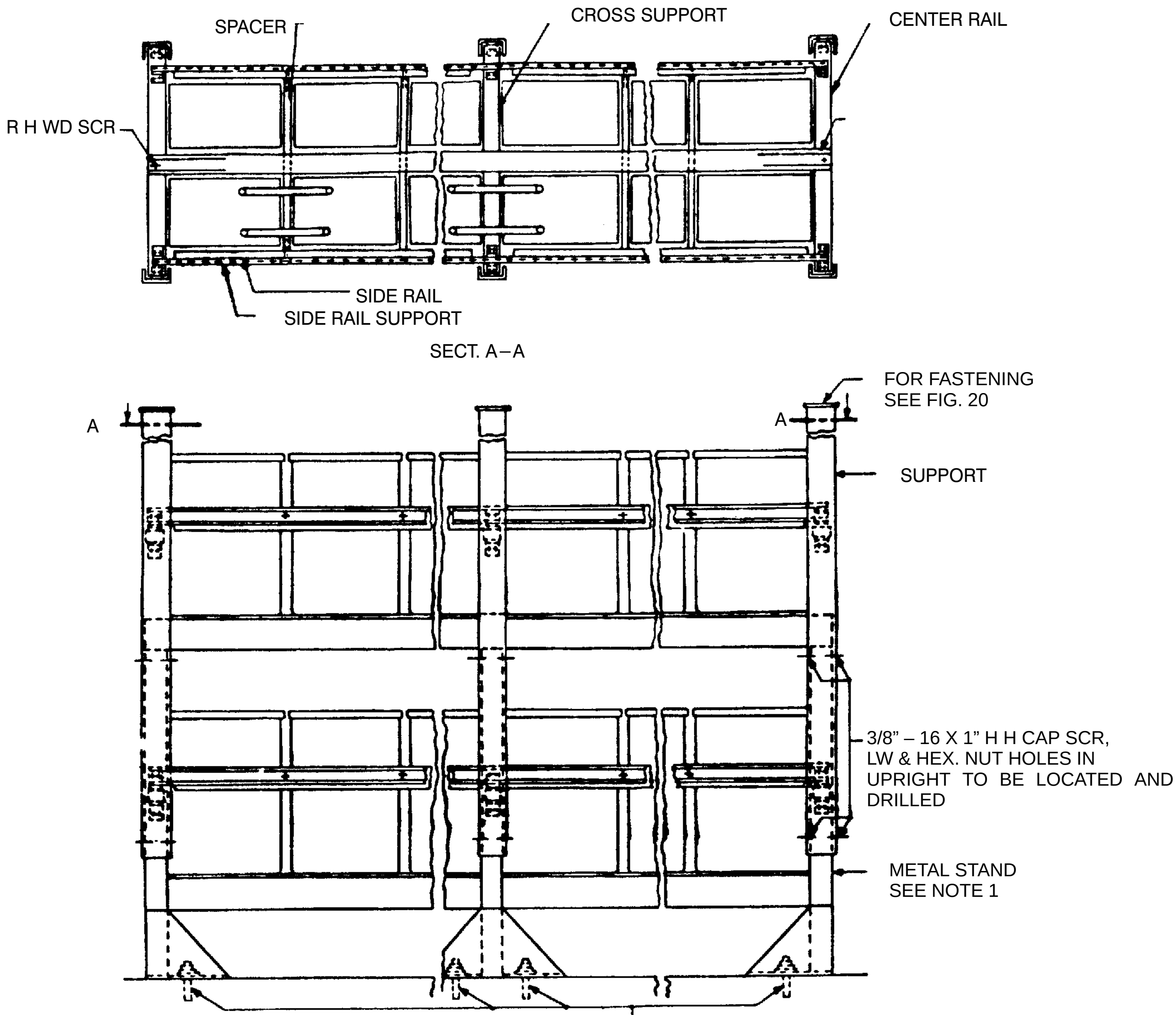
SECT. A−A



TYPICAL ASSEMBLY OF MAIN AND CEMF CELLS
2T1R STAND

NOTES:
1. FOR EARTHQUAKE PROTECTION DETAILS FOR ANY PARTICULAR KS LIST NO. OF BATTERY SEE ED−81613−01.

Figure 31 − Supports And Floor Fastenings For Metal Battery Stands Where Bus Bars Or Cable Racks Are Supported Directly From The Stand For Cells With Or Without CEMF Cells

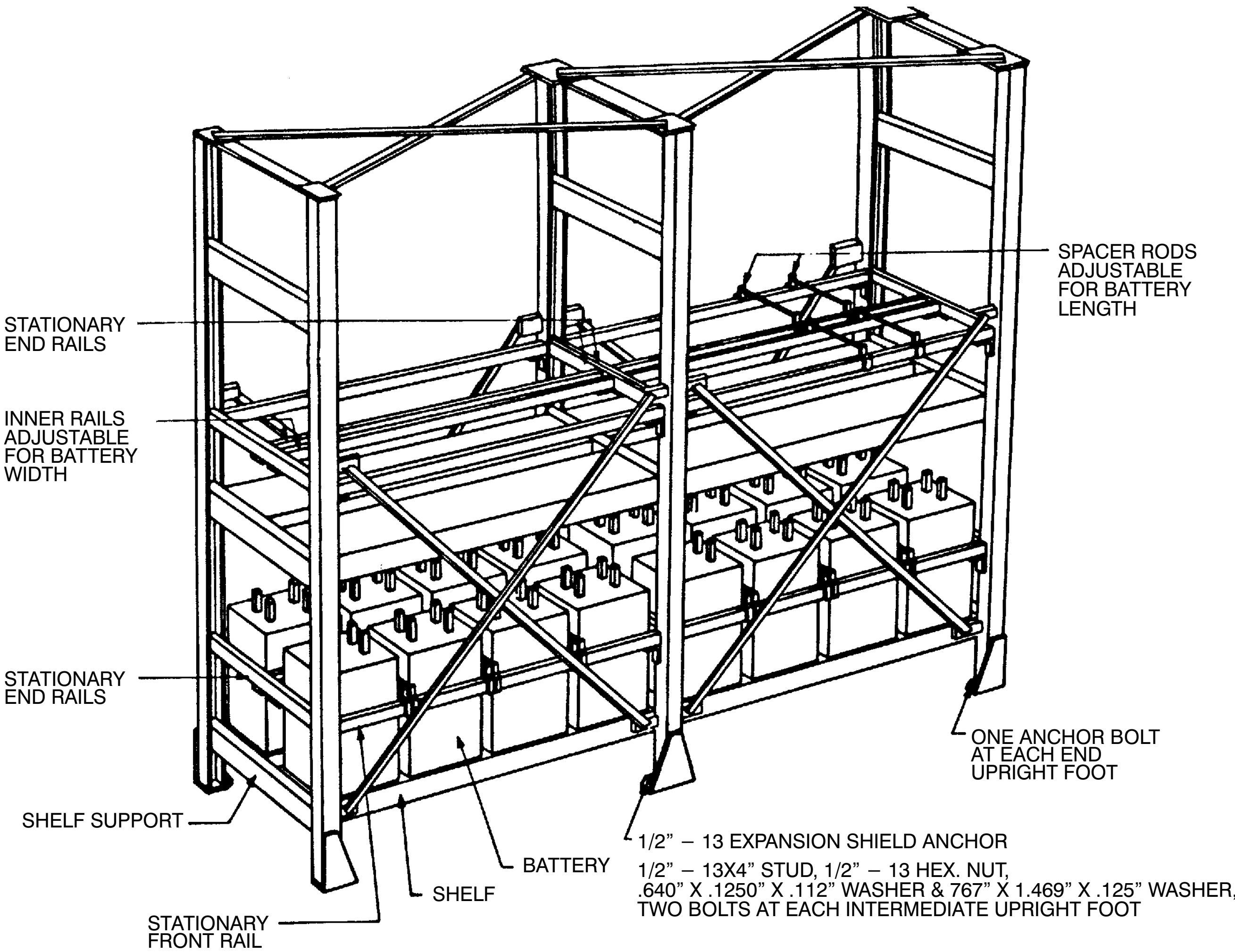


NOTE:
1. FOR EARTHQUAKE PROTECTION DETAILS FOR ANY PARTICULAR KS LIST NO. OF BATTERY SEE ED–81568–01.

1/2” – 13 EXPANSION SHIELD ANCHOR
WITH 1/2” – 13 X 4” STUD,
1/2” – 13 HEX. NUT,
.640 X 1.250” X .112” WASHER
.767” X 1.469” X .125” WASHER

FRONT VIEW
FOR 2T2R OR 2T1R STAND
2T2R STAND SHOWN

Figure 32 − Supports And Floor Fastenings For ED−81568−01 Metal Battery Stands Where Bus Bars Or Cable Racks Are Supported Directly From The Stand



NOTE:
1. FOR EARTHQUAKE PROTECTION DETAILS FOR ANY PARTICULAR BATTERY STANDS.

Figure 33 − Floor Fastenings For Metal Battery Stands

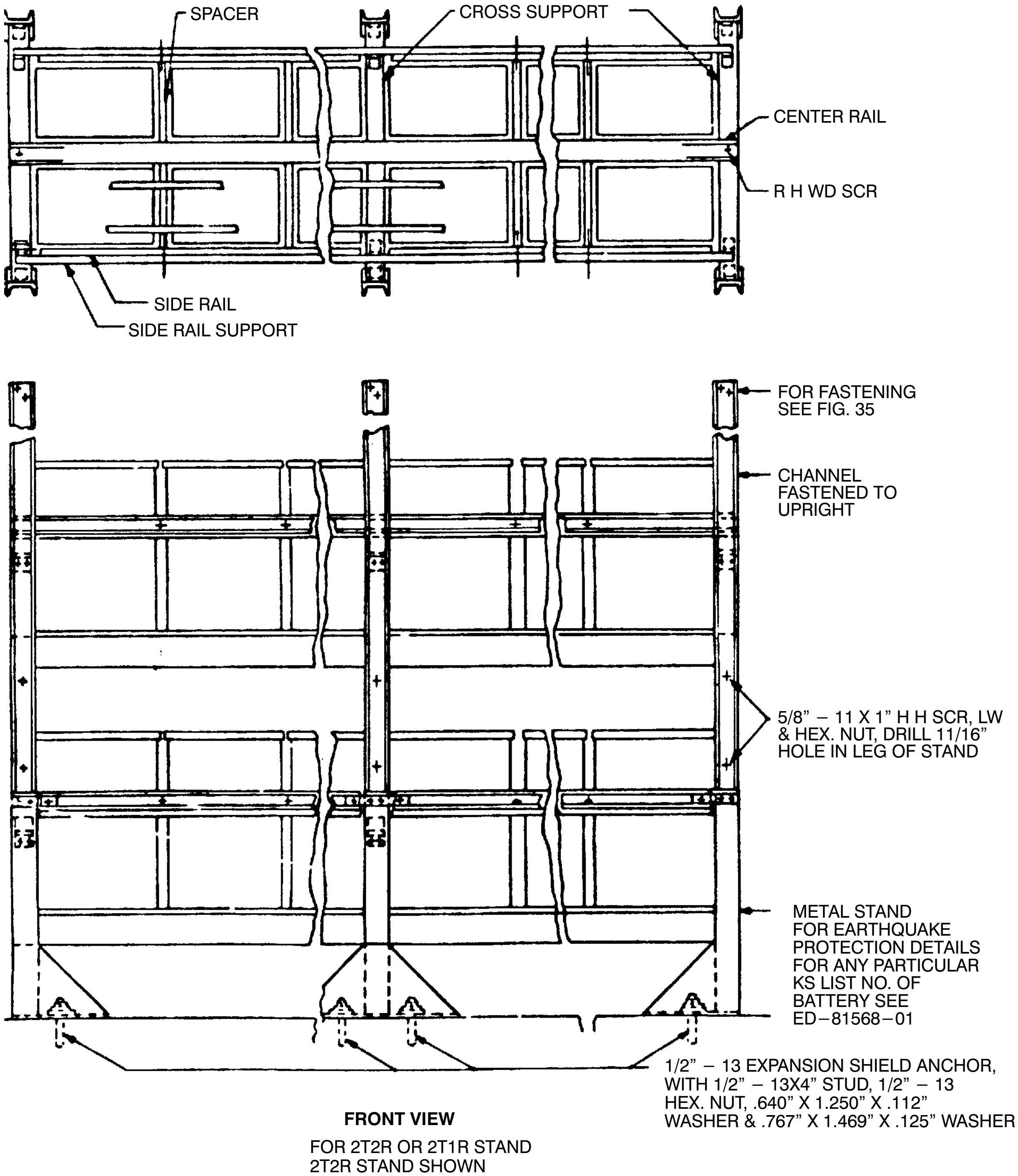


Figure 34 − Supports And Floor Fastenings For Metal Battery Stands Where Bus Bars Or Cable Racks Are Supported From The Ceiling

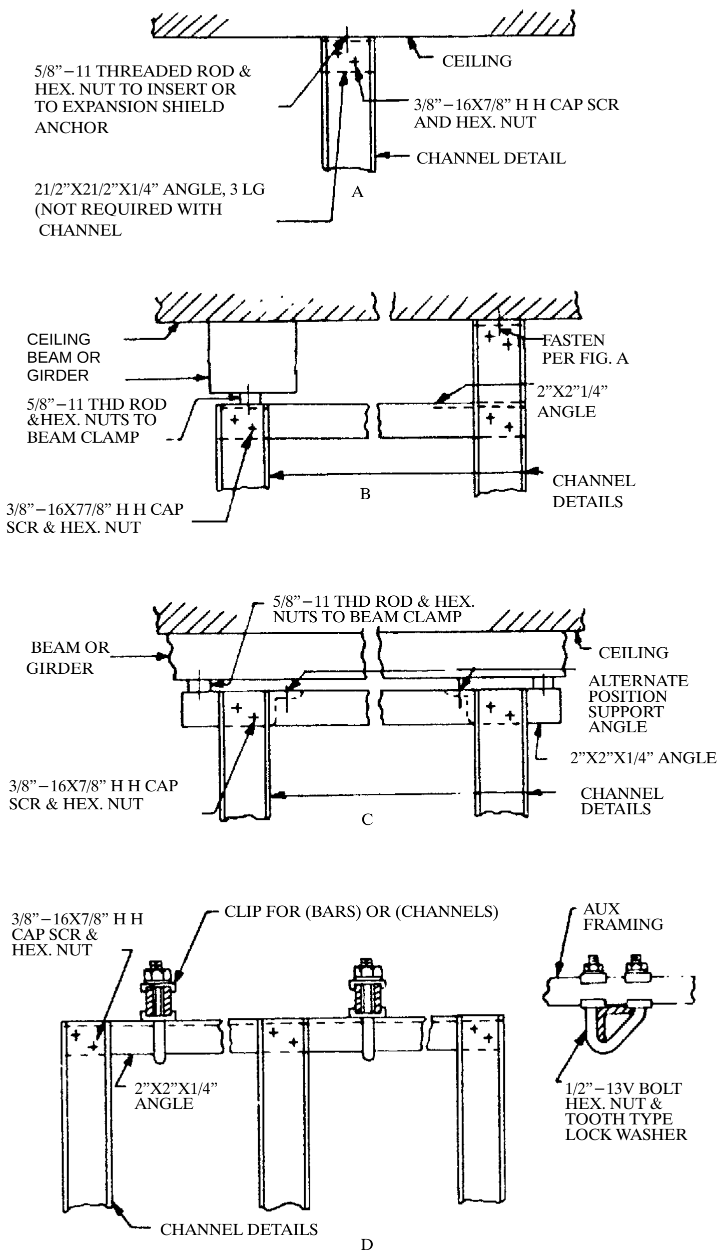


Figure 35 − Ceiling Fastenings For Isolated Battery Racks

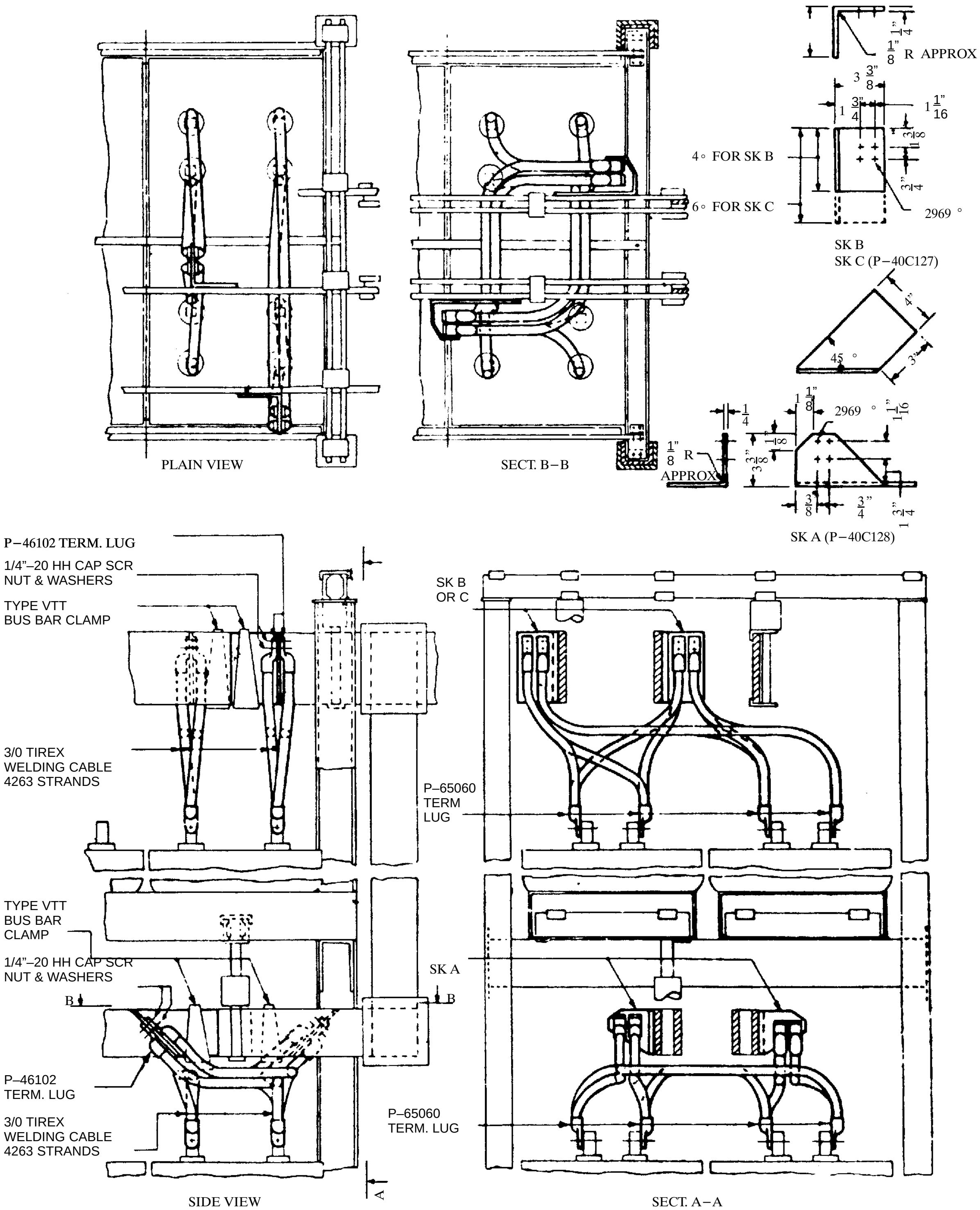


Figure 36 − Typical Arrangement Of Emergency Cells On Battery Stands Flexibly Connected To Bus Bars − 24 Or 48 Volts − 24 Shown

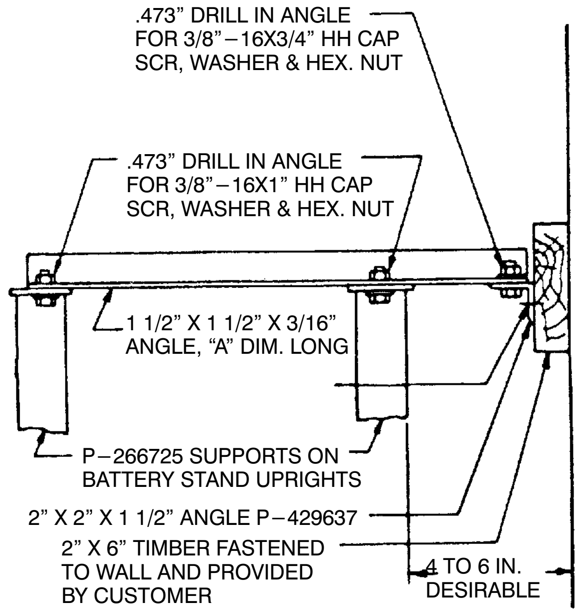


Figure 37 − Bracing Battery Stand Parallel To Wall

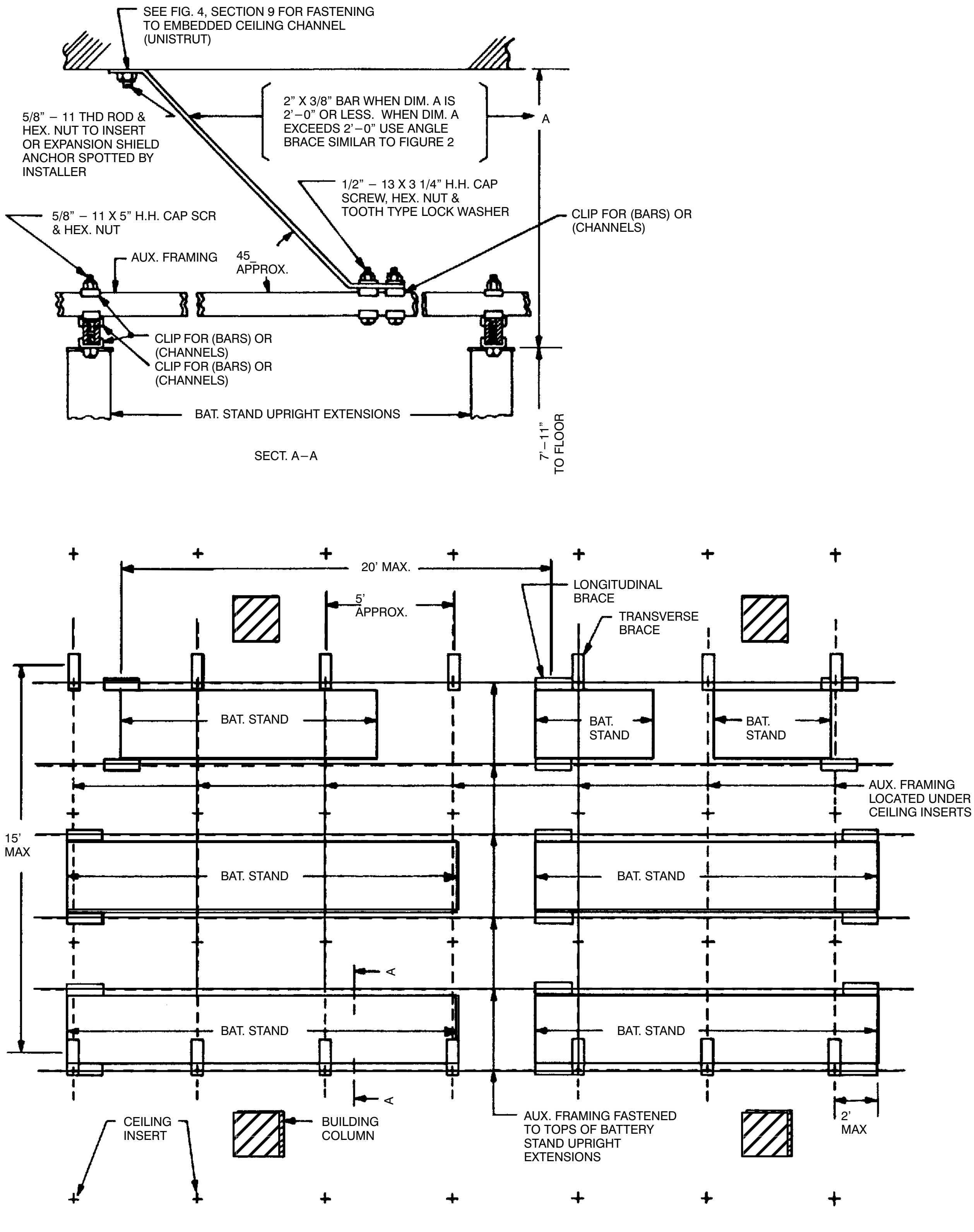


Figure 38 − Typical Arrangement Of Ceiling Braces For Metal Battery Stands Arranged In Parallel Lines

