SBC LEC
TECHNICAL PUBLICATION

NOTICE

This Technical Publication is published by the SBC Local Exchange Carriers (SBC LEC) as a guide for the designers and manufacturers of central office equipment, including the providing of engineering and installation services relating to SBC LEC communications systems or equipment. It is not intended to provide complete design specifications or parameters nor the assurance of the quality of performance of such equipment.

The SBC LEC reserves the right to revise this Technical Publication for any reason, including, but not limited to, conformity with criteria or standards promulgated by governmental or regulatory agencies; utilization of advances in the state of the technical arts; or to reflect changes in the design of equipment techniques or services described or referred to herein.

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In performing services hereunder, the Installation Supplier agrees to limit its activities to those necessary and essential to performing such services, to not interfere with or misuse any non-SBC LEC equipment or facilities on or adjacent to the SBC LEC’s facilities, to refrain from in any manner accessing customer lines to which customer has access and to indemnify and hold harmless the SBC LEC for any inappropriate use of material or information.

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1. GENERAL

1.1. Introduction

TP 76300MP, SBC LEC Installation Requirements, provides general requirements when doing equipment installation, modification, removals or building work activity in the central office environments of the SBC Local Exchange Carriers (SBC LECs).

1.1.2 Changes in this issue of Section A are summarized in Table A-1.

1.1.3 The SBC LECs assume no responsibility for any costs incurred by a given manufacturer or Supplier in conforming to the requirements of TP 76300MP. Further, conformance to all requirements delineated in this document does not constitute a guarantee of acceptance of a given Supplier’s product/service for use in the SBC LECs.

1.1.4 SBC reserves the right, without prior notice, to revise TP 76300MP for any reason.

1.1.5 The SBC LEC reserves the right to audit Installation Suppliers for compliance to TP 76300MP. Questions concerning the audit process or quality results should be referred to:

a) Ameritech:
   Installation Quality
   8440 Prospect St.
   Mentor, Oh. 44060
   Attention: Tony Berzin
   anthony.f.berzin@msg.ameritech.com

b) Pacific Bell and Nevada Bell:
   Network Installation Quality Assurance
   1611 Clayton Rd. Room 102
   Concord Ca. 94520
   Jxgrar@msg.pacbell.com

c) Southern New England Telephone:
   Manager-Maintenance & Transmission
1.2. Scope

1.2.1 TP 76300MP applies to all types of telecommunication equipment installations, e.g., switching, transmission, power, etc and building infrastructure.

1.2.2 TP 76300MP is applicable to all installation activities in the central office environments of the SBC LECs, regardless of who performs the work. This includes SBC LEC personnel, Competitive Local Exchange Carriers (CLECs) personnel, as well as any contracted installation suppliers performing work for the SBC LEC or on behalf of CLECs. For installations at Public Safety Answering Point (PSAP) locations, refer to TP 76911MP.

1.2.3 The intent of TP 76300MP is to familiarize the Installation Supplier with SBC LEC installation procedural requirements by:
   a) Covering the precautions to be taken to protect personnel and to prevent service interruptions and degradation during the installation activity.
   b) Outlining the basic standards to which the Installation Supplier’s performance will be expected to conform for job acceptance purposes.
   c) Defining the necessary documentation used to detail the installation activity.
   d) Defining installation start, job completion and job acceptance procedures.
   e) Identifying the SBC LEC involvement during the various aspects of the installation operation.

1.3. Definitions

1.3.1 Definitions of certain terms used in TP 76300MP are as follows:
   a) **SBC LEC Equipment Engineer** - the SBC LEC equipment engineering organization representative or the SBC LEC real estate management representative who is directly responsible for the installation in progress and who has overall responsibility for ensuring job completion and acceptance.
   b) **SBC LEC Representative** - The SBC LEC person(s), designated by the SBC LEC Equipment Engineer, who has responsibility for the daily coordination between the Installation Supplier’s on-site personnel and the SBC LEC.
   c) **Installation Supplier** - The provider of installation services, including telecommunications equipment and building infrastructure installation service providers,
as well as SBC LEC personnel who perform installation activities, within the central office environments of the SBC LEC.

d) **Central office environment** - SBC LEC owned or leased premises where network elements are located.

e) **High Seismic Zone** – Earthquake zones 3 and 4 as defined by USGS (United States Geological Survey).

f) **Installation activity** - Any activity provided by an Installation Supplier including, but not limited to, additions, modifications, removals, work performed on building infrastructure, and/or other contractual services performed within the central office environments of the SBC LEC.

g) **Low Seismic Zone** - Earthquake zones 0,1, and 2 as defined by USGS (United States Geological Survey).

h) **Shall** - Something that is mandatory and subject to audit.

i) **Should** - Something that is recommended.

j) **SBC LEC** - SBC Communications Inc Local Exchange Carriers.

k) **Yellow wallet** - A standard accordion folder with cover, minimum size 9” X 12”, in which job documentation to remain at the site shall be filed.

1.4. **General Requirements**

1.4.1 Unless otherwise indicated on the Checklist of Current Sections, TP 76300MP requirements become effective for jobs completing 90 days or more after the section issue date. The Checklist of Current Sections at the front of TP 76300MP indicates the issue date and the effective date of each section. Revisions will be issued on a section-by-section basis. Along with the revised section(s), an updated Checklist of Current Sections will be issued to indicate the current issue date and effective date for each section.

1.4.2 The Installation Supplier shall contact the SBC LEC Equipment Engineer to request any variance from TP 76300MP. The Installation Supplier shall provide documentation of approved variances in the yellow wallet at the job site.

1.4.3 The Installation Supplier shall have the TP 76300MP currently in effect available (may be electronic or paper copy) at the job site.

1.4.4 The Installation Supplier shall have the detail specification available (may be electronic or paper copy) at the job site.

1.4.5 The Installation Supplier shall have available (may be electronic or paper copy) at the job site a copy of the appropriate SBC LEC equipment and interconnect drawings.

1.4.6 The Installation Supplier shall have available, electronically or paper, at the job site a copy of all furnished manufacturers’ drawings as required in the detailed specification.
1.4.7 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.4.8 The Installation Supplier should refer questions pertaining to the detail engineering of the job to the appropriate detail engineer.

1.4.9 The Installation Supplier shall notify the Detail Engineering Service Provider (DESP) in writing of any conditions or items that do not meet the job documentation and TP 76300MP requirements.

1.4.10 The documents listed in Table A-2 support TP 76300MP and provide additional details. The Installation Supplier shall have access to these documents and shall refer to them as needed.

1.4.11 The Installation Supplier shall correct all defects within 30 days of notification, unless otherwise specified.

1.5. Quality Assurance Programs

1.5.1 The Installation Supplier shall comply with all Quality Assurance Programs as specified by the Regional Quality Assurance Organizations.

1.6. Proprietary Information

1.6.1 All proprietary documents referenced in TP 76300MP are available to contracted Suppliers through signed nondisclosure agreements or as detailed in current contracts between the SBC LEC and the Supplier.

1.7. Ordering Information

1.7.1 Internet access is available to approved suppliers for downloading electronic copies of TP 76300MP and other non-proprietary SBC LEC references. Information concerning internet access can be obtained from:

Gwen Schumaker
2200 N. Greenville, Room 3E
Richardson, TX 75082
E-mail: gs5695@sbc.com

1.7.2 Paper copies of TP 76300MP or other SBC LEC technical publications can be ordered from:

Technical Publication Information
530 McCullough, Room 2-E-02
San Antonio, TX 78215

1.7.3 Non-SBC LEC publications referenced herein should be obtained from the originator of the publication.

1.8. Comments On TP 76300MP

1.8.1 Comments on TP 76300MP should be submitted by e-mail or in writing to:

Jamie McCammon
201 S. Douglas, Room 111
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1. GENERAL

1.1. Introduction

1.1.1 This section covers general requirements related to safety, environmental, care of building facilities and premises, compliance with laws, rules and ordinances, and equipment preparation for installation.

1.1.2 Changes in this issue Section B are summarized in Table B-1.

1.1.3 Many of the items addressed in this section (e.g., building facilities, building conditions, etc.) will require joint SBC LEC/Installation Supplier review in advance of the actual installation activity. Sufficient time will be incorporated into the total job schedule to allow for alterations, additions (prior to the equipment installation timetable) and/or the additional expense approval by the SBC LEC Equipment Engineer.
1.1.4 For warranty purposes, the equipment manufacturer may have documented installation requirements pertaining to the “foot print of the equipment.” If these requirements conflict with the requirements given in TP 76300MP, the manufacturer’s requirements shall apply.

1.1.5 The Installation Supplier shall provide a minimum Level 3 representative (see Section C) on-site to oversee any work performed by the Installation Supplier’s non-approved subcontractors.

1.2. Safety

1.2.1 The Installation Supplier shall be entirely responsible for the safety and instruction of its employees or representatives.

1.2.2 All temporary installations shall adhere to the safety requirements for permanent installations.

1.2.3 The Installation Supplier shall take precautions to avoid harm to personnel, equipment and building (e.g., cutting installed threaded rod).

1.2.4 The Installation Supplier shall suspend work operations immediately when so instructed by the SBC LEC.

1.2.5 The Installation Supplier shall immediately report to the SBC LEC Representative any accident, outside agency inspection or hazardous condition, including:

a) Any accident or injury that occurs to employees or subcontractors of the Installation Supplier while on SBC LEC premises.

b) Any OSHA inspection or citations issued to the Installation Supplier while on SBC LEC premises.

1.2.6 Floors and work area shall be kept free of all potential hazards. The Installation Supplier shall avoid creating a slip or trip hazard.