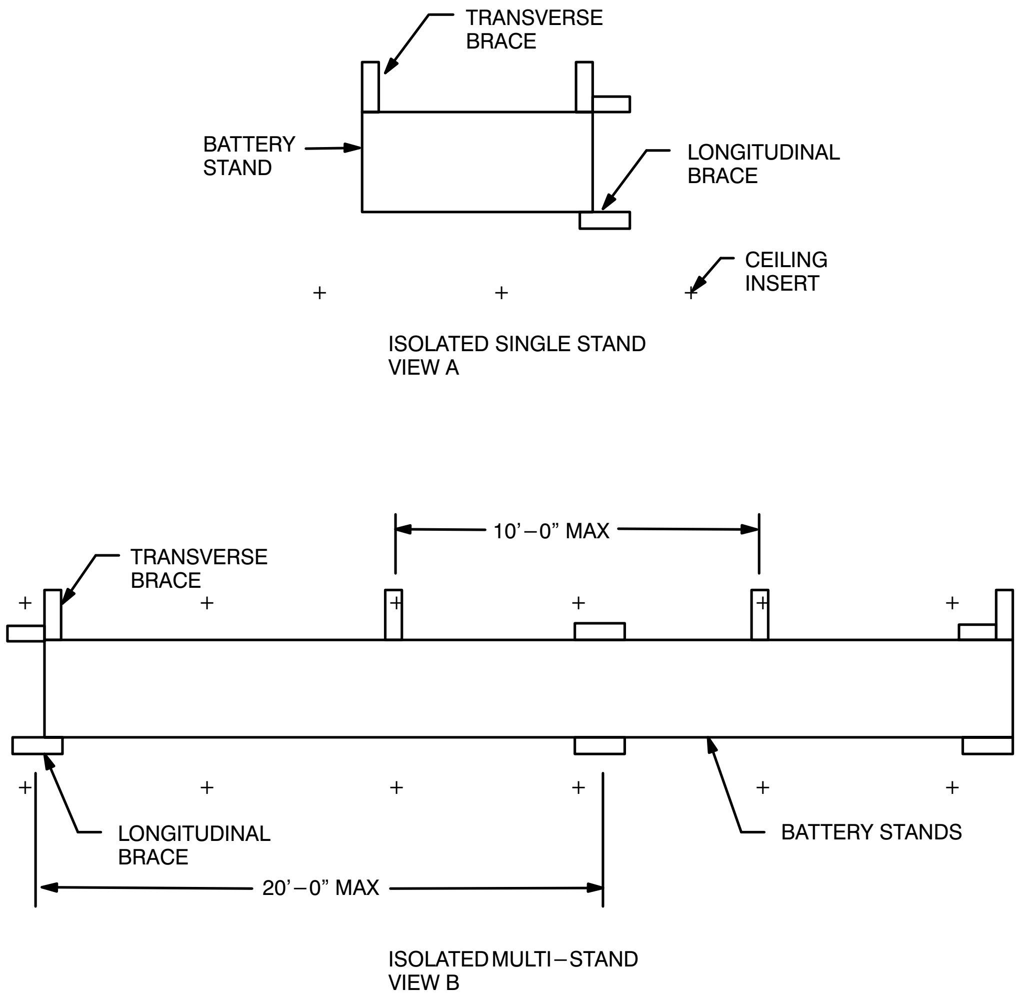


Figure 39 − Isolated Single And Multi−Battery Stands

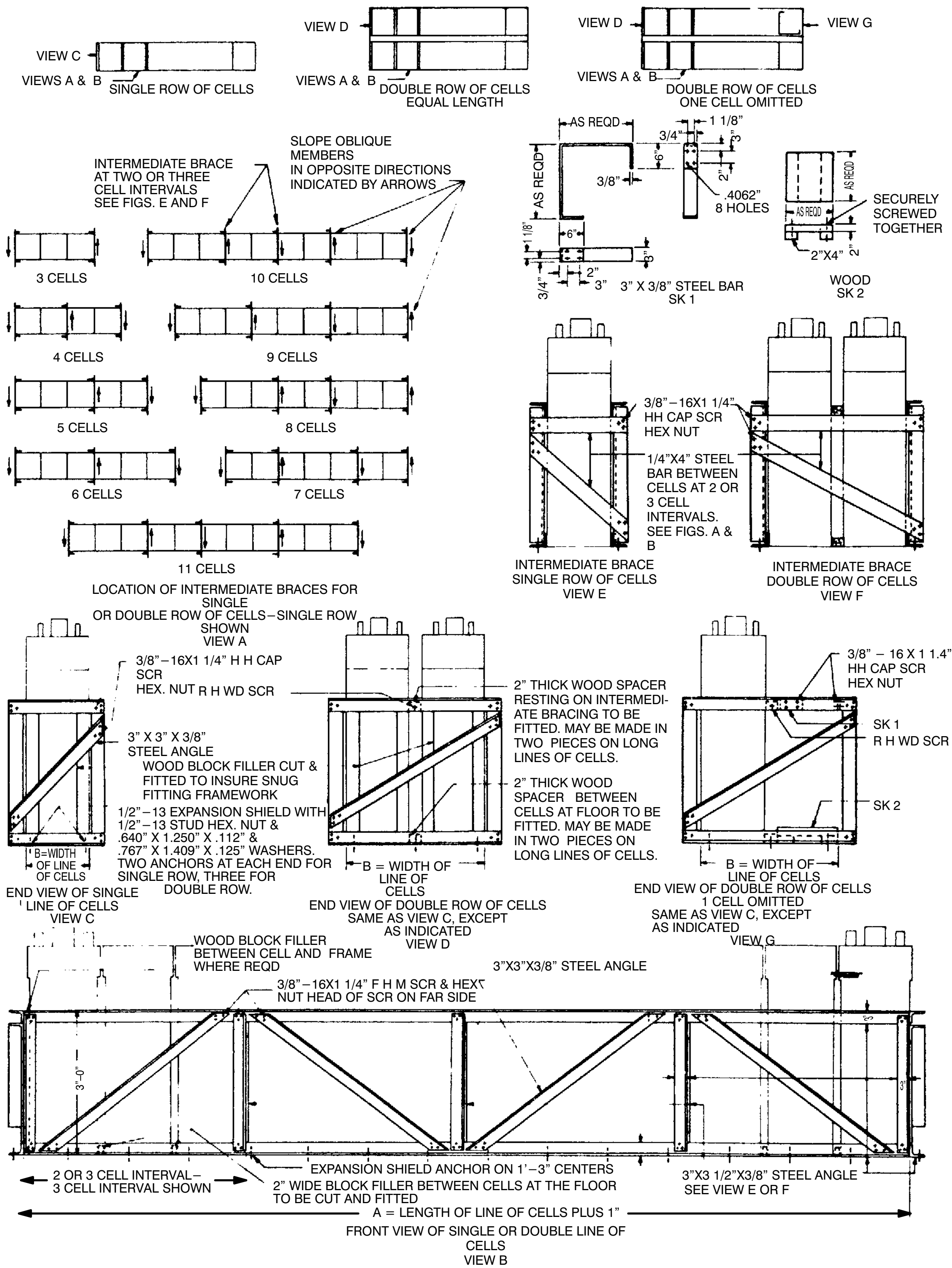


Figure 40 − Supplementary Supports For Large Sealed Batteries

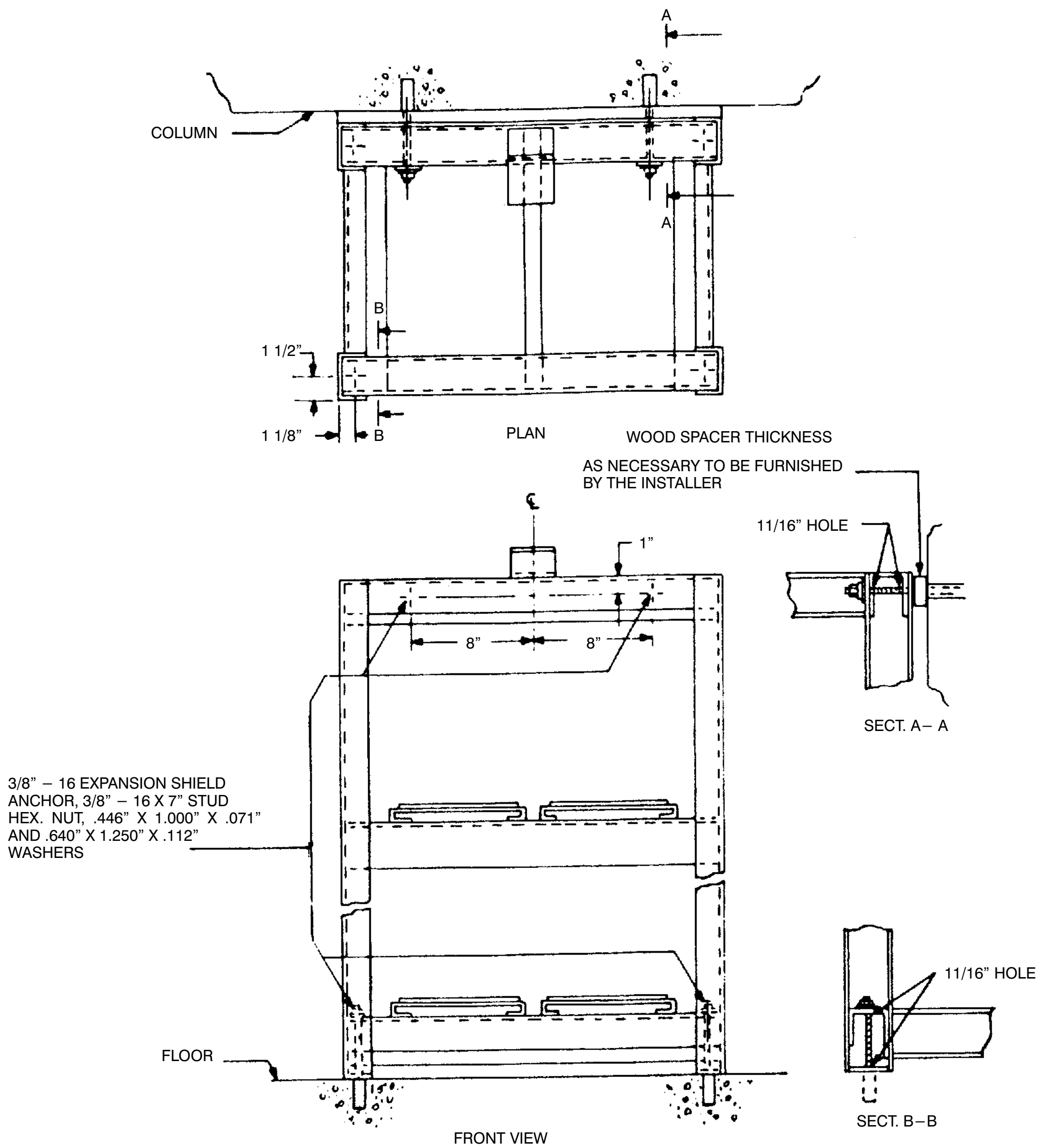
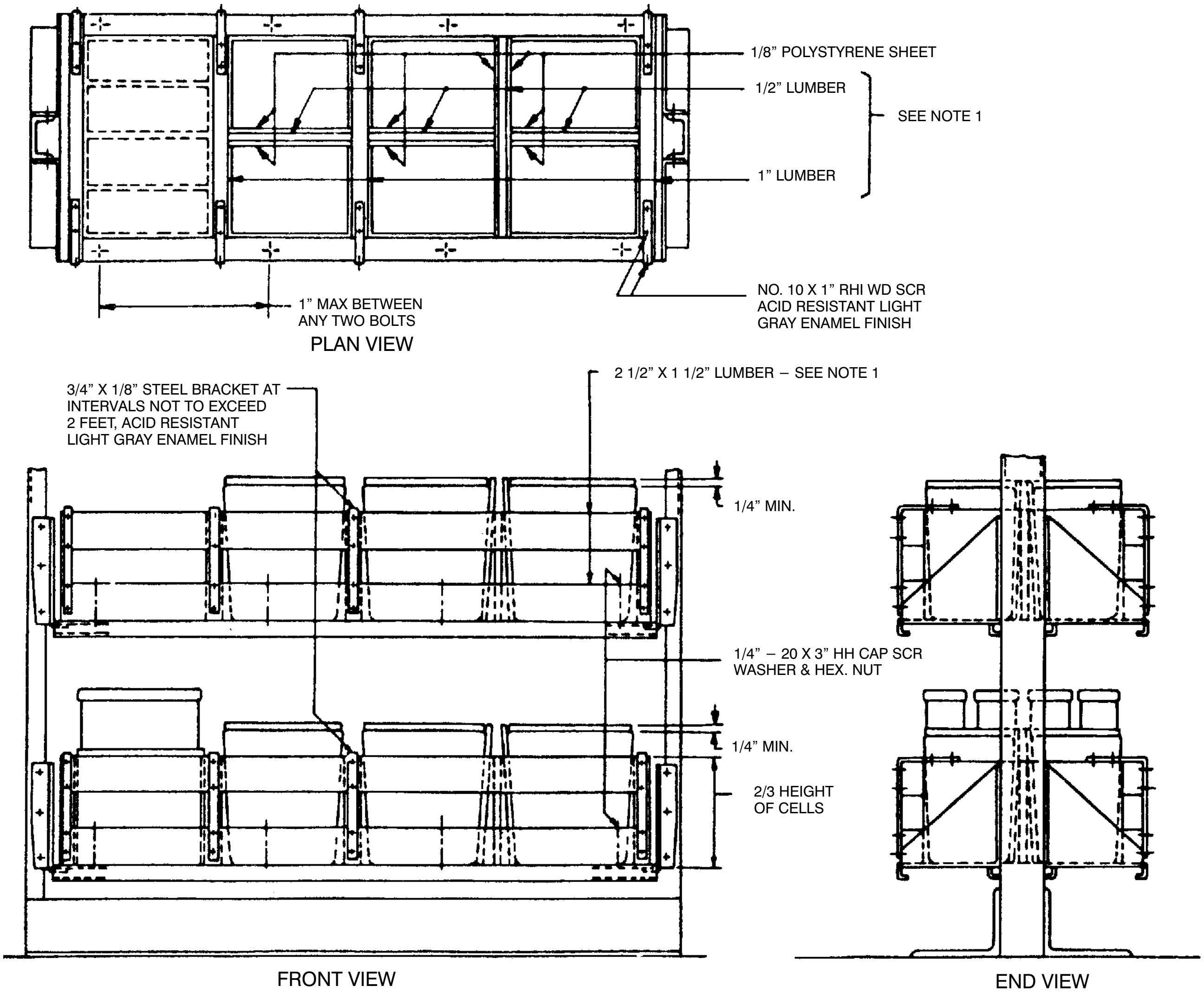


Figure 41 − Floor−Supported Battery Cabinets − Floor And Top Fastening



NOTE:
1. ALL WOODEN PARTS SHALL HAVE A GRAY ACID−RESISTANT 118AS FINISH OR 3 COATS,ONE DAY APART, OF GRAY ACID−RESISTANT ENAMEL WL−58751, IF FINISHED BY THE INSTALLER.

Figure 42 − Supports For Batteries On Relay−Rack−Type Battery Shelves

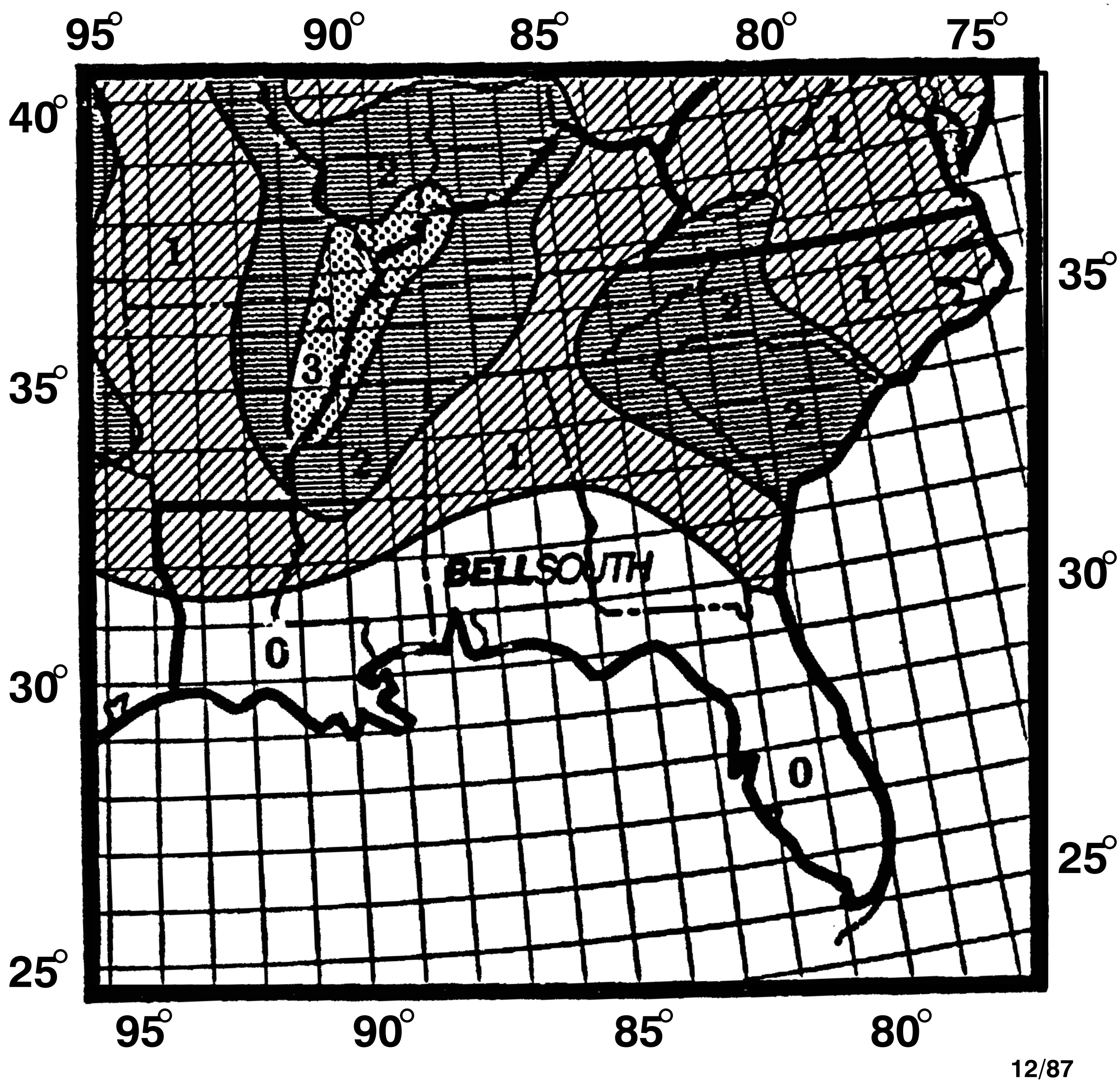
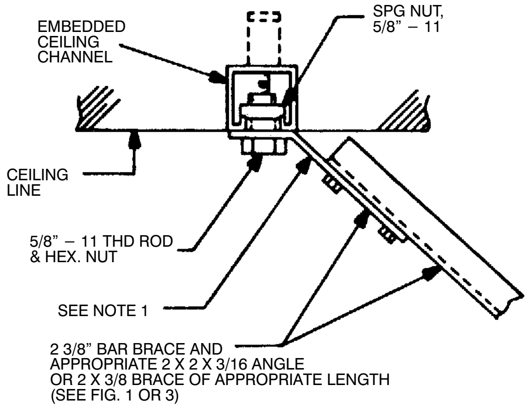


Figure 43 − Bellcore Earthquake Zoning Map Of The BellSouth Region



NOTE:

1. WHERE IT IS NECESSARY TO USE PARALLEL BRACING (IN LINE WITH THE UNISTRUT), 2" X 3/8" BRACE AND 2 X 2 X 3/16 ANGLE OR APPROPRIATE 2 X 3/8 BAR BRACE SHALL BE USED WITH 2, 1/2−13 H H CAP SCREWS AND 1/2−13 SPG NUTS.

Figure 44 − Fastening Auxiliary Framing Brace To Embedded Ceiling Channel (Unistrut)

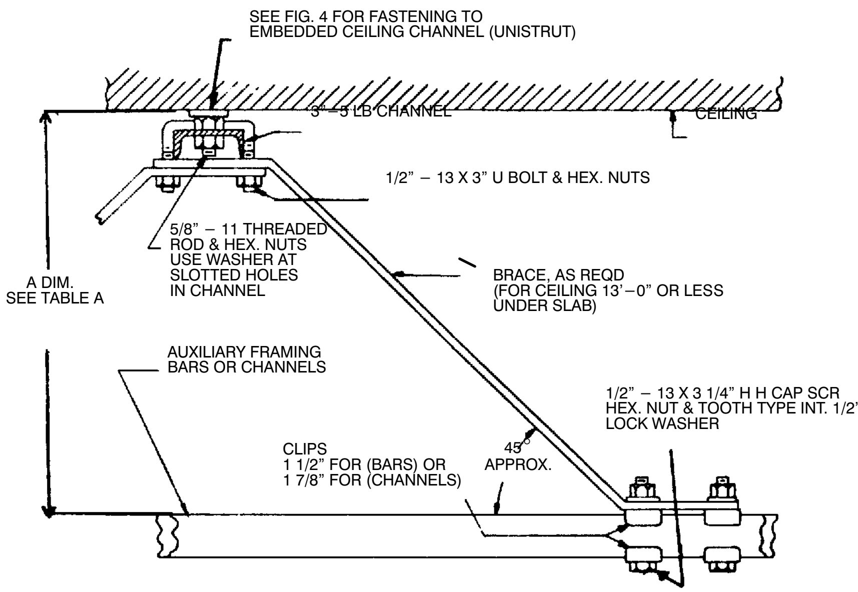


Figure 45 − Auxiliary Framing Brace For Use In Low−Ceiling Areas

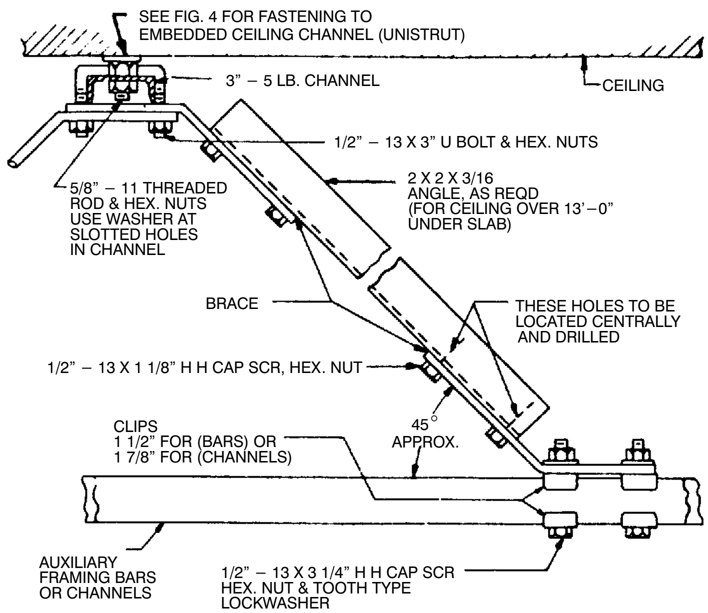


Figure 46 − Auxiliary Framing Brace For Use In High−Ceiling Areas

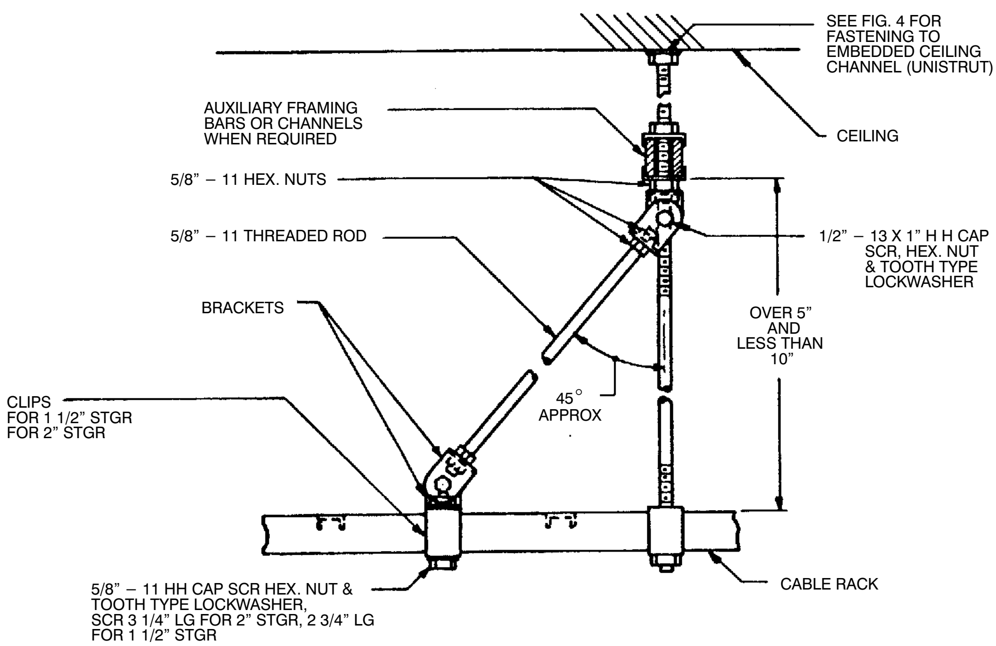


Figure 47 − Endwise Bracing Of Ladder − Or Bar−type Cross−Aisle Cable Racks With Threaded Rod Braces−−Ladder Type Shown

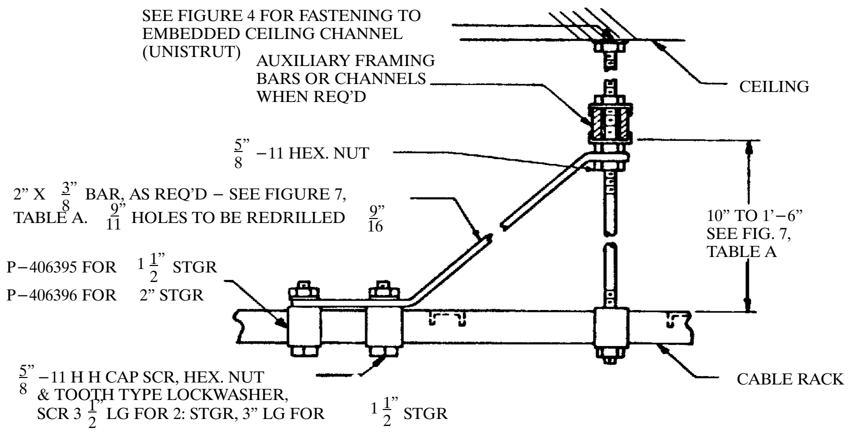


Figure 48 − Endwise Bracing Of Ladder−Or Bar−Type Cross−Aisle Cable Racks With Flat Bar Braces− −Ladder Type Shown

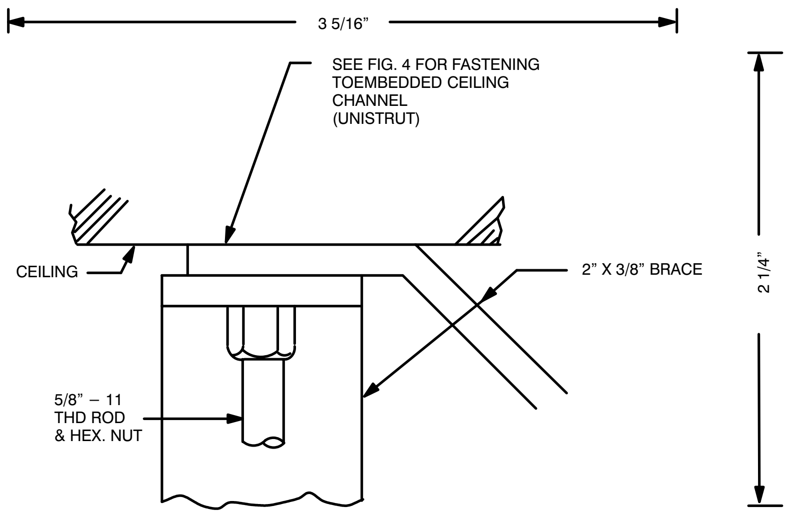


Figure 49 − Perpendicular Bracing Using A Spacer Between Brace Feet

SECTION 27	Effective Date January 4, 1999	Page 1 of 1

★★

CHANGE:	DATE	REVISION LEVEL
1. Change Paragraph 3.9, 5.5, 6.5 2. Delete Paragraph 13.6	10/01/97	G
Remove the word "flooded" in Paragraph 7.28 Change Paragraph 7.28 (B) Add Paragraph 7.28 (F)	1/4/99	G

POWER/FRAME AND AISLE LIGHTING SECTION INSTALLATION PROCEDURES

CONTENTS

POWER/FRAME AND AISLE LIGHTING SECTION INSTALLATION PROCEDURES

1. Introduction

1.1 This section addresses the general requirements for the installation of power equipment and associated systems. This section is to be used in conjunction with the job documentation and the applicable sections of the BellSouth Engineering and Installation Standard − Central Office Equipment.

1.2 The requirements in this section are general in nature and not all inclusive.

2. General

2.1 The appropriate section(s) of this document should be reviewed prior to the start of power related activities. Special attention should be given to Safety, Prevention of Service Interruption or Degradation, Building Facilities Access, Building Facilities Security, Protection of Premises and Equipment, Hazardous Material, Preparation of Method Of Procedures and all associated General and Workmanship Requirements.

2.2 The safety precautions and equipment protection information in this section is not intended to be all inclusive. Additional items, conditions, local issues, etc., may need to be discussed and agreed upon prior to the start of job activities. The additional agreed upon items shall be outlined in an approved MOP.

2.3 Although the National Electric Code (NEC) does not apply to telecommunications equipment installations, the installer shall complete any work involving AC power in compliance with the current NEC. When local laws or ordinances (city, county, or state) apply more stringent requirements, the installer shall adhere to the local law or ordinance.

2.4 In central office applications, all branch circuits to the power plant rectifiers shall be hard wired to the rectifiers. Twistlock AC plugs with flex power cords are acceptable at remote locations when specified by the manufacturer.

3. Precautions

A. General

3.1 The nature of a power room environment presents potential hazards to personnel and/or service. The Installation Supplier shall not allow installers to work in a power room until they are familiar with power room hazards and proper work procedures.

3.2 Prevention of service interruption or degradation is the joint responsibility of BST and the Installation Supplier.

B. Power Equipment

3.3 The safety requirements and suggestions in this section shall not be interpreted as a complete list of safety requirements for power installations. All OSHA and local safety rules shall be complied with. The Installation Supplier is responsible for providing a safe working environment and insuring compliance to all applicable national and local safety and electrical codes.

3.4 Safety glasses shall be worn at all times during job activities.

3.5 Remove rings, watches, dangling keys, jewelry, etc., during all job activities in the area of power equipment and batteries.

3.6 When it is essential to work on energized circuits, two people shall be present. Both individuals shall be aware of the hazards involved, the measures required to avoid accidents and the actions necessary in case of emergency.

3.7 Prior to making any DC power connection, verify that the polarity of the components to be connected is correct. Also, before establishing the connection, verify that the voltage potential difference is less than 0.50 volts between the components being connected.

3.8 While work is being done on AC circuits or supply circuits of 48 volts or greater, fuses shall be removed or switches opened whenever it is practical to do so without causing a service interruption. The Installation Supplier shall place a lockout tag meeting OSHA requirement on fuse clips or switches when electrical potential is removed in order to work on the circuit. This tag shall only be removed by the person responsible for the work being performed.

3.9 Protect bus bars with insulating materials when working in their vicinity. Use Masonite sheet fiber, rubber mats, or protective sheet fiber as insulating barriers. When working on power boards or cabinets with metallic enclosures, the adjacent metal structures shall be protected with insulating material. Metallic objects adjacent to live bus bar shall be insulated when work activities are to be performed on the bus bar.

CAUTION: The use of AC powered electrical tools (drill, band saw, etc.) shall not be used on live bus bars.

3.10 Metallic tools that will be used on or in the area of working equipment shall be insulated. Factory insulated tools are preferred; taped tools are acceptable only when factory insulated tools are not available. Taped tools, when in use, shall be triple overlapped taped and not capable of causing a short circuit.

C. Battery

3.11 Lead and lead oxide are hazardous to your health when ingested or absorbed through the skin. Care should be taken to avoid inhaling dust particles. Use a mask to prevent inhalation (or ingestion) of lead dust and gloves when using a brush to clean lead and lead coated parts (i.e., posts, straps). Wash your hands regularly, especially before eating, drinking, or smoking. All personnel involved in the handling and installation of batteries or cells should be properly trained and familiar with procedures for safety and first aid, particularly eye safety.

3.12 Shipping vent plugs shall be firmly in place while moving and/or handling cells. Explosion proof vents shall be installed prior to charging the cells.

3.13 All first aid supplies must be on the site before the job begins. Particular attention shall be paid to EYE WASH SOLUTIONS! Portable eye drenching facilities will be required to supplement existing CO facilities if there are none near the installation area. Use of shower curtains or plastic sheets may be necessary to prevent liquids from splashing onto equipment.

3.14 Protective gloves, aprons and face shields or safety glasses with side guards shall be worn when acid or battery cells are being handled and when taking battery readings with a hydrometer or a thermometer.

3.15 Open flames or spark producing equipment is prohibited near battery cells, without special written BST approval.

3.16 Adequate supplies of neutralizing and absorbing materials shall be on hand and in close proximity to the cells being worked on or otherwise handled. This requirement shall apply from the time any new cells enter a facility through the completion of a job, including the removal of any old cells from the facility.

Suggested materials include, but are not limited to:

Neutralizers: baking soda, sal soda (washing soda) or soda ash (enough to neutralize all of the acid in a cell or minimum 50 lb.)

Absorbent: vermiculite, clay grease sweep (kitty litter), rice hull ash or synthetic absorbers, (enough to absorb all of the acid in a cell or minimum two 32 gal. drums).

NOTE: **Present day combined Neutralizer/Absorbent are preferred over separate Neutralizers and absorbents. One such compound is available from the Charles E. Singleton Co. of FL., PID# 058923442, available in 5 gallon containers. (enough to absorb all of the acid in a cell or minimum 15 gal.).**

3.17 A roll of two inch acid resistant tape or duct tape shall be available to wrap or seal a cracked cell in an emergency.

3.18 The following is the suggested sequence of emergency procedures in the event of a large spill (a large spill is defined as greater than one gallon) or breakage of a cell/battery:

(a) Take care of any injuries to personnel.

(b) Contain the spill.

(c) Place absorbent on the spilled electrolyte.

(d) Mix neutralizer into the absorbent.

(e) Place all debris and contaminated absorbent in approved containers (See Section 21). Avoid making containers too heavy.

(f) Notify the BST Building Service Center (BSC) at 780−2740 (Southern Bell area) or 557−6194 (South Central Bell area).

(g) Notify appropriate BST personnel (refer to MOP).

(h) Do not dispose of waste without referring to Section 21 of this document, Hazardous Material Disposition. See Section 21 for additional information on neutralizing solutions, absorbent materials, and clean−up procedures.

3.19 Avoid handling cells during charge and for 24 hours after completion of charge. This is a safety precaution because cells emit highly flammable gases during and after charging.

4. Assembly

A. General

4.1 Refer to the Earthquake and Disaster Bracing For Central Office Equipment Section (Sections 9 and 26) for supplementary measures to be followed in the supporting and fastening of power equipment areas subject to earthquake shocks.

B. Battery Stands/Racks

4.2 The following are minimum distances between a stand and other objects. Notify the Capacity Manager if a minimum condition cannot be met.

(a) All two row stands must have a minimum of 30 inches clearance at the sides to any other battery stand, wall, or equipment bay (or greater, if floor loading requires the extra space).

(b) All single row stands may be placed within 3 inches of a wall on one side.

4.3 Single row stands or battery stands higher than two tiers must be braced horizontally and should not be used unless specifically called for by the Capacity Manager.

4.4 There shall be a minimum clearance of 1/8 inch between cells, sides of cells and the stand end brackets and side rails where cell separators are not required to meet earthquake requirements. The Installation Supplier shall notify the Capacity Manager if the above clearance cannot be obtained. Cell separators shall meet BellSouth flammability requirements. VRLA battery applications may not have adequate physical space to satisfy this requirement.

C. Bus Bar

4.5 Bus bars shall be positioned, assembled, aligned, braced,designated and installed as specified in the job documentation and this document. Aluminum bus bars shall be used only to extend or supplement existing aluminum installations. New bus bar installations shall be of copper.

4.6 Bus bar runs supported by ceiling inserts, threaded rods (5/8 inch) and/or auxiliary framing channels shall be braced, on both sides and lengthwise.

4.7 Bus bar splice plates with plant voltage potential, located outside the Power Plant environment (e.g., above or below secondary power distribution frames, cable rack, auxiliary framing, etc.) shall have each bus bar and its associated power cable connectors wrapped with two half lapped layers of friction tape (or an approved equivalent) or shall be equipped with noncombustible covers. Ground bars or current return bars shall not be wrapped with tape.

4.8 Bus bar splice joints shall be overlapped a minimum of the width of the bus bar (perpendicular to) and a maximum of two inches wider than the width (in line).

5. Overcurrent Protection Devices (Fuses & Circuit Breakers)

5.1 All alarm pilot fuse positions shall be connected initially whether or not the associated non−indicating fuse position is equipped or vacant.

5.2 Cartridge and knife type fuses shall be cleaned and coated with a thin film of NO−OX−A before installation or before being placed into a fuse holder or a spare fuse panel.

5.3 Fuse position contacts shall be cleaned and coated with a thin film of NO−OX−A prior to fuse installation (on contact surfaces only).

5.4 Spare fuse holders or panels shall be secured to wall, column, or equipment as specified in the job documentation. **This panel shall be stocked with at least one spare of every size of fuse that is used in the associated plant, and those spares shall be treated with "NO−OX−A" before being placed in the holder.**

5.5 Spare fuses shall be turned over to the Central Office Personnel at job completion.

5.6 All cable holes shall meet the requirements specified in the job documentation and Firestopping Requirements for Floor and Wall Openings (Section 24).

6. Connecting

6.1 Refer to Connections, Section 23 (live feeders, compression connections, bus bar), and other appropriate sections, and the job documentation for additional information on various connecting methods, procedures and requirements.

6.2 When installing battery distributing fuse boards, power boards, fuse panels, etc., all alarm wiring shall be connected initially(for all fuse positions) and verified for continuity whether the locations are to be fused or to be make spare.

6.3 When utilizing a spare fuse position in a battery distributing fuse board or power board the wiring for the alarm fuses shall be verified for continuity.

6.4 As a general rule, fused and unfused battery cables shall not be run on the same cable rack. If circumstances in some particular case necessitate this, the Capacity Manager shall be contacted for concurrence, and the unfused leads must be marked in some distinctive manner every four inches.

6.5 Battery charge and discharge cables, if run on the same rack, must be run on opposite sides of the rack with at least a 3 inch separation.

6.6 Battery supply and return cables shall be run in pairs by polarity and shall be placed on cable racks in as close proximity as possible.

6.7 Reference ground bars and power plant ground bars provided by the vendor must be equipped to terminate two hole lugs with 1" centers. Bars must be arranged to provide connections in sufficient number for all provided distribution and plant equipment, and to facilitate growth to the maximum number of leads and current that may reasonably be expected for the office and the plant.

6.8 Cable termination lugs must be placed directly onto the surface to which they are to be connected. It is not allowable to stack two or more lugs on top of each other. However, they can share holes with one on front and one on back of bus bars.

7. Batteries

A. General

7.1 Safety, equipment protection and equipment service is critical when working with live circuits. Refer to other appropriate sections and the job documentation for additional information.

7.2 Many of the paragraphs in this section deal with flooded lead acid batteries commonly found in central office applications and are not applicable for Valve Regulated Lead Acid (VRLA) batteries commonly found in remote locations. Many procedures for VRLA batteries are being revised by the industry to minimize the potential of thermal runaway. As these procedures are developed, they will be added to this document.

7.3 The Installation Supplier shall follow manufacturer's documentation for instructions on unpacking and inspection of new cells. See also subsection D of this section.

7.4 Batteries shall be positioned, assembled, aligned, connected, designated and installed as specified in the job documentation.

7.5 The cleaning products to be used on battery cells and posts shall be of the type specified in the manufacturer's installation documentation. The Installation Supplier shall contact his engineering representative for information when such information is not provided in the cell manufacturer's documentation. The materials and procedures for cleaning and preparing cell posts for connection shall be outlined in an approved MOP.

7.6 Cells from different manufacturers, of different capacities, or of different construction shall not be placed in the same string. Cells from different manufacturers may be placed in parallel strings.

7.7 Before installing a string of batteries, a cell shall be designated as a pilot cell. The pilot cell shall be the cell having the lowest specific gravity before initial charge. This cell shall be placed in the center of the string. A pilot cell shall not be placed at the end of the row of cells, next to a radiator, window or over a counter cell. When more than one string is charged in parallel, it will be necessary to select a separate pilot cell for each string. Record the pilot cell number in the appropriate box on the battery charge report.

B. String Transitions

7.8 The Installation Supplier shall obtain, from the Power Capacity Manager, the required battery reserve time to be maintained during string transitions. The Installation Supplier and the Capacity Manager shall determine the sequence of events during transition and installation. The Installation Supplier is responsible for providing transition strings with enough battery capacity to meet the reserve time specified. The Installation Supplier is responsible for the condition and capacity of the transition string(s). The details of the string transition shall be included in the MOP.

7.9 The battery string float voltage must be stable − not under discharge nor recharge at the time of opening the string. Only one string should be taken off line at a time. When opening a string, cover cable ends (after removing bolt assemblies) with thick insulation (if using tape, three layers are the minimum).

7.10 New or transition strings shall not be connected to a battery plant when the voltage difference is more than 0.5 volts. It is preferable to raise the transition string voltage to meet the power plant voltage when it is necessary to adjust voltages to meet the requirement above. If, as an alternative, a decision is made to lower the plant voltage,it shall be done in the presence of an observer and the plant voltage shall never be lowered more than 4.0 volts on a nominal −48 volt plant and 2.0 volts on a nominal +24 volt plant.

In all cases, the plant voltage shall be kept within the operating limits of the equipment served by the battery plant.

C. Hardware And Accessories

7.11 Flat washers marked 316 may have one sharp edge. Place this edge away from the lead plated copper intercell connector to avoid damaging the lead plating. The Installation Supplier shall use the battery manufacturer's recommended bolt sizes for post connections.

7.12 Flooded lead acid battery cells are equipped with explosion proof vents with dust caps (located on the top center of the cell) and shipping plugs/caps for the electrolyte draw off tubes. **WHEN CHARGING CELLS OR MAKING CELL CONNECTIONS, THE EXPLOSION PROOF VENTS SHALL BE FIRMLY IN PLACE FOR THESE CELLS.**

The shipping plug shall be removed, neutralized, rinsed in plain water and turned over to BST and the vent funnel shall be installed in its place prior to initial charge.

7.13 Cables for flooded lead acid cells of 1680 ampere hours or less shall be terminated directly at the cell posts with lead plated compression connectors. Cell plates may be used for the higher ampere hours rated cells.

7.14 All new batteries of 840 Ampere−hour capacity or greater must be arranged with a redundant set of inter−cell straps, and inter−tier and inter−row cables in such a manner that one set of straps can be removed for maintenance purposes without interfering with the second set of straps, i.e., without opening continuity of the string. NOTE: Redundant straps sharing bolting hardware on the same battery post <u>do</u> <u>not</u> satisfy this requirement.

D. Cell Unpacking And Inspection

7.15 The Installation Supplier shall closely inspect all batteries shipped to the job site (prior to installation) to identify any physical damage, defects or problems that may prevent their proper installation, maintenance and/or operation such as:

(a) Breaks in the container to cover seal.

(b) Crooked posts.

(c) Plates improperly supported on the bottom bridge.

(d) Loose paste material between the container wall and interior.

(e) Bent or broken internal parts.

(f) Cracked container or cover.

(g) Scratched, gouged or chipped container or cover. Indentations of more than 1/64 of an inch should be reported.

(h) Hairline cracks around the cell and post.

(i) Small dots on the post or early signs of post porosity.

(j) Uneven gaps or flaws in the cover.

(k) Crystals on plates.

(l) Low (touching plates) or high (at or above upper level mark) electrolyte level.

Notify the Capacity Manager if the conditions above are encountered.

E. Preparation Of Cell Posts And Straps For Connection

7.16 The Installation Supplier shall refer to the job documentation and cell manufacturer's documentation for specific requirements and precautions for cleaning and treating cell posts. If the cell manufacturer does not have recommended procedures for cell post cleaning and preparation, then the Installation Supplier shall contact the Capacity Manager for direction. The materials and procedures for cleaning and preparing cell posts for connection shall be outlined in an approved MOP.

7.17 Cell posts, battery straps, and lead plated lugs are lead coated surfaces. These surfaces shall be cleaned per battery manufacturer's specifications. Power tools shall not be used when cleaning lead plated surfaces. Do not install cell straps or other lead plated contact surfaces which have exposed copper. If a cell post has any exposed copper it shall not be installed. Notify the Capacity Manager if the conditions above are encountered.

7.18 Before connecting the straps to the battery cell terminals verify the posts are lightly coated with NO−OX−ID "A Special" compound and are free of dust or dirt on the compound. If the compound has been contaminated remove it by wiping lightly with a clean cloth and re−coat. At no time shall battery intercell connector post or straps be filed, scraped, sandpapered or brushed with a stiff wire brush as this will remove the protective lead coating. Apply NO−OX−ID "A Special" compound using a typewriter brush or similar stiff brush to coat all post and intercell connector surfaces in contact with the post and the threads of connector bolts.

7.19 Compression connectors for batteries/cells shall have a closed barrel transition in order to protect the conductor end from moisture and other environmental conditions.

F. Moving And Installing

7.20 All battery connections shall be tightened per torque requirements as specified by the manufacturer using a release type torque wrench.

7.21 Factory markings which identify matched cells shall be identified on the cell. If the cell does not have a production date, then the installer will stencil the installation date on the battery stand, battery shelf, or other readily readable location.

DO NOT PLACE UNMATCHED CELLS IN NEW BATTERY STRINGS.

7.22 If an individual flooded lead acid cell needs to be replaced then the new cell shall be charged following the manufacturer's documentation and the entire string shall be boost charged whenever possible. VRLA batteries should not be boost charged.

7.23 The moving, installation, and positioning of cells shall follow the cell manufacturer's documentation.

7.24 The first and last cell should not be positioned next to each other or side by side on a two row stand. A suggested arrangement on a two tier stand is to place the number 1 cell on the bottom row and the last cell directly above it. Number the cells consecutively with number 1 at the ground end of the string.

G. Cell Charging

7.25 There are various methods of charging cells and cell strings. The method used shall be discussed and agreed upon prior to job start, detailed in the MOP and authorized by the Capacity Manager.

7.26 Charging rates vary with manufacturer, size and type of battery. The installer shall follow the initial charging specifications as provided by the manufacturer and/or specific instructions provided by the Capacity Manager.

(a) After the initial charge, the battery string(s) shall be floated for a minimum of 72 hours.

(b) New cells over one year old should not be installed. Notify the Capacity Manager if this condition is encountered.

7.27 The Installation Supplier shall ensure that proper ventilation is present during the charging process. Warning signs must be placed near the charge area.

7.28 The following requirements shall be met prior to a lead acid battery string being turned over to BST. The Installation Supplier shall notify the Capacity Manager if these requirements have not been met prior to job completion.

(a) The cell string has been connected to the plant and on float for three or more days.

(b) Float Voltage Requirements

(1) Flooded Rectangular and Round cells with a nominal specific gravity of 1.215 +/− 0.005 shall operate with a float voltage of 2.17 +/− 0.01 volts per cell. Cells outside the limits of 2.13 V and 2.22 V shall be replaced Reference Bellcore TR−EOP−000232, "Generic Requirements for Lead−Acid Storage Batteries", Issue 1, June 1985.

(2) Valve Regulated cells shall operate with a float voltage as recommended by the manufacturer or as specified by the Capacity Manager. Nominal float voltage for VRLA batteries is 2.25 +/− 0.01 volts per cell. Cells outside the limits of +/− 0.05 V per cell from the specified float voltage shall be replaced.

(c) All cells with clear container shall be free of lead sulfate crystals.

(d) Battery charge record information shall have been measured and documented at proper intervals.

(e) Job documentation (e.g., Battery Charge Records, job specification, etc.) shall have been turned over to the Central Office Maintenance Personnel.

(f) Manufacturer provided documentation supporting cell matching compliance, shall be turned over to Central Office Maintenance Personnel. Reference Bellcore TR−EOP−000232, “Generic Requirements for Lead−Acid Storage Batteries”, Issue 1, June 1985.

H. Electrolyte

7.29 The electrolyte level should be between the upper and lower level lines.

7.30 Use only distilled, deionized, purified or filtered water when adding to the existing electrolyte. If there is a question as to which type of water is appropriate for a particular cell, the Installation Supplier shall contact the Capacity Manager.

I. Charging Records

7.31 The Installation Supplier shall utilize the Battery Charge Record or equivalent for each string. Document the voltage, specific gravity, and presence or absence of lead sulfate crystals for each cell at time of turnover except for cells with opaque containers.

7.32 Document on the Battery Charge Record, the time, charge current, voltage and temperature of the pilot cell, at the following intervals:

(a) At the start of charge.

(b) Once each hour until the current is stable (except when using chargers of 20 amperes or less).

(c) Once each day after current is stable.

(d) Just before charging is stopped or temporarily discontinued.

(e) When charging is restarted and the charge current is stable.

7.33 Complete battery records shall be maintained by the installer for each battery string installed. The electrolyte in any cell shall be maintained at the level specified by the manufacturer.

7.34 All Battery Charge Records shall be turned over to the Network Operations Supervisor or Capacity Manager at the completion of the job.

8. Color Coding AC Branch Circuits

8.1 The following is BellSouth’s color coding scheme for all AC branch circuits which shall be used in all telephone offices.

(a) 120V, 2−wire circuit: Grounded Neutral − White; Hot Leg − Black.

(b) 240/120 V, 3−wire, single−phase circuit: Grounded Neutral − White; One Hot Leg − Black; One Hot Leg − Red.

(c) 208/120 V WYE, 4−wire, three−phase circuit: Grounded Neutral − White; One Hot Leg − Black; One Hot Leg − Red; One Hot Leg − Blue.

(d) 240V Delta, 3−wire, three−phase circuit: One Hot Leg − Black; One Hot Leg − Red; One Hot Leg − Blue.

(e) 240/120 V, 4−wire, three−phase High Leg Delta Circuit: Grounded Neutral − White; High Leg (208 V to Neutral) − Orange; One Hot Leg − Black; One Hot Leg − Blue.

(f) 480/277 V WYE, 4−wire, three−phase circuit: Grounded Neutral − Gray; One Hot Leg − Brown; One Hot Leg − Orange; One Hot Leg − Yellow.

(g) 480 V Delta, 3−wire, three−phase circuit: One Hot Leg − Brown; One Hot Leg − Orange; One Hot Leg − Yellow.

(h) The AC Equipment Ground (ACEG) lead is required and shall be one of the following:

  (1) Green

  (2) Green with one or more yellow stripes

  (3) Bare copper if part of the cable assembly (i.e., armored cable).

9. Conduit

9.1 In case of interference with any conduit runs, contact the detail engineer with a suggested rearrangement and correct drawings as required.

9.2 Conduit shall be securely fastened to the auxiliary framing channel/ceiling rods at intervals of 6 feet or less.

9.3 Conduit shall be supported within three feet of each box, cabinet or other conduit termination. The use of any insulated type conduit coupling which results in an interruption of the electrical path of the conduit or raceway for any AC distribution circuit is prohibited.

9.4 Junction boxes and cabinets with unused openings that expose AC wiring shall be equipped with covers or snap−in blanks.

Ends of conduit that are cut on the job shall be reamed to remove internal rough edges or burrs.

9.5 Where a conduit enters a pull box or other fitting, a bushing shall be provided to protect the wire from abrasion unless the design of the box or fitting is such as to afford equivalent protection.

9.6 Conduits carrying control or signaling leads (not AC current) that terminate in the open, such as over a frame or cable rack, shall be equipped with a bushing. A support shall be provided as close to the open end of this conduit as possible.

9.7 Conduit originating from an integrated ground plane and routed to or through an isolated ground plane (Electronic/Digital Switch), must be routed and isolated through the ground window as described in Section 11.

RIGID CONDUIT, ELECTRIC METALLIC TUBING (EMT), AND FLEXIBLE CONDUIT

9.8 Flexible Metal Conduit and Liquidtight Flexible Metal Conduit (Sealtight) are not to be placed on cable racks in BellSouth. Flexible Conduit can only be used when it can be segregated from insulated type cables (e.g., for vertical drops from raceways and/or junction boxes into a bay of equipment).

10. Armored Cable

10.1 Armored cable shall be run only in the location and manner shown on the job/manufacturer's drawings. Armored cable is not to be placed in cable racks in any BellSouth central offices. Armored cable can be secured to the outside of the cable rack, but cannot exceed more than three feet (one bay gap) on the side of the cable rack.

10.2 Insulating bushings shall be used between the armor and the conductors where the armor is terminated. Connectors per CK20785 or equivalent are to be used to terminate armored cable.

11. Unistrut

11.1 The cut ends of unistruts and/or threaded rods shall be painted to prevent corrosion. See Section 8 for support requirements.

11.2 Cable racks that are supported by unistruts shall only be used for AC cables and conduits.

12. Engine

12.1 The engine isolators shall be bolted to the floor per the manufacturer's documentation.

FRAME AND AISLE LIGHTING–INSTALLATION PROCEDURES

13. General

13.1 All frame and aisle lights shall be located so as not to interfere with cable racks, rolling ladders, ladder tracks, and auxiliary framing or other obstructions. The lighting units may he placed on either side of the ladder tracks. If lighting is required for a frame on only one side of the aisle, locate the lighting on the side of the ladder track away from the frame, if ladder track is present.

13.2 Lighting equipment and appliance outlet circuits shall not be supplied by the same branch circuit. Wiring for both shall be run in the same conduit wherever possible. Motor wiring shall be run in a separate conduit. A maximum of ten trolley–type appliance outlets may be installed on a single–branch circuit.

13.3 The installer shall follow the specific Installation drawings and CO Base Drawings associated with the proposed location of light fixtures, outlets, conduit and supporting details. Frame and

Aisle Drawings will completely identify all equipment and apparatus items, piece parts, fittings and conduit either by direct reference or by reference to drawings on which this information is provided.

13.4 When adding fluorescent light fixtures and receptacles greater than 120 volts AC, (Example: 277 volts) the installer shall have each end of the conductor identified with a “277 Volt Circuit Marker”.

13.5 An assignment table is located on the frame and aisle lighting drawing that provides the installer an assigned circuit breaker (amperage), voltage (120/277) and the number of light fixtures and allowable wattage assigned to each circuit.

GROUNDING − INSTALLATION PROCEDURES

CONTENTS

GROUNDING − INSTALLATION PROCEDURES

1. Purpose And Scope

1.1 This section defines the minimum generic requirements for the grounding and bonding of network equipment within BellSouth central offices, hut's and Controlled Environment Vaults (CEVs).

1.2 BellSouth has adopted Bellcore's TR−NWT−000295 (TR 295), "Isolated Ground Planes: Definition and Application to Telephone Central Offices" as the grounding standard for electronic switches and the associated isolated ground planes and power supplies.

1.3 This section is not a stand−alone document; it must be used in conjunction with the equipment documentation, detailed specification and the Telephone Equipment Order (TEO) to establish specific job requirements.

1.4 All installations shall comply with the National Electrical Code (NEC).

1.5 Product specific grounding/bonding requirements more stringent than this section shall be adhered to.

NOTE: **Conflicts between product requirements and this section, shall be referred to the Capacity Manager for resolution.**

2. Grounding Conductor Wiring Type

2.1 All exterior buried (ring ground) wire is to be #2 AWG bare solid tinned copper.

2.2 Interior grounding conductors which terminate on the COGB or GRD WD/MGB shall be a minimum #6 AWG insulated, stranded copper and green insulated per CK5482−H unless the system specifies otherwise.

EXCEPTION: **Building vertical and horizontal equalizers provided by P&SM are to be black THHN insulated coper cable.**

3. Grounding Conductor Wiring Methods

General

The detailed specification and CO base drawings shall provide the installer specific grounding instructions. This instruction will specify the cable route, type and size of cable, and originating and terminating locations. Deviations from these instructions shall not be made without prior approval of the engineer who provided the specific installation instructions.

3.1 Grounding conductors shall not be run on cable racks. They may be supported by brackets attached to the ironwork or run in non−metallic conduit. Individual grounding cables #2/0 AWG or smaller may be strapped (using non−conductive ties) to the outside of the cable rack stringers. Dedicated grounding racks are allowed, but are not preferred. If dedicated racking is used, a note is needed to the installer stating, cable rack(s) to be stenciled at ten foot intervals with "**GROUNDING CONDUCTORS ONLY**."

3.2 Grounding conductors shall never be secured to AC conduit or raceways. However, grounding conductors may be placed in a non−conductive housing and then secured to the AC conduit or raceways.

3.3 Vertical equalizer conductors shall be run exposed and supported at intervals of 10 feet or less.

3.4 Metallic supports which totally encircle grounding conductors are prohibited.

3.5 Grounding conductors shall not be run through any metallic object that totally encircles it(i.e., ladder cable rack rungs, V bolts, small cable holes. It is permissible to run grounding conductors from the switch through a 12" X 24" cable hole.

3.6 Non−metallic sleeves are required when routing grounding conductors through walls or between floors.

3.7 Grounding conductors (except for ACEG) shall not be run in metallic conduits or sleeves. For older buildings with existing grounding conductors in metal conduit, both ends of the conduit must be bonded to the conductor(s) with a #6 AWG stranded conductor as they enter and leave the conduit.

3.8 All equipment and power plant frames, power board sections, battery stands, and other metallic objects shall be individually solidly grounded to, or by a collector grounding conductor, bonded to the building grounding system. "Daisy chaining," or frame to frame connecting of these conductors is not permitted.

3.9 All grounding conductor paths between points shall be in as straight a line as possible. Changes of direction should be taken over as wide a radius as possible, minimum bending radius for a single grounding conductor shall be one foot.

4. Connecting Methods

General

Connectors shall be of the type and size specified in the job documentation and connector manufacturer's documentation. Only connectors that are UL listed and/or approved for use in BellSouth shall be installed. (Copper connectors are preferred.)

4.1 Grounding conductor connections shall be made so that conductors are dressed in the direction of the main ground reference whenever possible. Increased conductor length and bending radius are more important considerations than the direction of connection.

Surface Preparation

4.2 Metallic surfaces to be joined shall be prepared to a bare, bright finish. (Minimum 1/16 inch larger than the contact surface) Nonconductive coatings (such as paint, lacquer, oxidation, and enamel) on equipment to be grounded shall be removed from threads and other contact surfaces to ensure electrical continuity. NO−OX−ID "A" or an approved equivalent anti−oxidizing compound is required for all grounding conductor mated surfaces. Only a thin film of anti−oxidizing compound is required. Excessive amounts of anti−oxidizing compound could act as an insulator, and has the tendency to become contaminated with dust, metal shavings, and other particles.

NOTE: Ground connections of lug terminals is made through direct contact between the lug and the attaching material surface; not through the attaching hardware.

Wire Wrap Connections

4.3 Wire–wrapped connections for grounding conductors are the same as power terminations, and requirements are outlined in Section 23.

Cable Shields

4.4 All shielded wires/cables shall be grounded/bonded by connecting the sleeve to the ground terminal associated with the terminals for the enclosed leads. The installer shall refer to the wiring drawing for specific connecting information as many shielded wires are grounded at one end only. Additional cable shield requirements are outlined in Cable and Wiring Section 22.

4.5 Requirements for ground connections made to bay–frame uprights(i.e.,chassis ground, shield ground, etc.) using #10 to #22 gauge wire are outlined in Section 23.

Compression

4.6 Only two hole type connectors that are UL listed and/or approved for use in BellSouth shall be installed, to prevent rotation and loosening.

4.7 All splices, joints, and the free ends of conductors shall be covered with an insulation equivalent to that of the conductors or with an insulating device suitable for the purpose.

EXCEPTION: C tap connections in the green wire or bare stranded wire grounding systems do not have to be covered.

4.8 Requirements for compression and H/C tap connections are further outlined in Section 23.

5. Designations

5.1 All busbars are to be clearly identified either with a name plate or by stenciling. The following are examples of acceptable abbreviations:

OPGP	**Office Principal Ground Point**
COGB	**Central Office Ground Bus**
COMBINED OPGP/COGB	**Combined OPGP–Central Office Ground Bus**
GRD WD/MGB	**Ground Window/Main Ground Bus**
FEGB	**Frame Equipment Ground Bus**
ICB	**Integrated Collection Bus**
IGCB	**Isolated Ground Collection Bus**

NOTE: The GRD WD/MGB shall be clearly marked as specified in paragraph 5.1 with the integrated and isolated sections marked.

5.2 All grounding conductors shall be equipped with tags (145C number plates or equivalent) designating the far end termination. Specific requirements on locations and designation information are outlined in Section 29.

6. AC Service System Grounding

6.1 The AC service entrance in BellSouth buildings is grounded by Property Management in accordance with NEC 250−94. Metal Oxide Varistor (MOV) type lightning arrestors should always be provided at the service entrance of equipment buildings.

6.2 Every receptacle mounted on the isolated ground plane shall be powered from an inverter within the isolated ground plane. These receptacles are not intended for general use and shall not be accessible except by way of doors or covers.

6.3 Special−purpose receptacles (Orange), defined as receptacles in which the grounding terminal is purposely insulated from the receptacle's frame, shall not be used.

6.4 Current return leads (AC neutral) on ac outlets shall be connected to ground only at the building service entry panel.

6.5 ACEG conductors (sometimes referred to as the "green wire" ground) shall be insulated and identified with a green color. Additional information on the color can be found in Section 27. The size of the ACEG shall be sized in accordance with the NEC and be run continuous from the source to load.

6.6 See section 27 for further branch AC Circuit information.

7. Cable Entrance Facilities (CEF)

7.1 All cables, including fiber optic cables, shall have their sheaths bonded to the central office ground system at or near where they enter the cable vault/building.

8. Integrated Ground System Requirements

8.1 The most basic requirement for integrated ground plane equipment is that all telecommunications equipment (i.e., bays, cabinets, frameworks, power plants, battery stands, engines, etc.) shall have an engineered connection to the CO ground system.

8.2 Historically, most problems with the integrated ground plane have been related to the removal of equipment without regard to the grounding system. The Installation Supplier must ensure that the removal of equipment bays does not impair the integrity of the grounding system.

Bays, Cabinets, etc.

8.3 The minimum size grounding conductor for grounding bays, cabinets, etc. is #6 AWG (stranded). If the grounding conductor is installed by the supplier, then an insulated conductor shall be installed, preferably green in color. Network and Unequal Flange Duct Type bays that come equipped with a #6 AWG ground assembly are acceptable. The ground assemblies do not have to be changed to a green #6 AWG conductor.

Line−up or similar group of members (Toll area)

8.4 Frame junction pipe shall no longer be used for grounding new lineups. The #2 AWG (green) grounding conductor is the preferred method. Additions to existing line−ups should continue to deploy the grounding scheme used in that line−up. The wholesale retrofitting of central offices from the 1 inch junction pipe is not recommended. An insulated #2 AWG stranded grounding conductor shall be run along the length of the line−up (present and future frameworks). If the grounding conductor terminates directly at the COGB or GRD WD/MGB, then the insulation shall be green in color. If the grounding conductor does not directly terminate at the COGB or GRD WD/MGB, then green insulation is preferred, but not required.

Distributing Frames

8.5 Minimum #1/0 AWG stranded green insulated grounding conductors from distributing frames (MDF, IDF, TDF) to the COGB and GRD WD/MGB (if located on the same floor).

Main Aisle Ground Feeders

8.6 Minimum #2/0 AWG stranded green insulated grounding conductor for a main aisle ground feeder “equalizer” connecting several lineups to the COGB.

BDFB Grounding Conductors

8.7 Minimum #2/0 AWG stranded green insulated grounding conductor from the BDFB to the COGB. BDFBs with battery return bus bars electrically connected to the framework require 750 MCM stranded green insulated grounding conductor from the BDFB to the COGB. The grounding conductor may be a continuous run or it may be a branch tap from a same size or larger horizontal equalizer serving other BDFBs or main aisle ground feeder in a floor segment.

Power Board And Power Plant Framework Grounding Conductors

8.8 Power plants serving isolated ground planes shall be grounded per TR 295 section 5.3.1 with Conductor A as a redundant fault−clearing conductor and Conductor A as a coupled bonding conductor considered as requirements. In addition, Conductor A should be a #2/0 AWG minimum, except when the minimum sizes specified in TR 295 Table 5−2 Size 2 exceed #2/0 AWG. This requirement results in Conductor B (from power plant framework to COGB) minimum #1/0 AWG and Conductor A (from power plant framework to GRD WD/MGB) minimum #2/0 AWG except as noted in TR 295 Table 5−2 Size 2. Power plants serving equipment in the intergrated ground plane only shall be grounded using a minimum #2/0 green insulated grounding conductor from the power plant to the COGB.

Rectifier, Battery Stand and other Power Framework Grounding Conductors

8.9 Power plant framework not containing distribution fuses or breakers and battery stands can have a minimum #6 AWG grounding conductor tied to a minimum #2/0 AWG main aisle grounding conductor leading to the COGB. All power plant framework rectifiers, and battery stand grounding conductors shall be green and insulated.

8.10 The system specification shall always be adhered to when grounding conductors larger than the minimum specified in this section are called for. In particular, any power plant, distribution bay, toll system, etc. with a non−insulated battery return bus directly connected to the framework may specify a larger grounding conductor to accommodate the return currents.

Radio Systems

8.11 Radio systems require special protection from lightning strikes. They employ an interior #2 AWG ring round system designed specifically to create minimum impedance to the flow of lightning induced current and a method of bonding between metallic components of the station that suppresses arcing. The ring ground system provides an equipment grounding function in radio stations similar to that of the CO ground system in central offices. BellSouth specifies (via drawings) interior ring grounds for all types of equipment installations.

Operator Positions

8.12 Operator positions are always part of the integrated ground plane. Bonding and grounding at operator positions to limit potential differences between AC power, telephone lines, equipment (including headset) is critical for personnel safety reasons. Due to the wide variety of operator equipment configurations, the Capacity Manager should evaluate each new operator facility in accordance with the latest recommendations and then specify the grounding requirements.

Neutral Grounding of Standby AC Systems

8.13 When the standby AC neutral is switched by a transfer device, the standby AC system is classified as a separately−derived AC source. Service grounding for such systems shall conform to the provisions of the NEC governing separately derived systems, including Articles 250−5, 250−25, and 250−26. When local codes differ from the NEC, the most stringent code shall be used.

Standby sets whose nominal line voltage is greater than 480 volts, can have their neutral solidly or resistively grounded. A direct and continuous connection should be made from the neutral (or output of the ground resistor) to the nearest building ground by means of a grounding conductor which meets NEC size requirements of Table 250−94. A second independent connection should be made between the neutral (or output of the ground resistor) to the metal frame of the set.

When the standby AC neutral is not switched by an automatic transfer device, the following provisions should apply. For standby sets of 480 volts or less,where a solidly grounded commercial power system is used, the neutral of the set shall not be grounded by connecting it to the equipment ground conductor of the set. An acceptable method of grounding the neutral of the set is to connect it to the neutral of the commercial power at the OPGP. In addition, the neutral and phase lead(s) of the set should be the same size.

Equipment Grounding of Standby AC System

8.14 Standby engine−alternator sets should always be equipped with an AC equipment grounding (ACEG) conductor in the conduit or raceways that contain the phase leads for the set. The ACEG conductor(s) should terminate within the standby control cabinet. The termination may be made on a bus bar or a ground stud electrically bonded to the cabinet as well as directly to the cabinet interior using compression terminal lugs. This requires that the cabinet be electrically connected to the set frame by a bonding strap or equivalent to provide ground continuity between the entire set and the ACEG conductor(s).

The primary control cabinet for the standby set shall be bonded to the metallic subbase or chassis. These bonds should be made with bare, stranded, or ribbon connectors designed and installed to withstand the vibration generated by the standby engine set.

Figure 1 shows a general framework grounding scheme for an engine−alternator room. The following shall be bonded to the COGB using a minimum #2 AWG green insulated main feeder and minimum #6 AWG branch grounding conductor.

(a) metallic fuel tanks (day and/or main)

(b) metallic fuel piping

(c) start battery racks, and

(d) start battery charging rectifiers not integral to the standby set

Engine chassis should be connected to the COGB using a minimum #2 AWG branch grounding conductor as shown Figure 1.

If the AC control panel is not attached to the engine chassis and is a stand alone unit a #6 AWG connected to a #2 AWG collector grounding conductor is required.

9. Digital Switch Grounding

9.1 All parts of the isolated ground plane shall be located not more than one floor above or below the Ground Window and no further than 100 feet horizontally. The farthest member of the isolated ground plane from the COGB shall not exceed 200 feet.

9.2 To minimize isolation violations, the Isolated Ground Zone (IGZ) should be kept as small as practical, i.e., limited to the switch cabinets and lineups. To accomplish this:

(a) Do not run AC conduits to the switch when it can be avoided. Place lighting fixtures on the integrated rather than the isolated ground plane. Use DC for modems and other equipment. Use inverters embedded in the switch for the remaining AC requirements.

(b) On additions and new installation, no conduit, raceway or other part of the Isolated Ground Plane shall be installed under a raised floor or above a hung ceiling unless it is completely covered with an insulating material.

(c) Spare circuit pack cabinets shall be part of the integrated ground plane and connected to the CO ground system with a minimum #6 AWG stranded. An exception is if the cabinet is located in a switch lineup and is attached to the isolated framework, then it must be part of the isolated ground plane and treated accordingly.

(d) Work stations for all new installations shall be a part of the integrated ground plane. This includes all printers, VDT and any other device that lets a person communicate with the switch. Connection to the switch shall be by modems, fiber optics, current loop (20 milliamps) or any other means that opens the ground connection from the isolated ground plane. AC power for these work stations shall be provided from the integrated ground plane. Most existing work stations are located in the Isolated Ground Zone (IGZ) and must be maintained in the IGZ or modified to locate in the integrated ground zone.

(e) Local test cabinets, remote from the switch, shall be installed as part of the integrated ground plane. This will require that all external supplies to the cabinet: −48v, 103v, ringing, etc., be provided from sources external to the switch.

(f) Metal parts of the isolated ground plane shall not be connected to the integrated ground plane without first passing through the Ground Window and bonding to the MGB.

(g) All conductive intergrated ground plane members located within 6 feet of the isolated ground plane shall be bonded to its MGB with a #6 AWG stranded copper conductor to minimize surge potential differences between nearby members of the two ground planes. Such intergrated ground plane members included, but are not limited to the following:

(1) Metallic stands, desks, and pipes.

(2) Equipment frames.

(3) Auxiliary framing and ironwork. (It is not necessary to place a ground strap around connecting hardware.)

(4) Air ducts.

(5) Lighting fixtures and AC raceways that are not part of the isolated ground plane,

9.3 **Insulation Test** − Each frame or group of frames that is part of the isolated ground plane shall undergo the following insulation tests after being secured to the floor. This shall be done before connecting any power or grounding conductors to the isolated ground plane. These tests ensure that the necessary insulation has been provided between the hold−down fasteners and the integrated ground plane. These tests must be outlined in an MOP so that they may be observed by local Network Operations. A test record shall be made and turned over at job completion.

9.4 Low−Voltage Resistance Test − Connect an analog low−voltage ohmmeter between each frame or group of frames and the MGB within the designated ground window. Measure the resistance. The resistance reading shall be 100 kilohms or more.

9.5 High−Voltage Resistance Test − If the frames pass the low−voltage test, connect a 500−volt megohmeter between the lower part of each frame or group of frames and the MGB within the designated ground window to measure the resistance. The resistance shall be 100 kilohms or more.

Test the lower part of the frame instead of the upper part to prevent equipment damage if the insulation breaks down.

10. Digital Loop Carrier − Remote Terminal Sites − HUTS And CEVS

10.1 The exterior ring ground system employs driven ground rods(ground electrodes) encircling the HUT or CEV. The exterior ring ground is a series of driven 5/8 inch diameter, 8 feet long, stainless or copperclad steel ground rods connected with #2 AWG bare tinned solid copper wire that rings the entire building buried to a depth of a least 18 inches below grade. All connections buried in earth shall be either exothermic welded or connectors. The exterior ring ground shall be connected to the CO ground bar with two #2 AWG bare tinned solid wires as illustrated in Figures 8 and 9 (HUTs) and Figures 5, 6, and 7 (CEVs). The exterior ring ground system is also used to ground the AC disconnect via the grounding electrode conductor (NEC 250−94).

10.2 Installing the exterior ring ground system may vary from site to site depending on the easement and back fill required, but should follow the minimum guidelines as illustrated in Figure 8 (HUTs) or Figure 5 (CEVs). Ground rods/electrodes shall be driven a minimum of 10 feet apart and shall not exceed a maximum of 15 feet apart. The grounding conductor shall be buried 12−18 inches below the surface. The turns or bends in the exterior ring ground shall comply with a 12 inch minimum bending radius.

10.3 Refer to Figures 3−11 for methods of grounding Mini Huts, Maxi Huts, CEVs, Concrete Huts, and customer premise locations. These figures were provided from BSP 631−600−243BT, “Bonding and Grounding Methods for Digital Loop Carrier − Remote Terminals”.

10.4 All framework, cable rack, and other metallic objects throughout the structure shall be grounded. The cable rack shall be electrically continuous. The size of the conductor/wire can vary according to the application and type of equipment. A minimum of a #6 AWG wire will always be required.

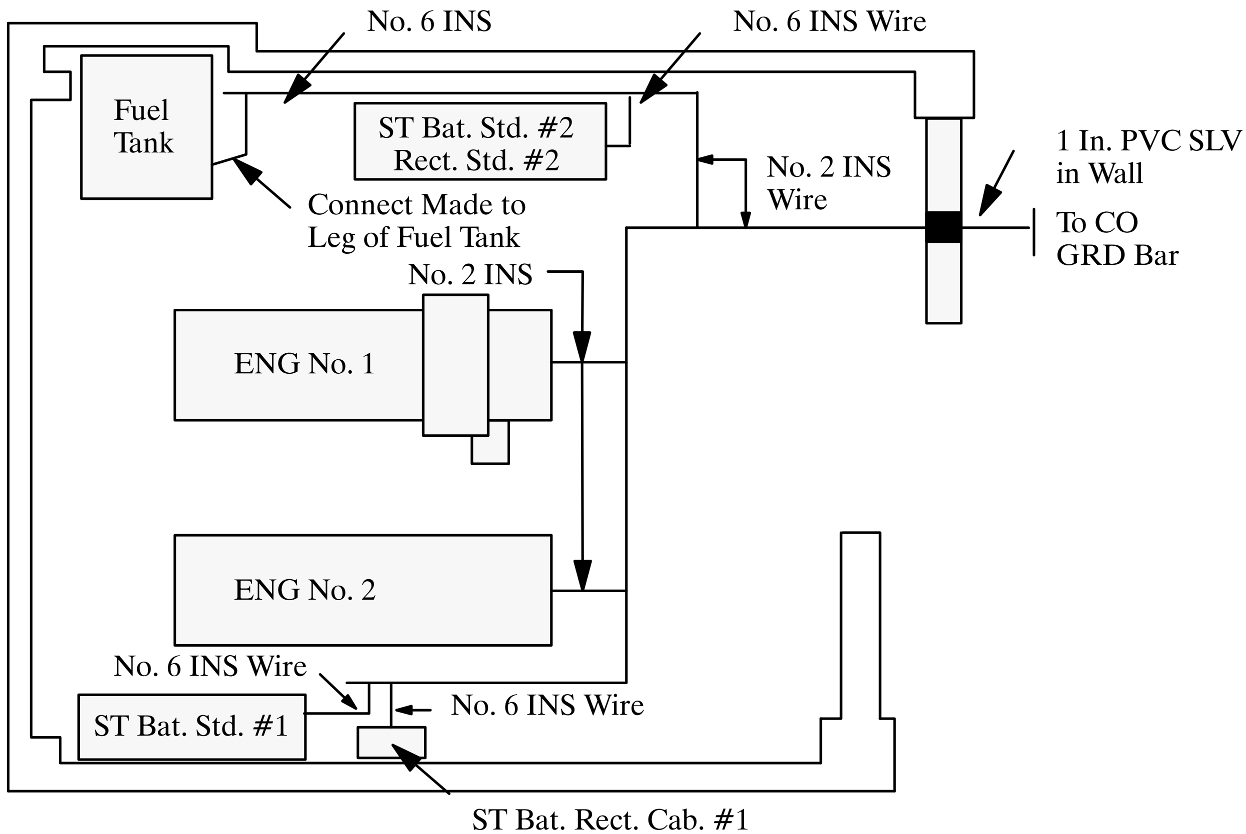


Figure 1 − Typical Method Of Grounding Engine Room

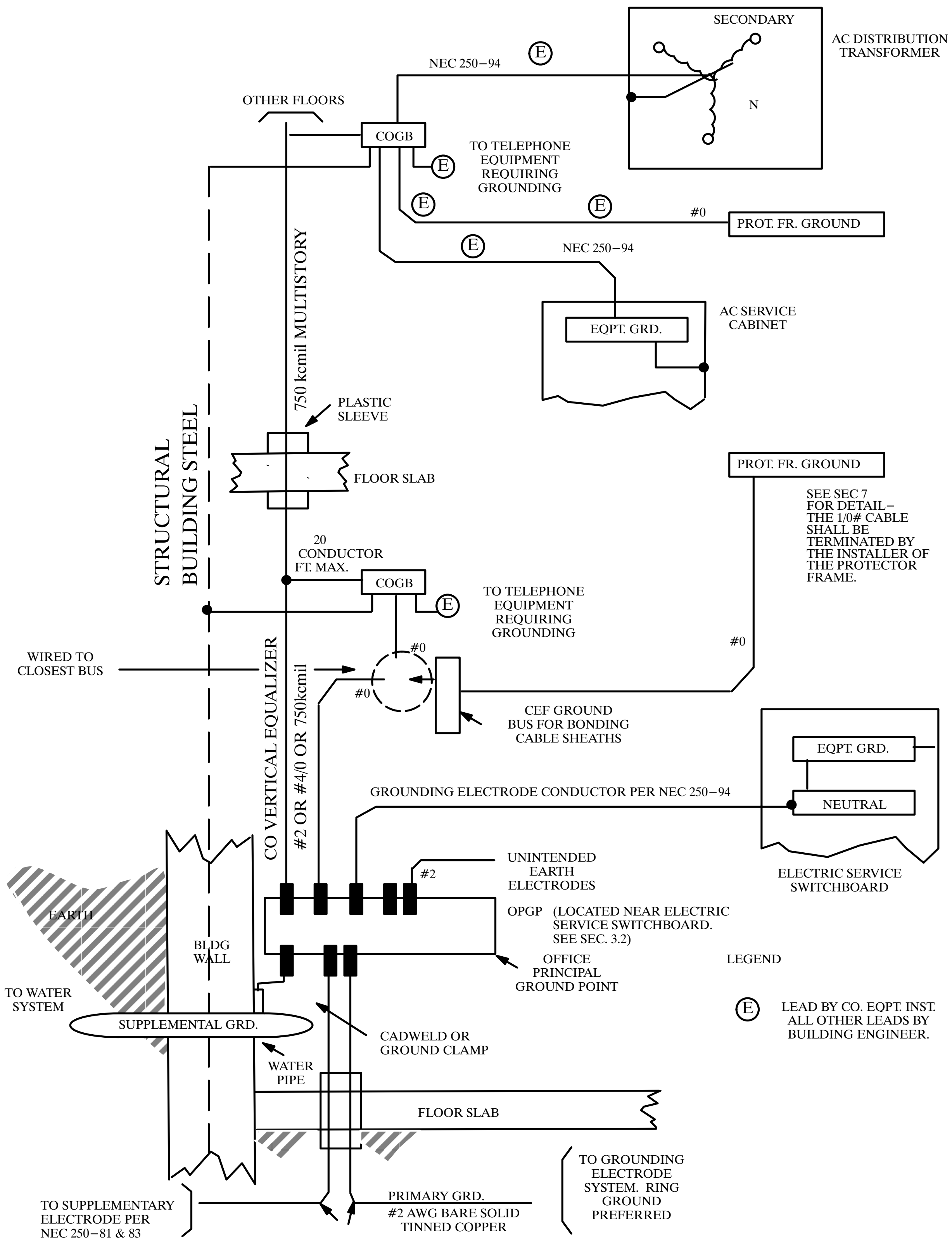


Figure 2 − Typical C.O. Building Grounding Schematic

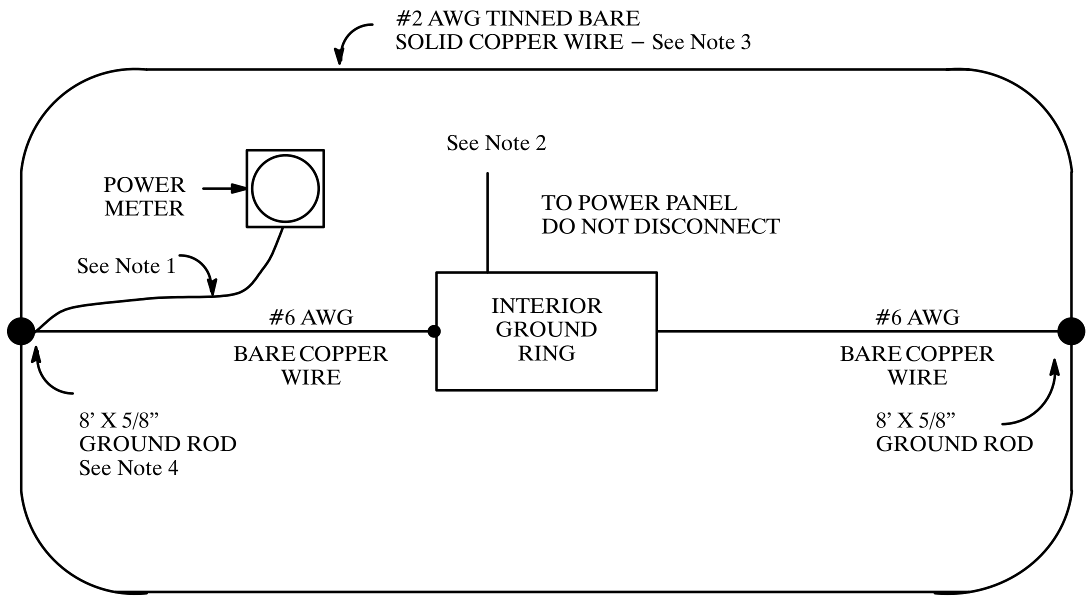


Figure 3 − External Ground Connections − Meter Attached To Structure − Mini Hut

NOTES:

1. **Power service grounding electrode conductor sized per NEC 250−94.**
2. **Bond power neutral bus to equipment ground bus in the power pedestal and at the power disconnect switch in the Hut, NEC 250−24.**
3. **Bury #2 AWG copper wire 6″ to 12″ deep within 2′ of Hut.**
4. **Ground rods to be covered with a DLC Flush Mount Ground Rod Closure per 629−010−901BT for inspection purposes.**

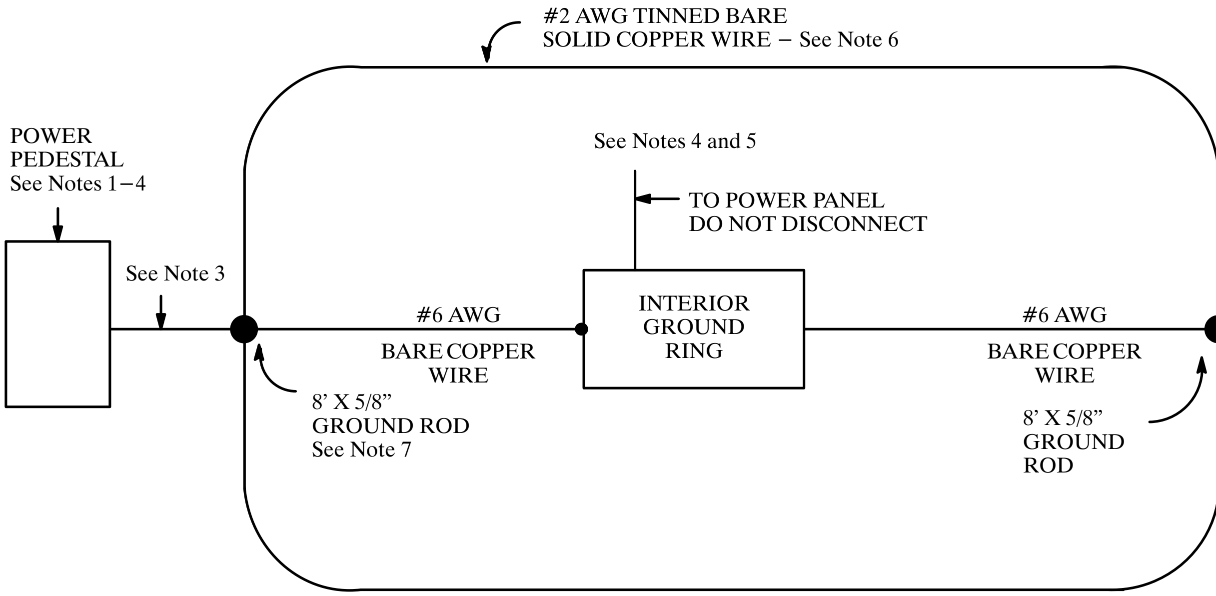


Figure 4 − External Ground Connections − External Power Pedestal − Mini Hut

NOTES:

1. **If the power pedestal is located within 8′ of the Mini Hut, only 2 ground rods are required to ground the Hut and meet the requirements of the NEC.**

2. **If the power pedestal is located more than 8 feet away from the Mini Hut, 2 − 8 foot ground rods, spaced 8 feet apart, are required to ground the power pedestal per NEC 250−83. These rods must be bonded together with a minimum #6 AWG bare copper wire. If the power service ground rods are located within 10 feet of the Hut ground rods or #2 AWG wire, the ground systems must be bonded together with #6 AWG bare copper wire. The bonding connections are to be made to the ground rods.**

3. **Power service grounding electrode conductor sized per NEC 250−94.**

4. **Bond power neutral bus to equipment ground bus in the power pedestal and at the disconnect switch in the Hut, NEC 250−24 (see note 5 if bonded in the Hut).**

5. **Place a power service grounding electrode conductor sized in accordance with NEC 250−94 direct from the disconnect switch to the ground rod.**

6. **Bury #2 AWG copper wire 6″ to 12″ deep within 2′ of Hut.**

7. **Ground rods to be covered with a DLC Flush Mount Ground Rod Closure per 629−010−901BT for inspection purposes.**

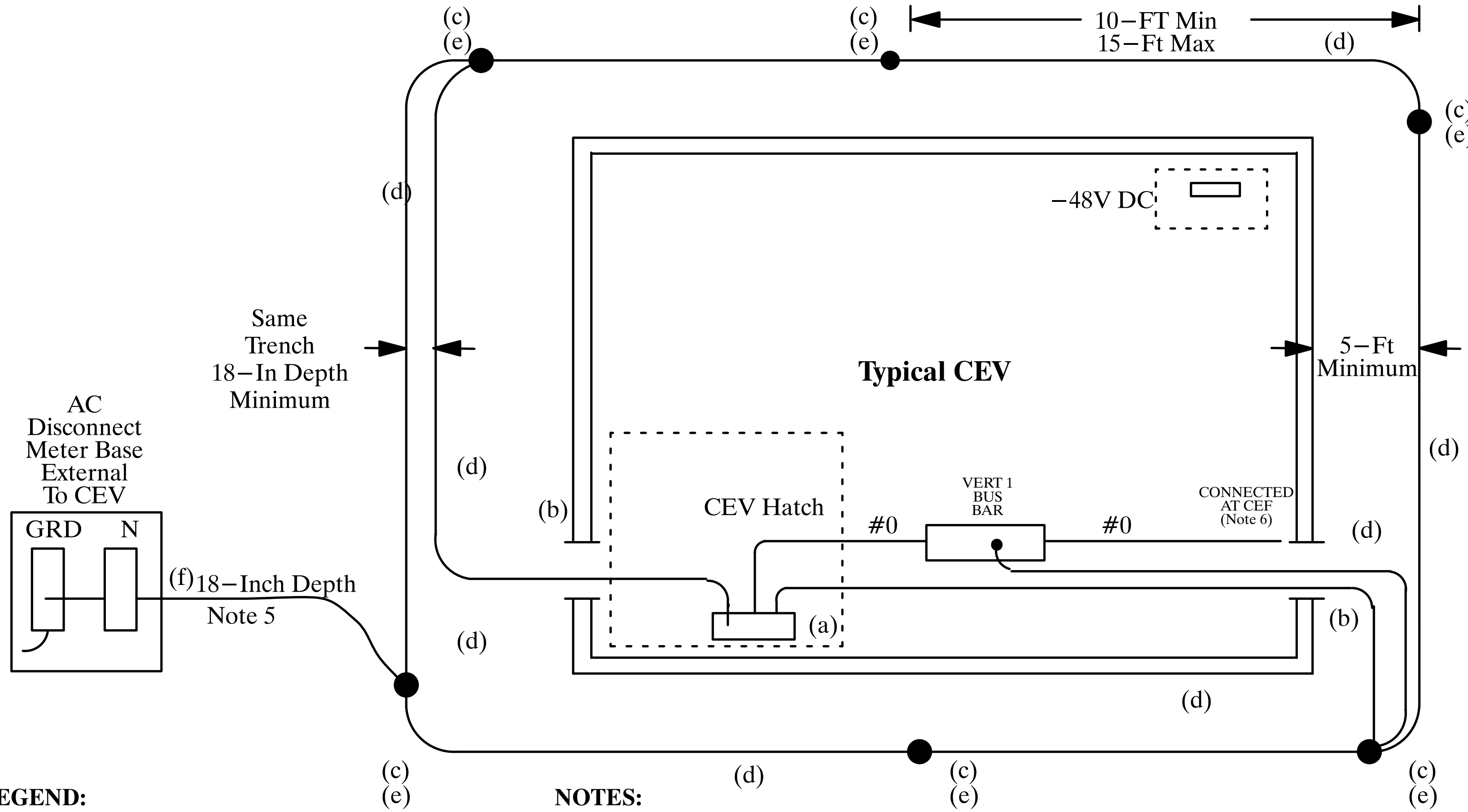


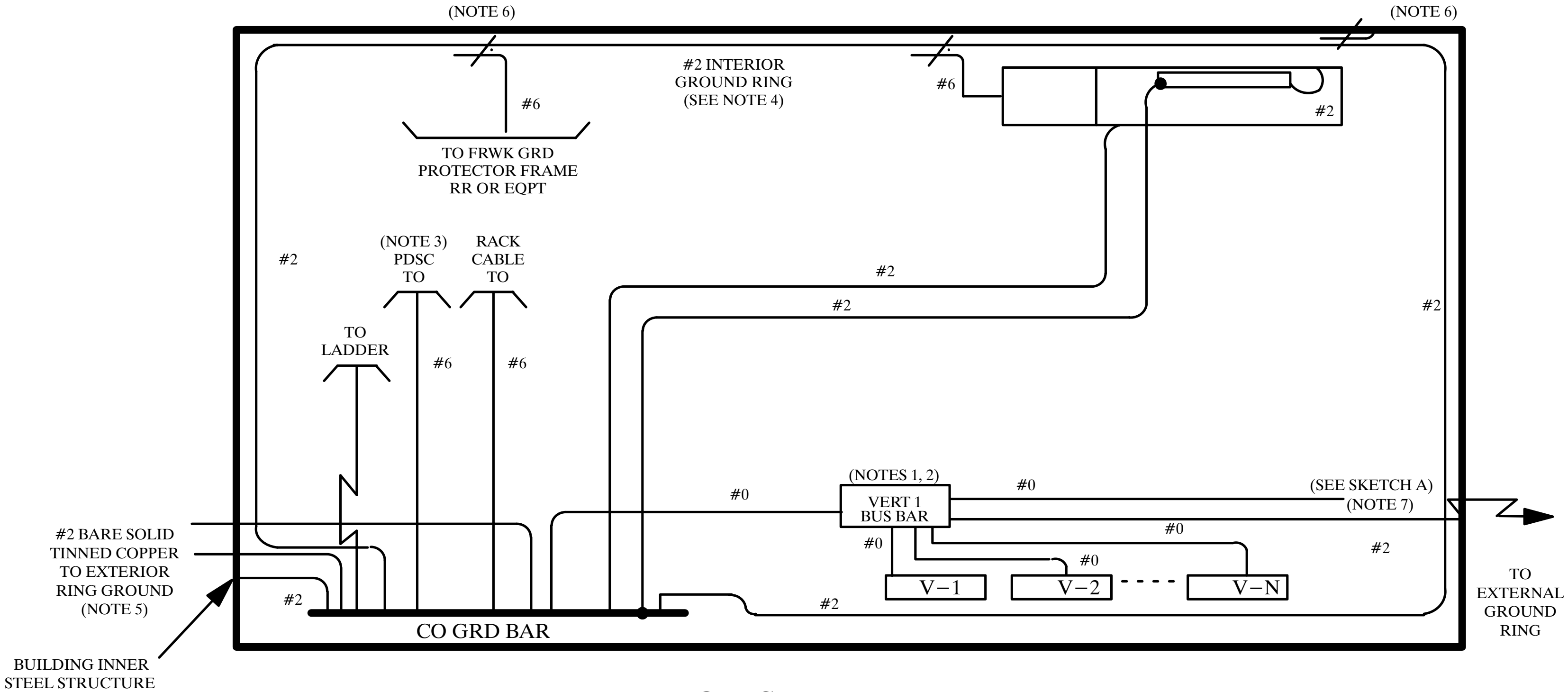
Figure 5 − CEV External Grounding

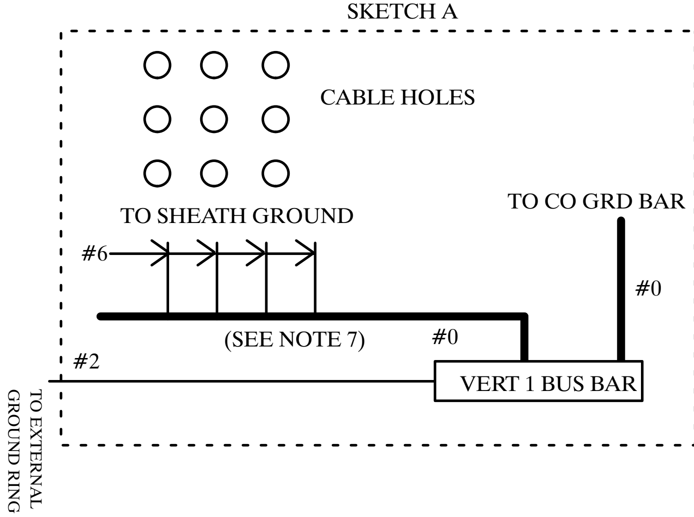
LEGEND:

(a) CO Ground Bar
(b) PVC Conduit Thru Wall/Top Half of CEV, Encapsulant Sealed
(c) Exothermic Welded or Approved Connectors − Below Ground
(d) #2 AWG Bare Tinned Solid Copper Wire
(e) Six Stainless or Copperclad Steel 5/8−In Dia, 8−Ft long Rods Driven to a Depth of 18 Inches Minimum Below Grade
(f) Grounding Electrode Conductor

NOTES:

(1) Refer to BSP 802−001−191 For Additional Information
(2) Construct Exterior Ring Ground A Minimum of 5 Feet From Wall of CEV in Undisturbed Earth
(3) If Right−of−Way is not available, Exterior Ring Ground may be constructed 12 inches deep below the base of the CEV excavation.
In this case, the Exterior Ring Ground may be installed under the perimeter of the CEV, with the Ground Rods spaced approximately 10 feet apart.
(4) Exterior Ring Ground Shall Be Installed By An Electriction.
(5) If the power pedestal is located more than 8 feet from the grounding ring, 2−8 foot rods, spaced 8 feet apart are required per NEC 250−83.
These rods must be bonded together with a #6 AWG bare copper wire. If either of the power service ground rods are located within 10 feet of the ground ring, they should be bonded to the ground ring, at a ground rod location using approved grounding connectors, with #6 AWG bare copper wire.
(6) Same as Note 7 on Figure 6.

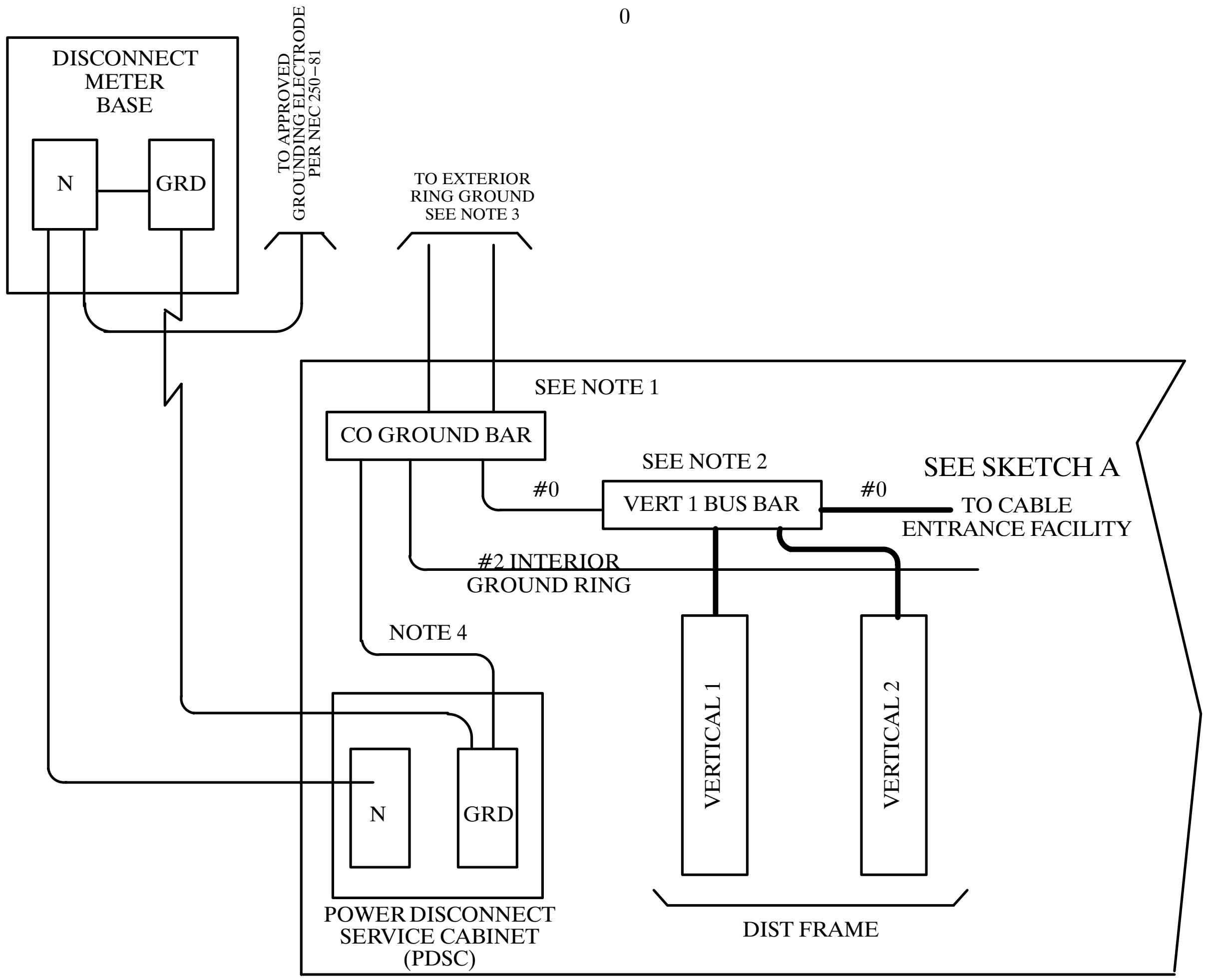




NOTES:

1. EACH VERTICAL TIES TO VERT 1 BUS BAR WITH A SEPARATE #0 WIRE.
2. VERT 1 BUS BAR IS LOCATED ABOVE VERTICAL 1 (V−1) OF THE PROTECTOR FRAME.
3. #6 AWG FRAME GROUND REQUIRED FOR 100 AMP POWER DISTRIBUTION SERVICE CABINET (PDSC) #3 AWG FRWK GROUND REQUIRED FROR 200 AMP PDSC.
4. #2 AWG COPPER BARE STRANDED ATTACHED TO WALL HALFWAY BETWEEN CABLE RACK AND CEILING.
5. #2 AWG GROUND SHALL EXIT CEV THROUGH PVC IN WALL/TOP HALF OF CEV.
6. CONNECT CEV'S INNER STEEL STRUCTURE WITH #2 AWG AT ALL FOUR CORNER LOCATIONS ON TOP HALF OF CEV. (AT LEAST TWO OF THE FOUR BONDS MUST BE CONNECTED TO THE CO GROUND BAR.)
   ALSO, #2 AWG SHALL BE USED TO CONNECT THE CEV'S TOP HALF INNER STEEL TO THE CEV'S BOTTOM HALF INNER STEEL AT EACH CORNER.
7. THIS CONNECTION BETWEEN THE CEF AND EXTERNAL GROUND RING IS REQUIRED ON ALL CEV'S EXCEPT THE MINI−CEV.
8. THIS DRAWING IS TYPICAL OF THE EQUIPMENT LAYOUT IN A 16 FOOT CEV. THE EQUIPMENT LAYOUT FOR OTHER CEV' MAY BE DIFFERENT. HOWEVER, THE BONDING AND GROUNDING WIRES WILL BE THE SAME SIZE.

Figure 6 – Typical 16 Foot CEV Internal Grounding



NOTES:

(1) CO Ground Bar Located Near Power Board Distribution (PBD)

(2) Vert 1 Bus Bar Located Above Vertical 1

(3) #2 Ground Wires Exit CEV Through PVC in Wall/Top Half of CEV

(4) #6 AWG REQUIRED FOR 100 AMP PDSC, #4 AWG REQUIRED FOR 200 AMP PDSC

(5) This Connection Between CEF and External Ground Ring is Required on All CEVs Except Mini−CEV

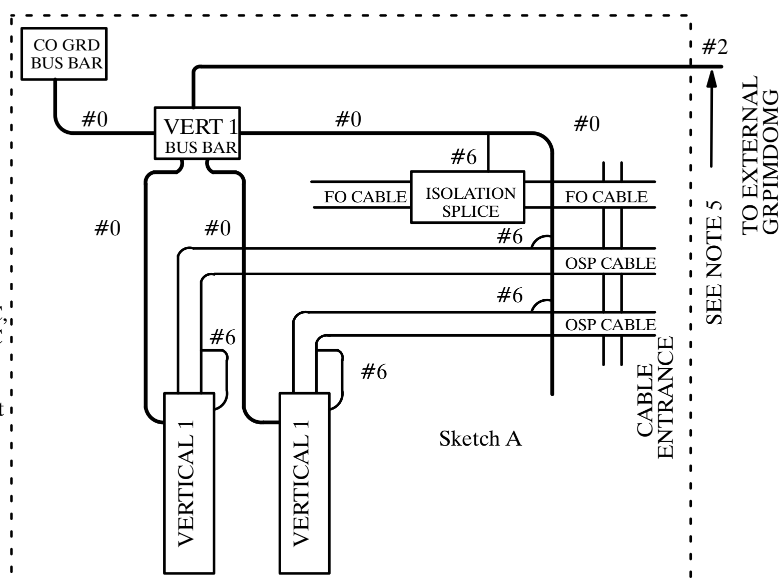


Figure 7 − Controlled Environmental Vault Cable Grounding

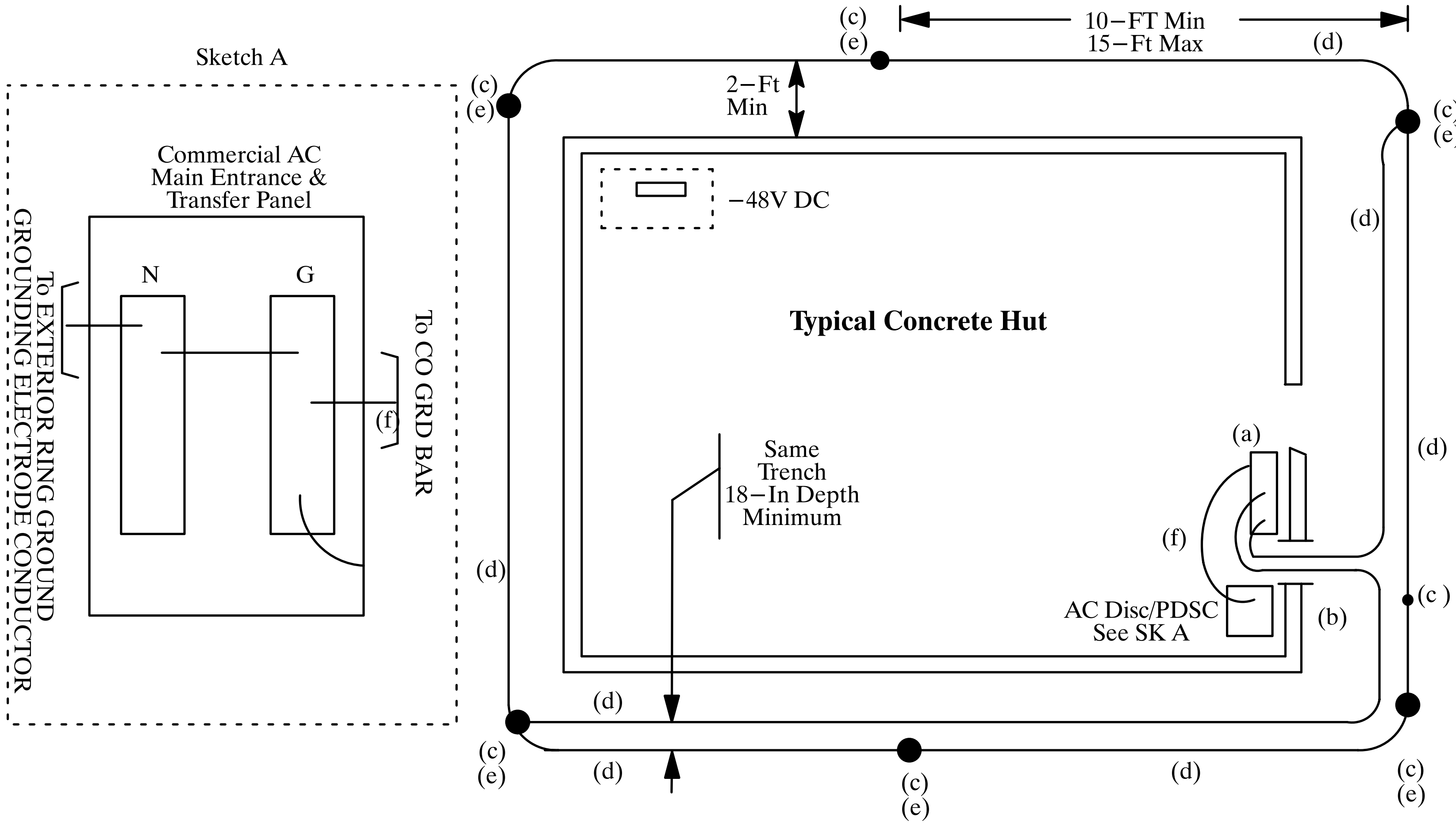


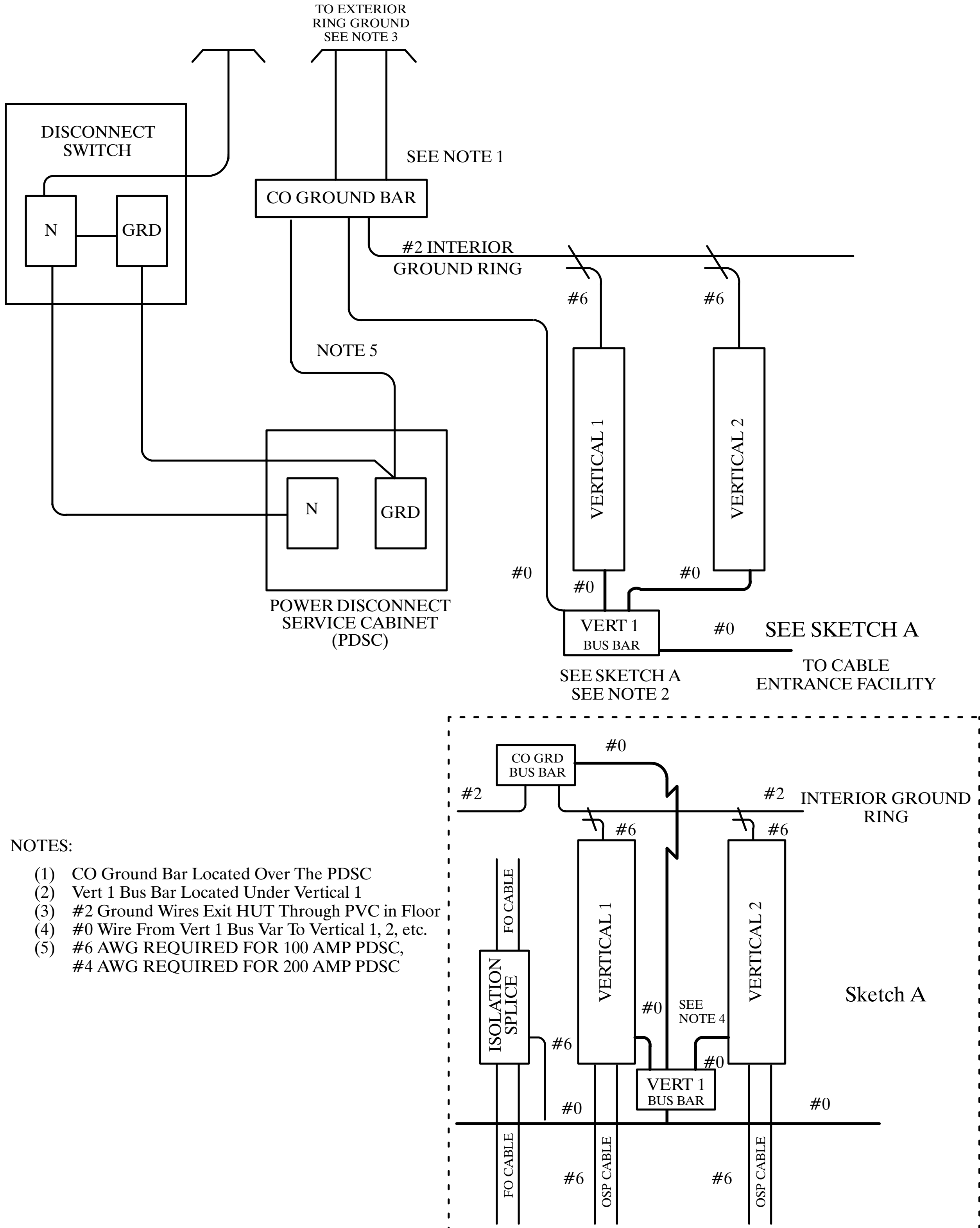
Figure 8 – Concrete Hut Exterior Ground Connections

LEGEND:

(a) CO Ground Bar
(b) PVC Conduit Thru Floor
(c) Exothermic Welded or Approved Connectors − Below Ground
(d) #2 AWG Bare Tinned Solid Copper
(e) 5/8−In dia Stainless or Copperclad Steel 8−Ft Long Rod Driven to a Depth of 18 Inches Minimum Below Grade
(f) #6 AWG Insulated Stranded Copper Framework Ground For The 100 Amp or 200 Amp PDSC

NOTES:

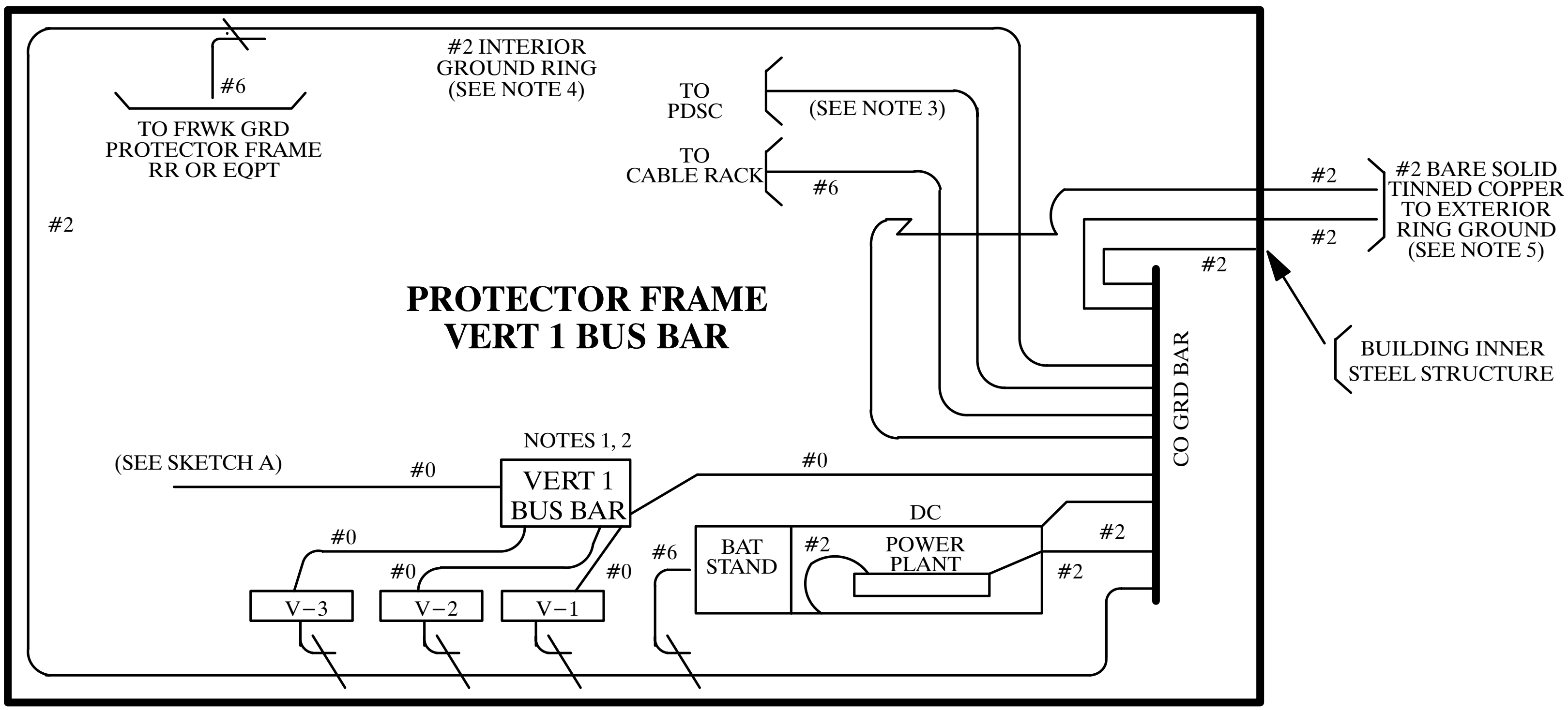
(1) For Additional Information Refer to BSP 802−001−191 and Section 760−400−510SV
(2) Exterior Ring Ground Connections Shall Be Connected By An Electrician
(3) Exterior Ring Ground May Be Installed Under the Hut When Outside Space is Not Available. Ground Rods Should Be Spaced Approximately 10 Feet Apart



NOTES:

(1) CO Ground Bar Located Over The PDSC
(2) Vert 1 Bus Bar Located Under Vertical 1
(3) #2 Ground Wires Exit HUT Through PVC in Floor
(4) #0 Wire From Vert 1 Bus Var To Vertical 1, 2, etc.
(5) #6 AWG REQUIRED FOR 100 AMP PDSC,
#4 AWG REQUIRED FOR 200 AMP PDSC

Figure 9 − Concrete Hut Interior Grounding



NOTES:

1. EACH VERTICAL TIES TO VERT 1 BUS BAR WITH A SEPARATE #0 WIRE.
2. VERT 1 BUS BAR IS LOCATED BELOW VERTICAL 1 (V-1) OF THE PROTECTOR FRAME.
3. #6 AWG FRWK GROUND REQUIRED FOR 100 AMP POWER DISTRIBUTION SERVICE CABINET (PDSC) #4 AWG FRWK GROUND REQUIRED FOR 200 AMP PDSC.
4. #2 AWG COPPER BARE STRANDED WIRE FOR EXISTING APPLICATIONS ATTACHED TO WALL HALFWAY BETWEEN CABLE RACK AND CEILING. A #2 EQUIVALENT (SOLID, INSULATED, etc.) IS ACCEPTABLE FOR EXISTING APPLICATIONS.
5. #2 AWG GROUND SHALL EXIT CONCRETE HUT THROUGH PVC IN FLOOR. A #2 EQUIVALENT (STRANDED, INSULATED, etc..) IS ACCEPTABLE FOR EXISTING APPLICATIONS.

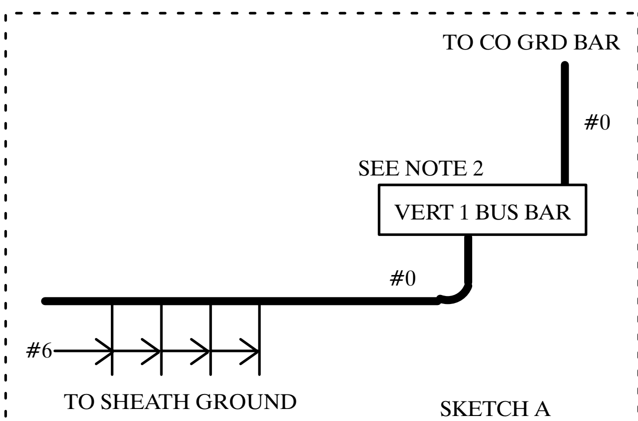


Figure 10 – Concrete Hut Co Ground Bar Terminations

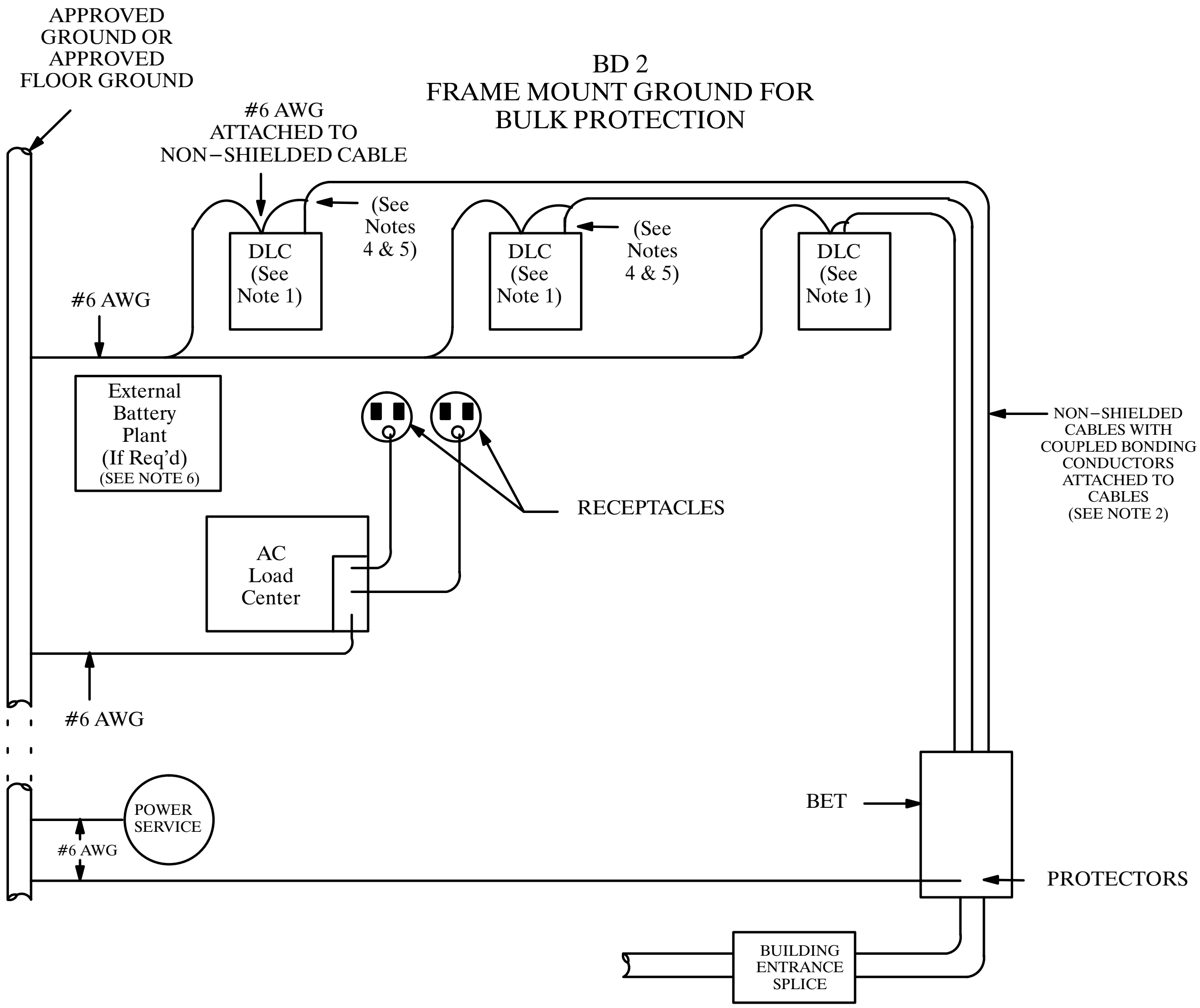


Figure 11 − Customer Premise

NOTES

1. **On a customer's premise protectors equipped with gas tubes are located at the Building Entrance Terminal (BET). Any protectors in the DLC channel banks and 1A power and jack panel or 8A power panel must be removed.**
2. **A Coupled Bonding Conductor is attached to the cables that are not shielded. The Conductor consists of #6 tie wrapped to cable & grounded at both ends. Coupled Bonding Conductor is a replacement for cable shields that are not present (e.g., House Cable).**
3. **If the Cross−Connect Field is located in a metal enclosure, the sides of the box should be used as the coupled bonding conductor bar.**
4. **The cable sheath or coupled bonding conductor should be grounded at the DLC frame as well as the BET.**
5. **Ground the cable shields at both ends on derived and feeder cables.**
6. **Power Plant and Grounding engineered and installed per established central office requirements. See Figure 2 for typical.**

EQUIPMENT DESIGNATIONS − INSTALLATION PROCEDURES

CONTENTS

EQUIPMENT DESIGNATIONS – INSTALLATION PROCEDURES

1. General

This section covers installation guidelines for the numbering and lettering of central office equipment. It particularly addresses requirements which are common to all apparatus and equipment such as size, color, style, and general location of designations.

1.1 Designations shall wherever possible be so located that they may be most easily read by an observer in the position usually assumed when identifying the apparatus and equipment to which the designations apply. Use rubber stamps or permanent marking pens with lettering guide for applying all equipment designations on bays, end guards, shelves, covers etc. (i.e., flat surfaces). Designation labels are acceptable if approved by BellSouth, and/or if designed and provided by the equipment manufacturer, as are bar coded labels, engraved metal labels, and preprinted cards that accompany an equipment order.

Other requirements are:

(a) Designation label lettering systems must employ thermal transfer technology or system laser plate material.

(b) Thermal transfer technology must be used on smooth, non−porous surfaces. Use or ripple−finished or irregular surfaces is not acceptable.

(c) Manufacturer instructions must be followed when using a thermal transfer technology labeling system.

Approved labeling systems and materials are as follows:

- Brothers P−Touch XL30
- Merlin Express (thermal transfer technology)
- MAX Letrex lettering machine LM−500 (equipped with Super A&E scratch resistant tapes)
- Kroy Dura Type 240SE (equipped with laminated tapes)
- Brady Laser Plate manufactured labeling device (use laser plate material)

1.2 Free hand designations with marking pens are acceptable on the following:

(a) Fuse, ring tone, milliwatt, or other record sheets.

(b) Tracing cards, normally used to reference equipment interconnect by cross connections, that change during each installation activity. (These entries are normally printed in pencil.)

(c) Timing slot assignment labels/plates, such as at the DCD 400 timing supply.

When it becomes necessary to change or remove designations,

- remove all old designations and apply new ones in the proper location.
- if surface is impaired, retouch before stamping.
- when applying labels clean surface with mineral spirits and let dry.
- do not reuse or reposition a label. Remove and discard.
- where designations are inaccessible they may be painted out using a color that matches the background upon which it is applied.

1.3 Write−on, self laminating labels are required on the ends of terminated and unterminated fiber optic jumpers and AI Switch cables. Labels are only required at the far−end in relationship to the network equipment (i.e., Fiber Optic Distributing Frame Lightguide Shelf, AI Switch, Black Box, etc.) The labels shall be placed within the shelf or cabinet upon termination of the fiber.

1.4 Listed below is an acceptable write−on, self laminating label. An overall tape size of 1" x 3" with a writing area of 1" x 3/4" should provide sufficient area to designate the far−end termination equipment type, and shelf number etc. The labels shall be placed around the fiber or cable 4−6 inches from the connector and adhered to itself (flagged) so that is laminates the write−on area. The installer shall use the permanent marking pen provided with the label dispenser to designate the labels. 3M Electrical Products Division. Part Number: 054007−12177. (Includes label dispenser, roll of 100 labels, and permanent marking pen). Note: Distributors of electrical products either stock or can order this product. Graybar Electric, Anixter, and Alltel Supply, for example.

1.5 The location of designations for any particular piece of apparatus not covered in this Technical Reference or the equipment drawing shall agree as nearly as possible with the locations shown on the illustrations of apparatus it most closely resembles. If the installer is unable to determine the appropriate location for a designation from the specifications and drawings provided as part of the job, from this document, or from like equipment on the site, then they shall contact the appropriate BST representative for direction.

1.6 Common Language Equipment Identification (CLEI) codes are required to identify equipment and apparatus in a uniform function oriented language. For Distributing Frames, the installer shall stencil/stamp the CLEI code on the outside cover of the block that has been assigned in the TEO. These blocks can be of various types.

1.7 The Frame/Bay equipment location shall be stenciled/stamped with the seven digit bay code and the CLEI code (equipment location , top or bottom). Each location must be stamped with the CLEI code. Detailed stamping information should be provided in the TEO or installation specification. CLEI codes primarily apply to transmission and switch type equipment. In general, power equipment is excluded.

1.8 CLEI code markings shall be shown in the space allocated by the equipment specification. For wired equipment, space allocation is based upon providing an area to mark the alphanumeric CLEI code. The code shall appear in one line (ten characters). If space does not permit, the code may appear in two lines (four and six characters) or three lines (four, four and two characters). CLEI codes, whether marked by conventional methods, such as rubber stamping, or silk−screening, or by label, shall be marked either horizontally or vertically, never diagonally.

(a) CLEI code stenciling has traditionally been placed on the upright of the equipment bay. When this space is unavailable, such as when covered by fiber optic raceway, it is allowable for the vendor to stencil the CLEI information on the nonremovable portion of the fiber raceway, or directly on the equipment. If the CLEI code is stenciled on a removable cover then it shall also be stenciled on a nonremovable portion of the equipment, shelf, etc.

(b) Manufacturer applied/supplied labels that identify equipment using the required CLEI codes are acceptable for use, and may satisfy the stenciling requirements outlined in Section 29, as long as the labels have the correct CLEI code on them, are readily visible and unobscured by mounting hardware, the bay upright, fiber raceway, etc.

1.9 When installing major items of equipment such as bays, cabinets, and shelves and applying frame designations, the Installation Supplier shall stencil/stamp/label the equipment with the following information.

Installed by: (Company Name)____
BellSouth TEO Number: ____________________
Date Installed: ____

The stenciling/stamping/labeling shall be located where it is most easily read by an observer. Where all shelves within a bay are installed under the same BellSouth TEO and Installation Supplier, only one stencil/stamp/label is required.

Stamping Colors

1.10 Use black ink on light surfaces and white ink on dark surfaces, depending on which gives the better contrast. Some examples of exceptions to this requirement are:

(a) Black ink on a vermilion (red) rectangular background, when used for stamping caution notices on rotating machines, and motor−generator sets, such as “DANGER AUTO START”.

(b) Voltage designations for appliance outlets which supply more than 120V AC shall be stamped with vermilion (red) characters on the front or the side of the outlet indicating the voltage.

(c) White ink shall be used where stamping is required on transparent type plastic relay covers. White ink shall be used on all black backgrounds.

Stamping Sizes

1.11 Table A provides the installer the preferred sizes of designations which are stamped on frames and rack−mounted equipment. Due to the wide array of point sizes that are available with the approved labeling devices the installer should try to use point sizes as close as possible to the sizes listed in Table A. Whichever point size is utilized, the stamping should be legible, of sufficient size, and contain all of the required information.

TABLE A
EQUIPMENT STAMPING SIZES

LOCATION OF STAMPING	CLASS OF DESIGNATION								
					NUMERICAL				
	CLEI CODE	GROUP	SUB−GROUP	FUNC−TIONAL	IN LINE WITH GRP DESIG	ELSE−WHERE	DRAW−ING NUM−BER	CODE	OTHER
Apparatus Panels and Mtg Plates									
Apparatus Side									
Common cover	3/8	3/8	3/16	3/16	3/8	3/16	3/16	–	3/16
Face of plate or panel	3/8	3/8	3/16	3/16	3/8	3/16	3/16	3/16	3/16
Face of large apparatus over 1−3/4 inch wide	3/8	3/8	3/16	3/16	3/8	3/16	3/16	–	–
Face of small apparatus 1−3/4 inch wide or less	3/16	3/16	3/16	3/16	3/16	3/16	3/16	–	–
Term side of apparatus	–	3/16	/16	3/16	/16	3/16	–	–	–
Wiring Side									
General	–	3/16	3/16	1/8	1/8	1/8	–	–	1/8
Duct−type frames only	–	3/8	3/16	1/8	3/8	3/8	3/16	3/16	1/8
Fuse Panels:									
Individual mounted fuses									
Front	–	3/16	3/16	3/16	3/16	3/16	–	–	3/8−3/16
Rear	–	3/16	3/16	1/8	1/8	1/8	–	–	3/8−1/8
Modular Fuse Blocks:									
Front and rear	–	1/8	1/8	1/8	1/8	1/8	–	–	3/8−3/16
Unit Framework:	3/8	3/8	3/16	–	3/8	3/16	3/16	–	–
Casing Doors:									
Front	–	3/4	3/4	–	3/4	3/4	3/16	–	3/8
Inside	–	–	–	–	–	–	3/16	–	–
Frame Base or Cabinet:	3/4	3/4	–	–	3/4	3/8	–	3/8	–
Frame Upright or Cabinet:	3/8	3/8	–	–	3/4	3/8	3/16	3/8	–
Test Equipment:									
Portable and frame−mounted									
Wiring side	–	–	–	–	–	1/8	3/16	–	–

1.12 The space between adjacent lines of characters shall be approximately half the height of the larger characters involved when space permits. Recommended spacings may be reduced when space limitations dictate such a condition. When necessary to reduce character size, the reduction will be in 1/16" increments until the stamp will fit within the space.

Designation Content

1.13 When abbreviations for equipment designations are required in cabling diagram figures, the standard abbreviations shall be used for the individual words of the equipment designation instead of the designation appearing on the product. For example, the abbreviations ("AUX INC REG LK FR") would be used for an Auxiliary Incoming Register Link Frame, instead of "AIRL" which appears on the frame itself.

1.14 Equipment code designations, drawing numbers, and specific designations, such as, row numbers or letters, voltage, fuse−capacity designations, and lamps, shall be located as covered in equipment drawings.

1.15 The use of hyphens shall, in general, be limited to the following and similar condition. When required, use the hyphen with a length approximately 1/5 of height of the associated characters to obtain better appearance and save space.

1.16 Where use of letters adjacent to numbers may cause misinterpretation, use a hyphen to separate the letters from the numbers, for example: CI−1, CI−2, CI−0, C2−0, etc.

1.17 Separate the components of compound types of current supply with a hyphen, for example:

(a) AC − DC

(b) 60V − DC

1.18 In stamping equipment specifications codes and drawing number, use hyphens between base numbers and suffixes, for example:

(a) SD90505−01

1.19 Decimal points shall be stamped where required. The use of periods shall, in general, be avoided except under the following conditions.

(a) Use a period to separate a basic functional designation from its numerical suffix where two or more pieces of apparatus or elements are required to make up the value of a circuit element. For example, where a circuit specifies a 10−MF capacitor with the functional designation TR and five separate capacitors are required to make up this value, they are identified by the designations TR.1, TR.2, TR.3, TR.4, and TR.5. (TR.1 and TR.5 are stamped at first and last when in same row.) In no other case is a period used to separate the basic and suffix parts of a functional designation.

(b) Periods may be used between words or abbreviations to clarify the meaning where lack of space necessitates crowding characters together without proper word spacing, and then only where the meaning of the designation is not clear without periods.

1.20 Distributing Frame block information is provided on the CO base drawing indicating the location of the groups of circuits and whether the terminal strip is mounted horizontally or vertically. The installer shall locate the numerical and functional designations as shown in Figure 1.

Designation Content, Size And Location Examples

1.21 Equipment framework equipped with a designation card shall be designated with the bay name, drawing number or numbers and bay number as shown in Figure 2. The CLEI code, when required, may be shown in the lower left hand corner of the designation card.

1.22 Equipment framework not equipped with a designation card shall be stamped on the top surface of the frame base, both front and rear as shown in Figure 3.

1.23 End guards installed at each end of a continuous line up of frames shall be designated as shown in Figure 4. The end guards will be stenciled from top to bottom in order of proximity. In other words, the designation of the frame nearest the endguard will be shown first and the designation of the frame farthest away will be shown last. A line up broken by a building column or a space for future frames shall be designated as such.

1.24 Aisle pilot alarm lamps mounted on end guards or auxiliary support shall have the colors and designations stamped as shown in Figure 5.

1.25 Switches for frame and aisle lighting and appliance outlets shall have appropriate designations stamped on the cover plates when mounted on open–type end guards and cabinet type end guards as shown in Figure 6.

1.26 Capacity and fuse code designations for ARC–Resisting Fuses are stamped on the front panel only. Fuse position, row number and voltage designation is required on the front and rear of the fuse panel as shown in Figure 7. Where the fuse panel serves more than one type fuse capacity (amperes) the individual fuse capacity and code shall be designated. Brackets shall be stamped or the unequipped fuse position provided between different capacities shall be removed, and a black strip stamped on the bus bar.

1.27 Capacity and fuse code designations for modular fuse blocks are stamped on the front panel only. Fuse position, row number and voltage designations are required on the front and rear of the fuse panel as shown in Figure 8.

1.28 Each fuse position equipped with a fuse shall be equipped with an appropriate designation pin. For those fuse positions which are assigned and a wire is terminated (WT), but the apparatus at the equipment frame is unequipped, a designation pin shall be provided. The pin will correspond to the capacity of the fuse to be installed. Dummy fuses are to be installed in all vacant positions.

1.29 The installer shall update fuse record books and sheets, when applicable, on those ring/tone and fuse bays which utilize a fuse record book and sheets. Information entered on the record sheets is taken from the CO Base drawing (fuse bay) or miscellaneous relay rack equipment drawing. A replacement fuse record sheet should be provided with the equipment order for additions and removals. A typical fuse record sheet is shown in Figure 9 and shall contain information in accordance with the following:

(a) Circuit drawing and figure number

(b) Abbreviated circuit name from schematic drawing or wiring list

(c) Functional designation of fuse or lamp (position 1 top shown in Figure 9)

(d) Circuit number for each fuse position

(e) The fused equipment location (Bay, Frame or relay rack number)

(f) Group limit lines as required

(g) Fuse capacity.

NOTE: **Fuse record sheet entries shall be typed. Minor additions may be made with a fine black pen limited to 10 lines of entries. These entries must be legible. A minimum number of record sheet changes may be made with correction tape or correction fluid (white only). After 10 entries, a new fuse record sheet should be inserted. If the T−Base drawing for fuse assignment is not available at the time of installation, the latest drafting version of the drawing can be pasted in the fuse record book with the penned updated entry.**

1.29.1 Alarm−type fuses associated with ARC−Resisting type fuse panels (Figure 7) are divided into two classifications, "regular" and "non−flashing". The non−flashing types differ from the regular type in that the fuse wire is protected by a glass (or porcelain) tube. Table B lists fuses of both types.

TABLE B
INDICATOR ALARM TYPE FUSES

Regular	Non−Flashing	Color of Fuse	Rated Capacity (Ampere)
35R		Yellow	0.180
	35S	Violet (formerly Pink)	1/4
35F	35J	Red	1/2
35T		Tan	0.650
	35P	Brown (formerly Tan)	3/4
35A	35K	White	1−1/3
35C	35L	Orange	2
35G	35M	Blue	3
35H	35N	Green	5

NOTE: Non−flashing indicator alarm type fuses (35−type) shall be used on all circuits 90 volts and higher except for 35R fuses, used in 130 volt DC plate battery supply circuits when this fuse is functioning as a non−flashing type.

1.30 Alarm−type fuses associated with modular type fuse panels (Figure 8) are divided into two classifications, "normal" and "slow−acting."

1.31 The rated capacity of a 70−type fuse with normal operating time characteristics can be determined by the solid color of the plastic indicating bead projecting beyond the cap. A slow−acting 70−type fuse will have a longitudinally striped bead with three stripes of color separated by three stripes of white; the identifying color used will be the same as that for the same capacity fuse with normal operating time characteristics. Table C lists the colors used to indicate the rated capacity of the 70−type fuse.

TABLE C
INDICATOR ALARM TYPE FUSES

Normal	Slow−Acting	Color of Fuse and Designation Pin	Rated Capacity (Ampere)
70E or 70E2		Yellow	0.180
70F or 70F2		Violet (formerly Pink)	1/4
	70K or 70K2	Violet & White (formerly Blue−Green)	1/4
70G or 70G2		Red	1/2
		Red & White	1/2
70H or 70H2		Brown (formerly Tan)	3/4
		Brown & White	3/4
70A or 70A2		White	1−1/3
70B or 70B2		Black & White Orange	1−1/3 2
70C		Blue	3
70D5		Green with Black Stripe	5
	70P	Gray & White	0.100
	70R	Red & White	0.150

1.32 A small designation pin, having a head of solid color, a ring of color (eyelet or white dot in the center), is required for 70−type fuses to designate the fuse capacity. The color of the fuse indicating bead should correspond to the color of the designation pin. A pin having a bead of solid color is used with a fuse having normal operating time characteristics while the ring of color (eyelet) indicates a slow−acting fuse.

1.33 It shall be the responsibility of the installer to replace all missing capacity designation pins and to make necessary replacement of designation pins when a change in rated capacity is made.

1.34 For fuse positions which are assigned but not equipped, a designation pin shall be provided to indicate the capacity of the fuse to be installed when the circuit is activated.

1.35 Power polarities such as positive and negative 24V, 48V, 130V, shall be stamped on power plant and distribution panels as specified on the job drawings.

1.36 When designating battery cells the lowest numbered cell shall be at the end of the battery string with potential nearest ground unless the ground connection can be changed by switching. In this case, the lowest numbered cell shall be at the positive end. Starting with cell number 1, apply designations for each alternate cell in the battery string. For strings with an even number of cells, also identify the last cell of the string. Apply a combined numerical and alpha designation to identify the pilot cell "P" in each battery string. All designations shall be 3/4 inch. The finished installation should identify first, last, and all odd numbered cells in a string, as shown in Figure 13.

1.37 Apply a group designation for each battery or group of cells, including start batteries, arranged for individual connection, and for each string of permanently paralleled cells in the battery or group. The group designation should be located near the main aisle end of the string.

1.38 All battery terminations shall be identified as to what they feed as shown in Figure 14.

1.39 The group designation or the terminating information at the distant end must be marked on the front of the fuse, switch, or breaker, **and the fuse breaker, or switch position designation shall be stenciled on the rear.**

1.40 When an alarm type fuse (which is associated with a cartridge type fuse) is not located adjacent to the cartridge fuse, the arbitrary number assigned to the alarm fuse shall be the same as the number assigned to the cartridge fuse. Capacity designations are not required for 70−type fuses equipped with color coded designation pins.

1.41 The capacity designation of each cartridge type fuse shall be stamped on the apparatus side only parallel to the fuse as shown in Figure 15. Voltage, functional and group designation shall appear on the front and rear. A typical cartridge type fuse block shall be designated as shown in Figure 16.

1.42 Power distributing service fuse cabinets shall have the name of the circuit for each set of fuses. The fuse capacity in amperes, and the fuse position number shall be stamped on the wiring gutter covers which form the inner side walls of the fuse block compartment unless the cabinet is equipped with a designation chart.

1.43 When the cabinet is equipped with a designation chart, the fuse position number, fuse capacity in amperes and name of circuit associated with the fuse, shall be stamped either on the chart or on the wiring gutter covers previously described, whichever is more convenient.

1.44 The fuse position number shall also be stamped on the designation card which is furnished at each fuse position on the front of the fuse head as shown in Figure 17. This is done to associate the fuse position with the information which will be stamped either on the chart or on the wiring gutter covers (described above) for the fuse cabinet.

1.45 Spare fuses and fuse storage panel shall be provided and located in the immediate vicinity used exclusively for the power plant. Figure 18 shows a typical spare fuse holder panel.

Number Plates

1.46 Number plates (cable markers), as shown in figures 10 and 11, shall be provided to identify framework ground cables, power plant ground bus bars and any other equipment grounds terminating on relay rack, frame or junction pipes, etc. The installer shall abbreviate and use as few designations as possible. The tag should be secured with cord.

1.47 Stamp the number plates using either 1/8 inch or 3/16 inch characters (black ink) depending upon the space available to adequately identify the destination of each cable. Both sides of the plate may be used for proper identification. Handwritten entries are allowed but must be legible and not smeared. Two authorized black pens are Sharpline (fine tip) permanent marking pen and Staedtler Lumocolor 329.

Grounding Applications

1.48 All grounding conductors terminated at the Office Principal Ground Point (OPGP), Central Office Ground Bus (COGB), and the Main Ground Bus (MGB) shall be equipped with a number plate stamped with the aisle, frame, and/or equipment being grounded by the conductor. In addition, all grounding conductors with both ends terminating at relay racks, frames, cabinets, etc. shall identify the far end termination.

EXCEPTION: Number plates will not be required where both terminations of a cable can be identified from either point of termination, from the floor, and the continued identification of these cables will not be obscured by future installations.

1.49 When the ground lead is associated with a numbered battery lead termination, this number will suffice as adequate identification as shown in Figure 11.

1.50 The numerical designation, usually shown on job drawings, will be stamped on the bus, panel, etc., when room permits as shown in Figure 12. When room does not permit, a number plate will be used s shown in **Figure 11.**

1.51 In addition to the number plate, the lead at the COGB from the OPGP shall have a brass tag stamped “DO NOT DISCONNECT’ affixed to the grounding conductor as near to the compression lug as possible.

1.52 When number plates are required at the equipment end, they shall be attached at or near the cable termination point and are to be placed in such a manner where they will not interfere with the placement of protective covers and can be read without removal of the cover.

NOTE: For dedicated frame applications, 145c tags are not to be installed in the cable rack.

1.53 Battery return/discharge leads that terminate on clearly designated fuse positions are not required to have number plates. (Ensure that the rear fuse position has a numerical designation and that the front of the fuse position is designated as outlined in this section.

1.54 Number plates are required on the ends of battery discharge and return leads where they dead end for future equipment (in the cable rack). The number plates shall not have any metal attached to them.

1.55 The following is a list of typical designations which must be stamped on equipment. The list is not all inclusive, but rather is a list which may be used by the installer as a guide:

- Stamp bays with the relay rack number (front and rear).
- Stamp all bays and shelves with the CLEI code sets.
- Stamp all distributing frames with vertical and horizontal shelf numbers.
- Stamp all end guards to indicate added equipment.
- Stamp all aisle switches with a direction arrow.
- Stamp all AC outlets which provide voltages other than 120 volts.
- Stamp all fuse panel row designations.
- Stamp fuse capacity at fuse position.
- Stamp all voltage designations on fuse panels.
- Stamp all fuse record book covers with relay rack location.
- Stamp all power service cabinets with name and number.
- Stamp “Disconnect AC Before Opening” on trolley coupling or end cap.
- Stamp “Danger Auto Start” on all automatic start equipment.
- Stamp all designations associating alarm fuses with discharge fuses.
- Stamp frame number associated with battery discharge fuse.
- Stamp direction of rotation of machines
- Stamp CLEI code set designations as required
- Stamp all distributing frame terminal strips per office records.
- Stamp tags for power feeds with power bay and fuse locations.
- Stamp installation date on battery stands
- Stamp all fuse record books with appropriate fuse bay location.

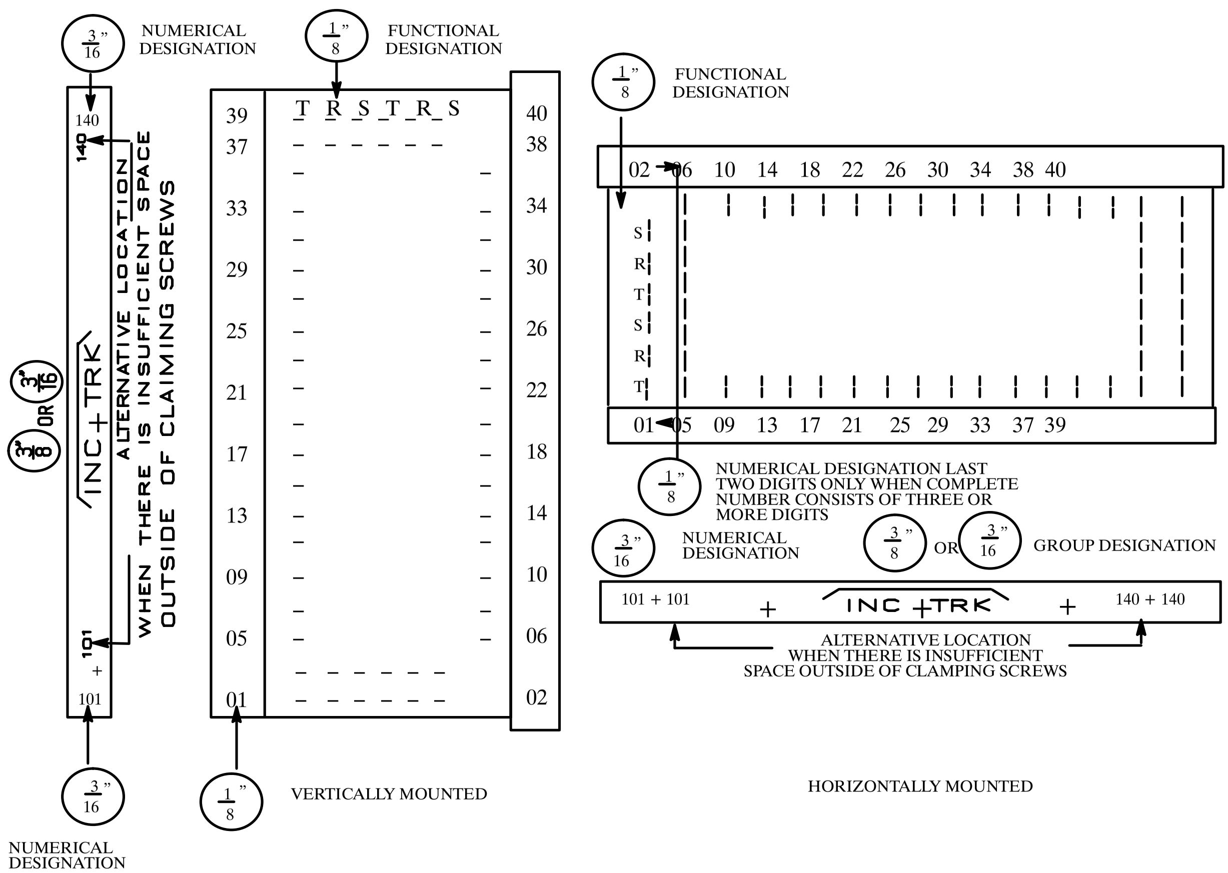


Figure 1 − General Requirements For Size And Location Of Character

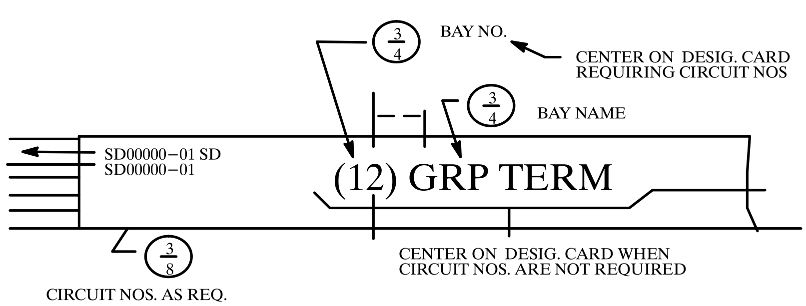


Figure 2 − Bay Designation Card

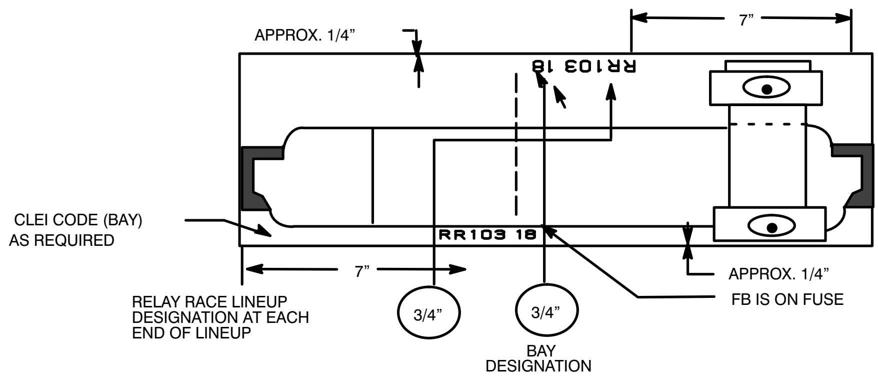


Figure 3 − Typical Frame Base Designation

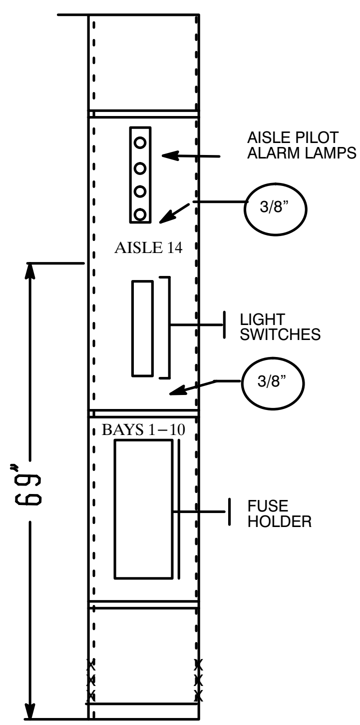


Figure 4 − Typical End Guard

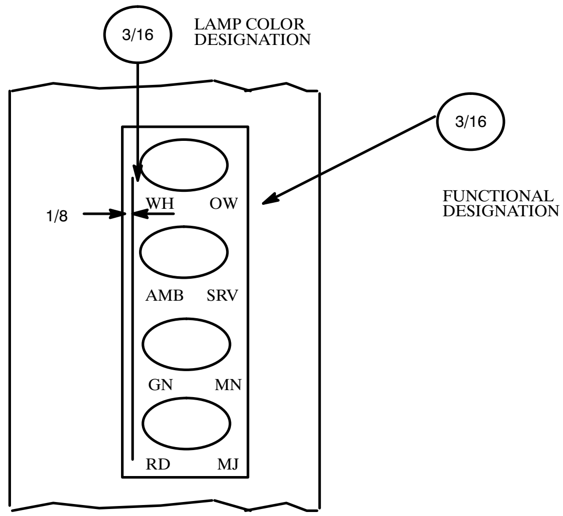


Figure 5 − Typical Aisle Pilot Alarm Lamps

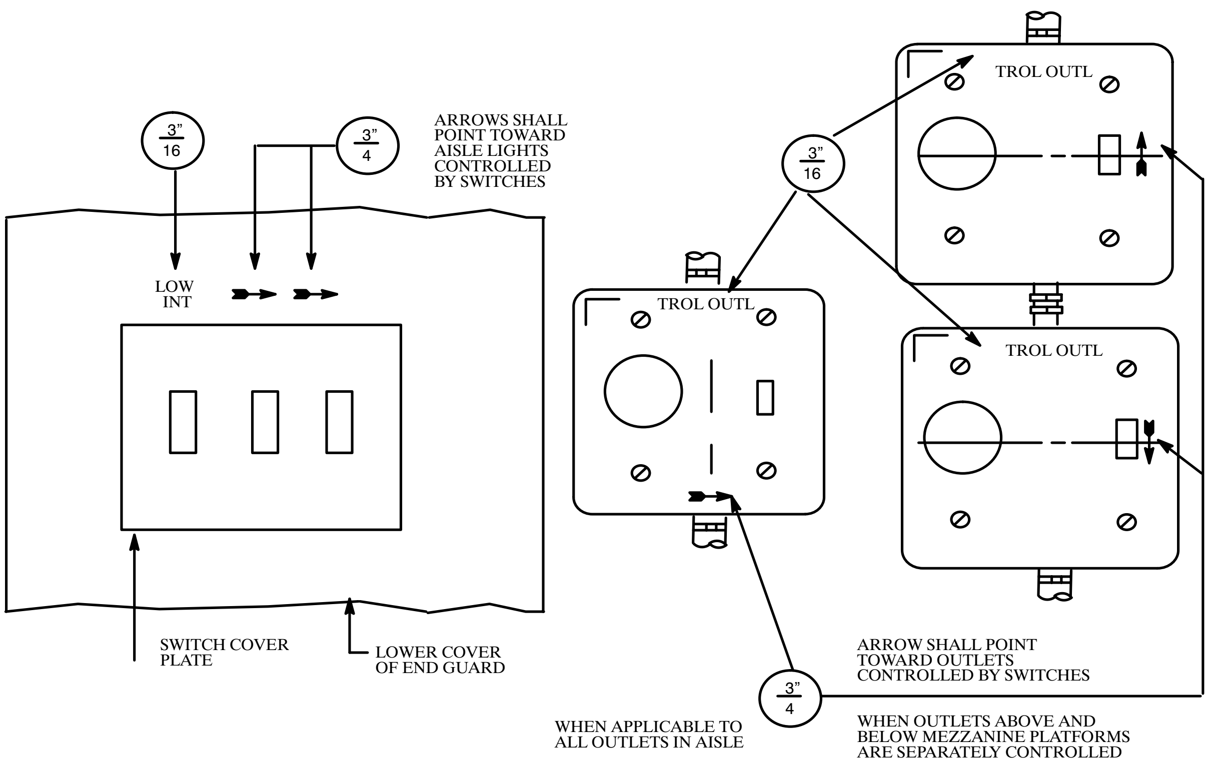


Figure 6 − Typical Aisle Lighting Switches And Appliance Outlets

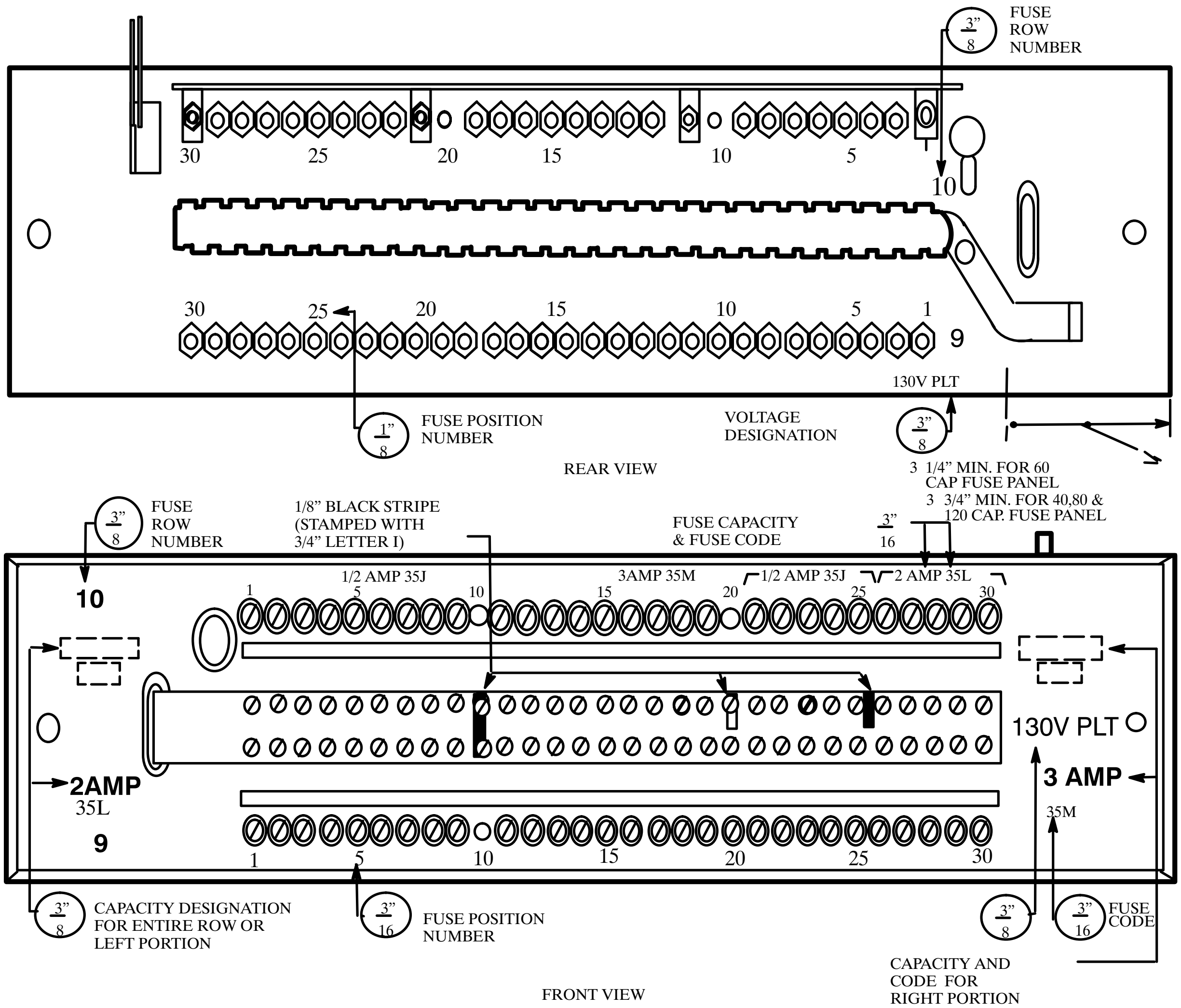


Figure 7 − Typical (ARC-Resisting) Fuse Panel

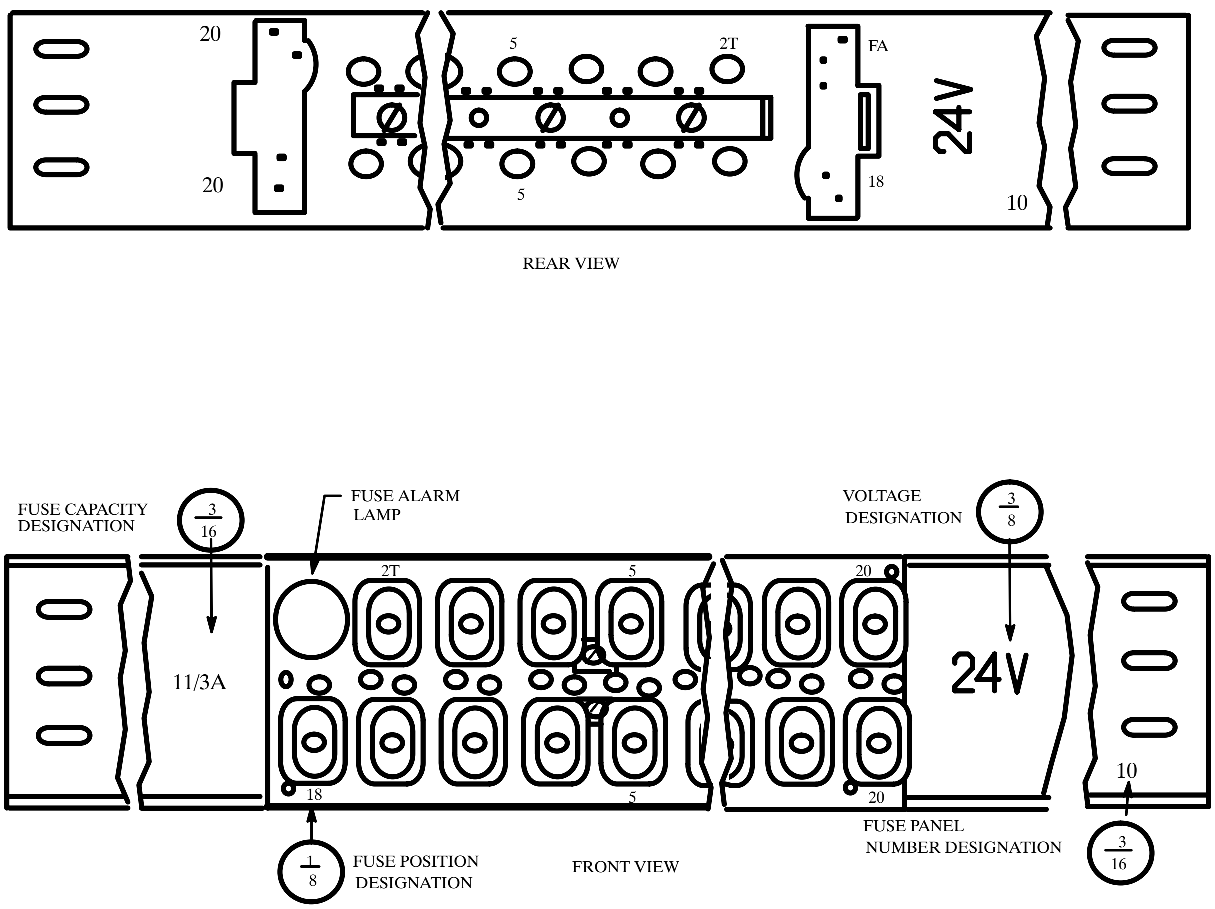


Figure 8 − Typical (Modular) Fuse Panel

FUSE PANEL EQUIPMENT

POT.	POS	AMP	FUNC DESIG	CIRCUIT NO.	CIRCUIT DRAWING TITLE	CIRCUIT DRAWING NUMBER	CIRCUIT DRAWING FIG.	EQUI LOC
	1T	–	fA	–	FA	T−31613−15	7	–
	2T	1 1/3	A	15.20	ROTS GR−2	T−3068−19	7	202.3
	3T		B	−			13	
	4T		–	0	MFR−O	T−95536−30	4	–
	5T			1				
	6T			2				
	7T			3				
	8T			4				
	9T			5	[WT]			
	10T			6	[WT]			
	11T			7				
	12T			8	[WO]			
	13T			9	[WO]			
	14T			10				
	15T			11	[WO]			
	16T		–	–	FB FA	T−31613−15	11	200.0
	17T				[PLT 1−6,26−		3	
48V S1G	18T		A		30,36]		8	
	19T				[PLT 36−41]			
	20T	5	–		ZONE ALM	T−96052−11	17	*
	1B	1 1/3	A		ROTS GR−1	T−30843−19	1	202.3
	2B			1.5				
	3B			2.7				
	4B			3.8				
	5B			4.9				
	6B			5.10				
	7B			11.16				
	8B			12.17				
	9B			13.18				
	10B			14.19				
				15.20				
	11B		B	–			13	
	12B		A	1.6	ROTS GR−2		1	
	13B			2.7				
	14B			3.8				
	15B			4.9				
	16B			5.10				
	17B			11.16				
	18B			12.17				
	19B			13.18				
	20B			14.19				

RR−200 FB−0 Row−1
T−0001−215

Figure 9 − Typical Fuse Record Sheet

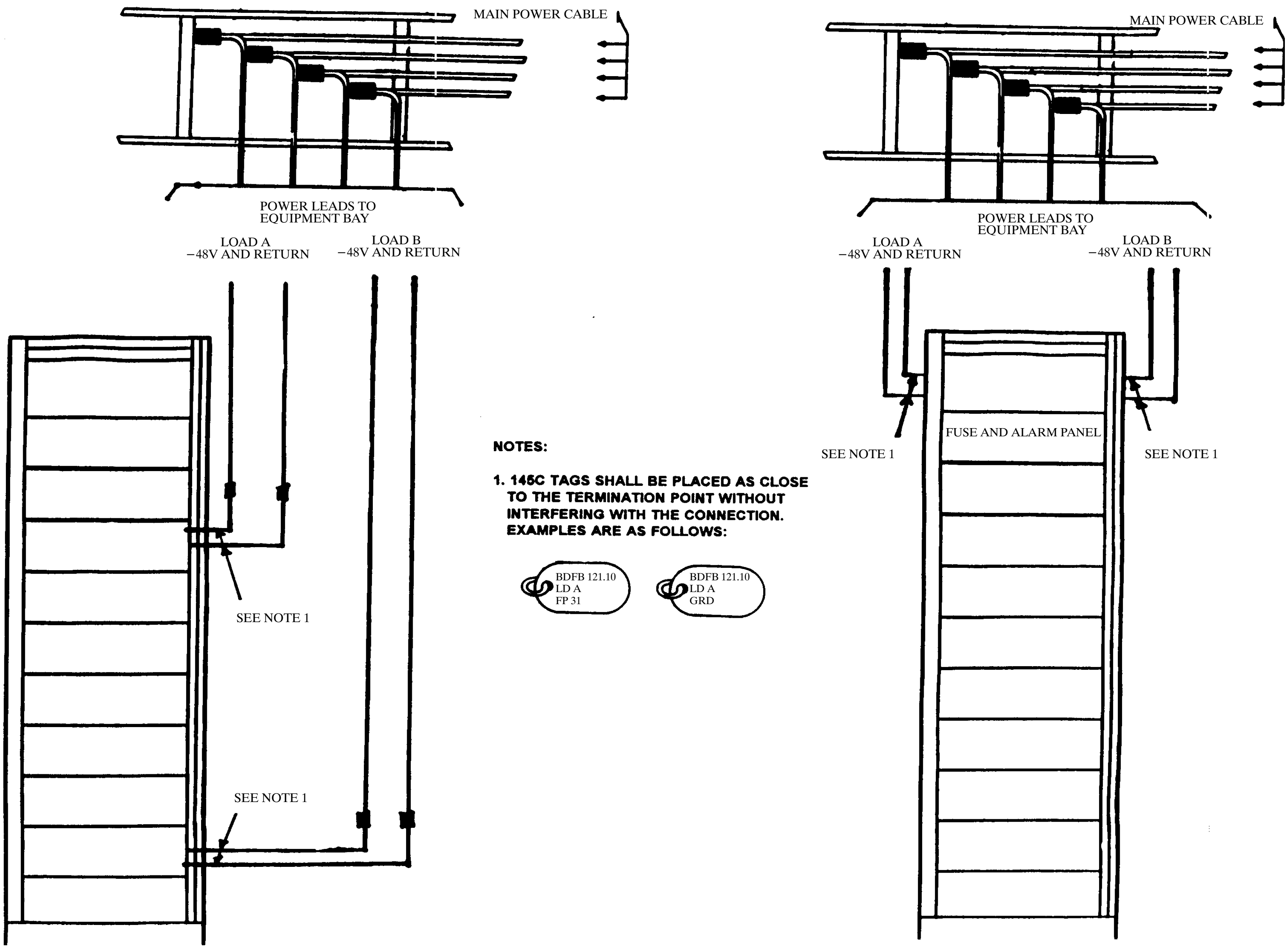


Figure 10 – 145C Tags

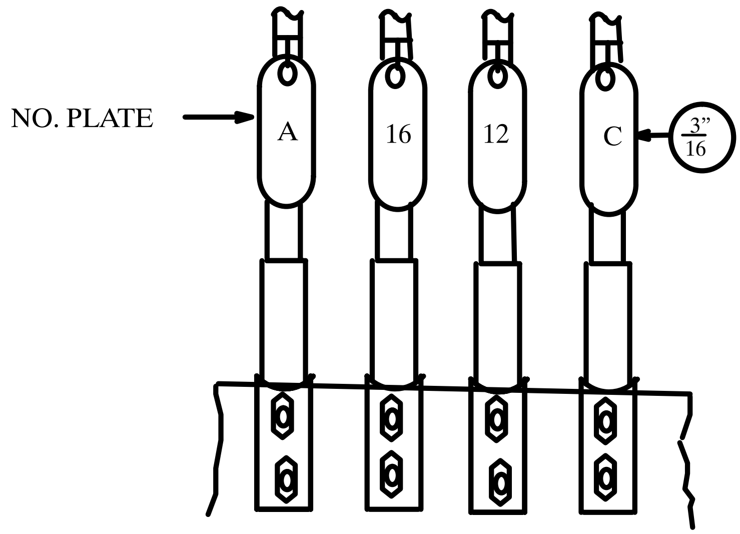


Figure 11 − Ground Bus Bar On Fuse Bays, Battery Distributing Fuse Boards, Power Boards

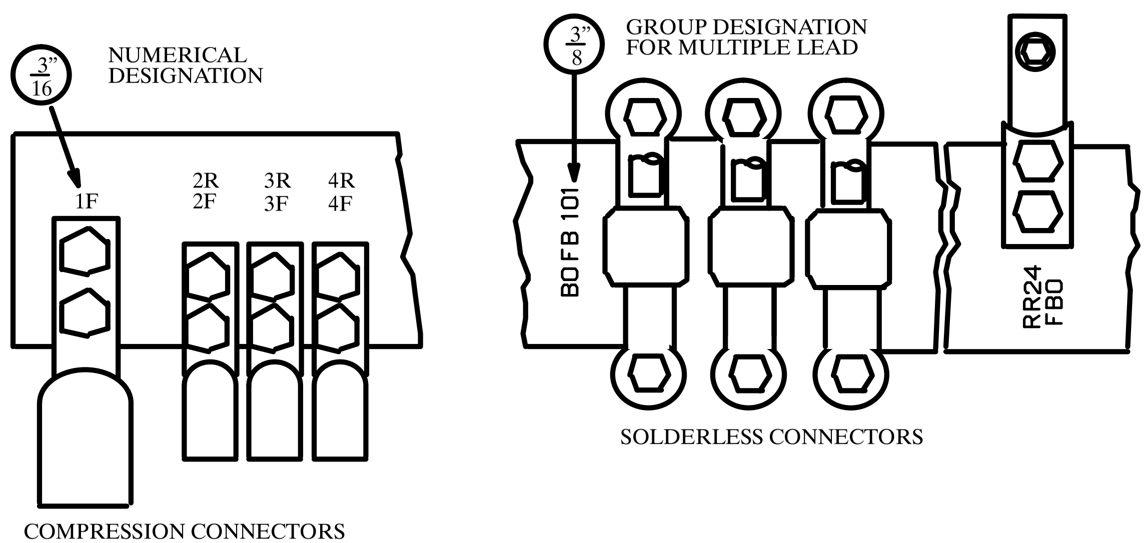


Figure 12 − Ground Bus Bar

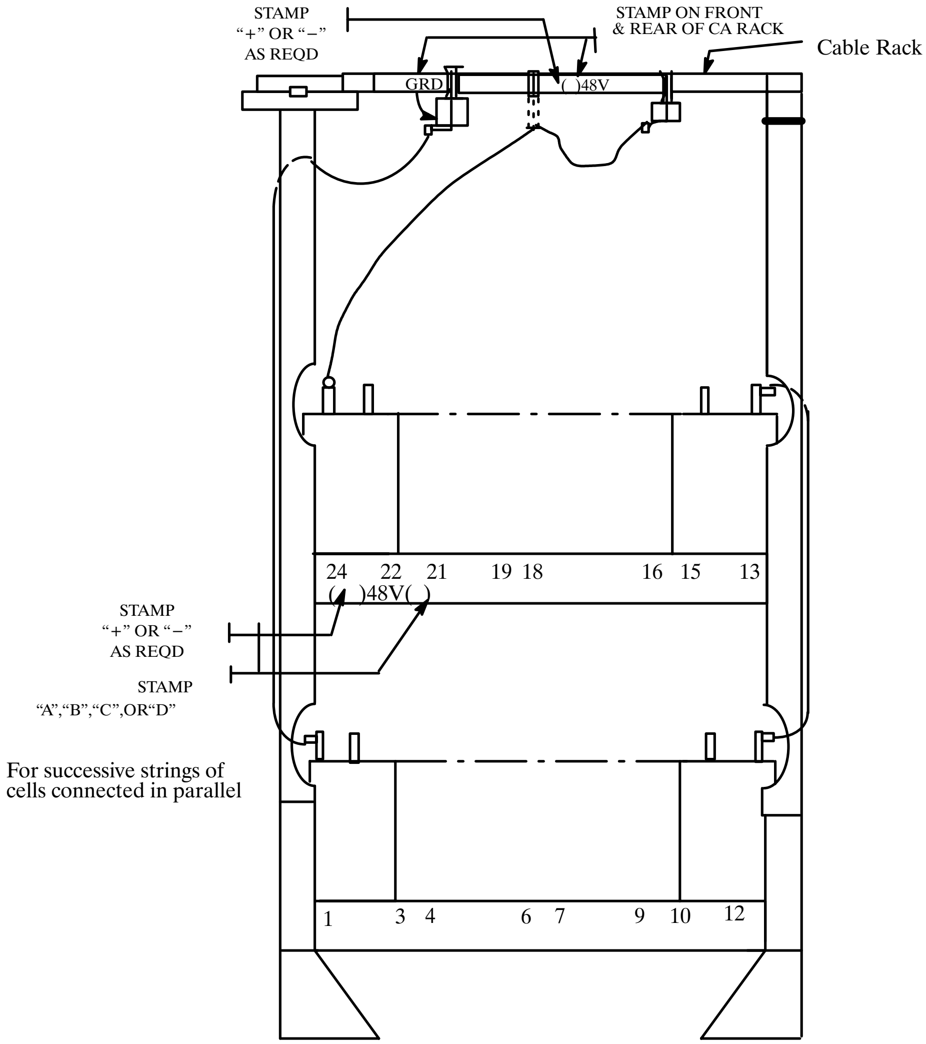


Figure 13 − Battery Cells Two Tier One-row Stand

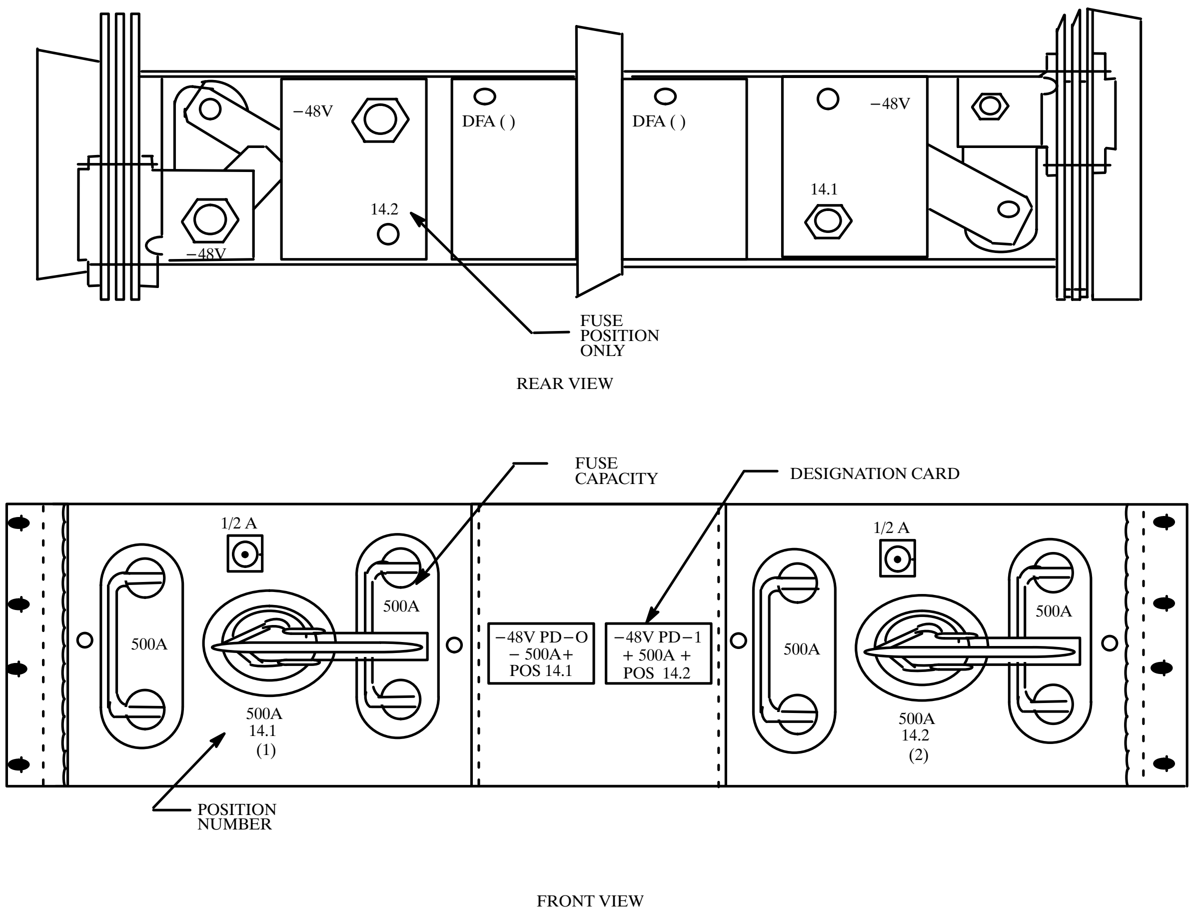


Figure 14 − Discharge Fuses And Switch Unit

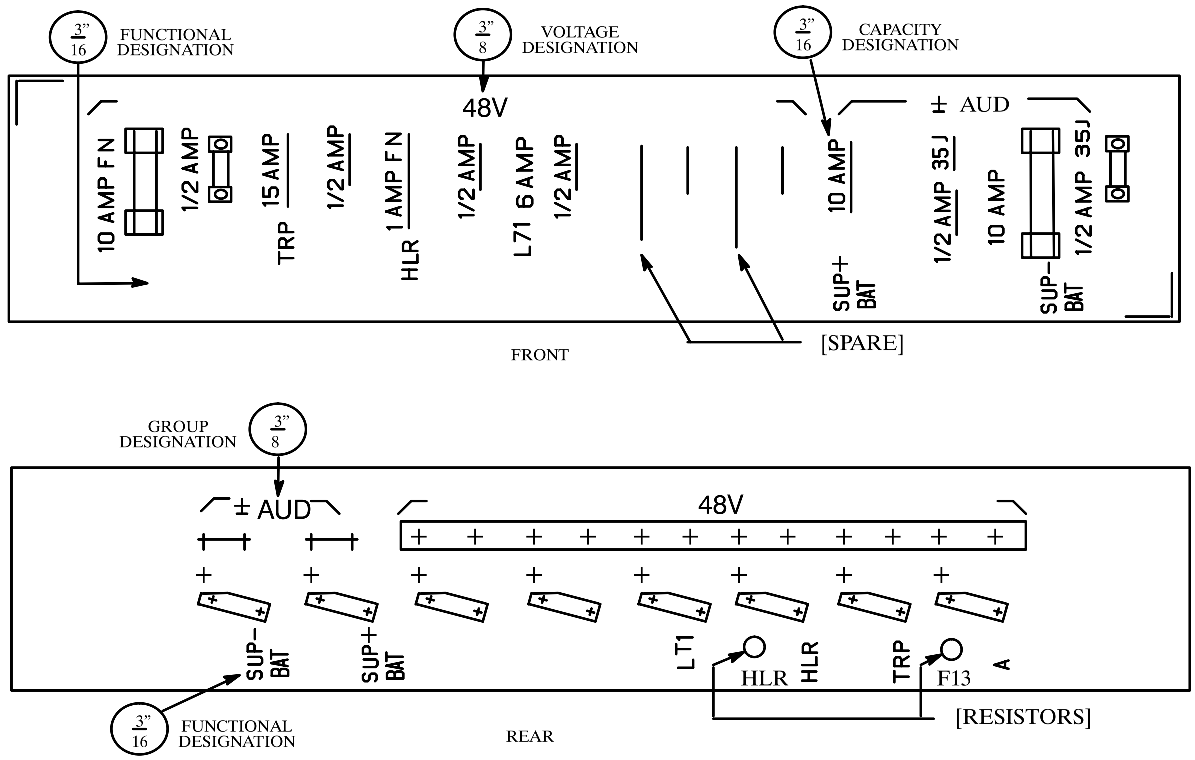


Figure 15 − Fuse Panel With Cartridge And Alarm Type Fuses

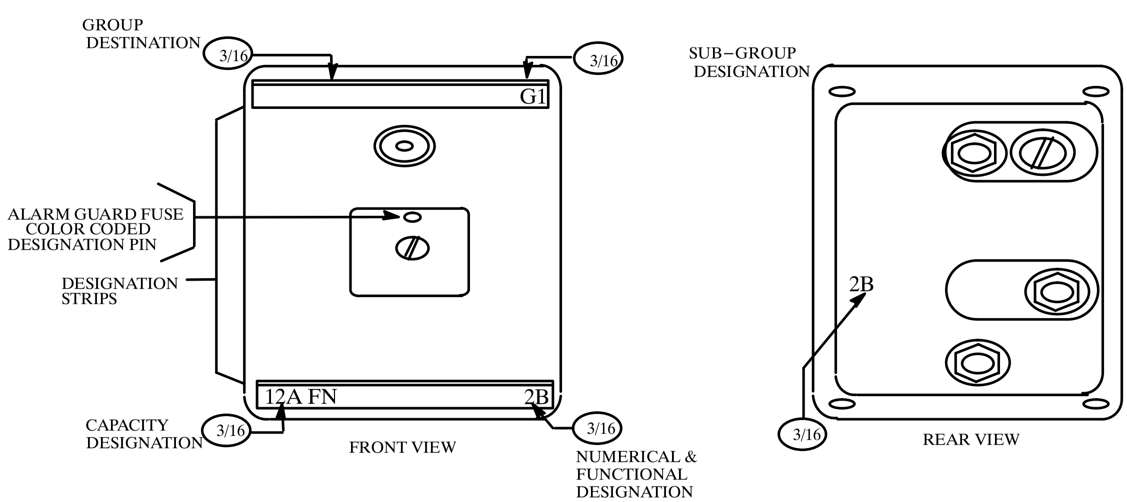


Figure 16 − Typical Cartridge Type Fuse Block

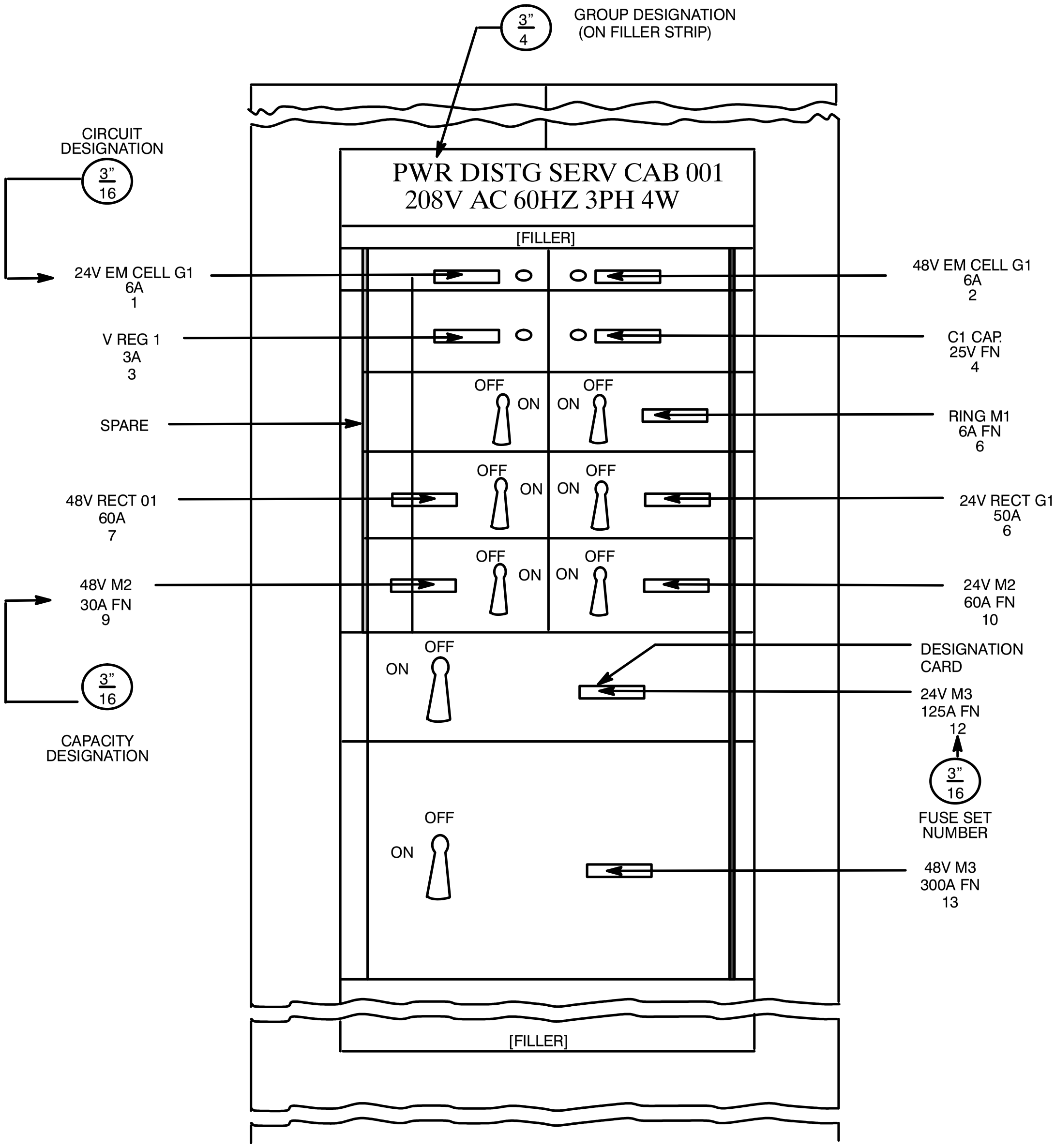


Figure 17 − Typical Power Distributing Service Switch And Fuse Switchboard

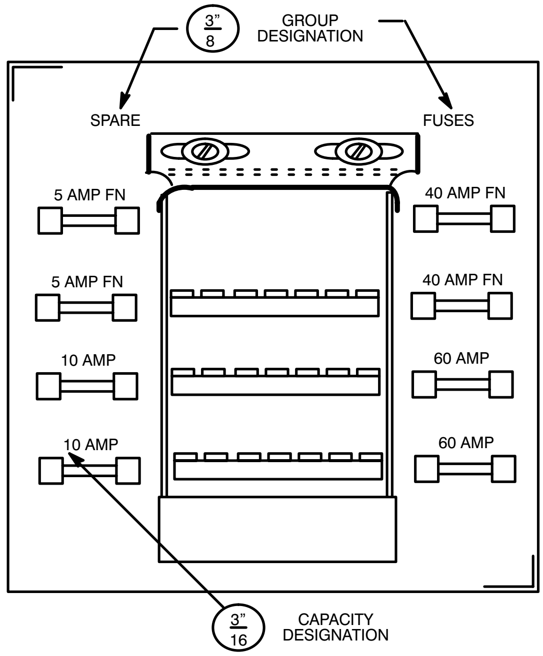


Figure 18 − Typical Spare Fuse Panel For Nec Fuses And Alarm Type Fuses