1.2.7 All combustible materials stored overnight in the equipment area shall be completely covered with a fire retardant and anti-static tarp that meets NFPA 701 or UL 214 and is clearly marked as such.

1.2.8 The Installation Supplier shall store flammable materials i.e. spray paint, solvents, etc., outside the building in a fire rated cabinet, if available, or remove the material from SBC LEC property.

1.2.9 All waste materials, such as waste paper, foam plastic, cloth bags, packing boxes, packing material and similar material supplied during the installation, shall be removed from the building by the Installation Supplier on a daily basis (or more frequently if required).

1.2.10 All walkways, entrance and exit routes through the equipment area shall be kept clear of tools, equipment, equipment packaging, cable, etc. Caution signs shall be posted where needed.
1.2.11 The Installation Supplier shall not obstruct doorways, equipment aisles, corridors, stairs, fire exits, fire extinguishers and fire fighting equipment, pull box alarms and electrical breaker/fuse panels.

1.2.12 If the Installation Supplier has any questions in regard to safety, contact the SBC LEC Representative.

1.2.13 The Installation Supplier shall ensure the following during the installation:
   a) That its employees are informed of any hazards that may exist on the job and the action required, minimizing the risk of personal injury, property damage, or service interruption. Furthermore, all Installation Supplier personnel shall comply with the safety guidelines and policies that are followed by the SBC LEC in installation equipment areas (e.g., safety glasses).
   b) That personal protective clothing and equipment, such as cotton gloves, heat resistant gloves, low-voltage rubber gloves, ear protection, safety eyeglasses, etc., are provided and used to minimize the risk of personal injury.
   c) That combustible furniture is not brought into equipment areas.
   d) That apparatus or materials are not stored in equipment aisles, corridors, stairs or fire exits.
   e) That Installation Supplier’s personnel adhere to the SBC LEC’s non-smoking policy.
   f) That precautions are taken to prevent fire resulting from the use of temporary wiring, test wiring, lamps, soldering irons and other similar equipment.
   g) That Installation Supplier personnel are familiar with the building’s evacuation features.
   h) That Installation Supplier personnel are familiar with the location and use of the fire extinguishing equipment in the installation area.

1.3. **Safety, Tools and Precautions**

1.3.1 The Installation Supplier shall provide its own tools.

1.3.2 Extension cords shall be NRTL listed, three conductor, 14 gauge or larger, commercial grade.

1.3.3 All tools used for installation activities on and adjacent to “hot power” environments, (e.g., the common battery supply and grounded battery return in the power room or area, and power distribution boards, cabinets or bays, BDFBs, PCFDs and GPDBs), shall be factory (OEM) double insulated. Only compliant single ended box and open end wrenches, socket sets (including compliant ratchets, sockets, extension bars and torque wrenches), nut drivers, screwdrivers and hex (allen) type wrenches are approved for hot power installation.

1.3.4 All power tools shall be battery powered or double insulated.

1.3.5 The Installation Supplier shall inspect all tools that are used for installation activity in the SBC LEC power areas before the start of each shift.
1.3.6 The Installation Supplier shall remove all personal jewelry when performing installation activities.

1.3.7 Safety goggles, face shields and gloves should be worn when working with batteries.

1.3.8 Metal framed ladders, metal desks and metal chairs shall not be placed in the immediate vicinity of working equipment. Metal desks and metal chairs may be used in assigned administrative areas.

1.3.9 Non-conductive measuring devices shall be used in the vicinity of working equipment, except metal measuring tape may be used for floor measurements.

1.3.10 Insulating floor mats should be used for personal protection from electrical shock while performing work on or near power equipment.

1.3.11 Caution should be exercised when working in the vicinity of equipment and tools with rotating components. Loose clothing may become entangled in the equipment.

1.3.12 Insulated blankets that comply with ASTM D1048-93 or ASTM D1048-88a shall be used when working in or around primary and secondary power equipment.

1.4. **Environmental Management**

1.4.1 The Installation Supplier shall follow the guidance provided in Sections G and V of TP 76300MP when addressing Hazardous Materials and Waste management.

1.5. **Vacuum Cleaners**

1.5.1 A vacuum cleaner equipped with a High Efficiency Particulate Arresting (HEPA) filter may be used for removing metal shavings and other debris, except debris that contains or is presumed to contain asbestos. The vacuum cleaner used shall conform to the following requirements:

   a) The HEPA filters shall provide a particle collection efficiency of 99.97% or greater for particle size of 0.3 microns or smaller.

   b) Hoses and any other vacuum cleaner components that may come in contact with electronic equipment shall be made with insulating material.

1.5.2 When it is necessary to use vacuum cleaners in the central office environment, the following procedures shall be followed:

   a) Vacuum cleaners shall be plugged into a wall- or pillar-mounted AC receptacle.

   b) Electrostatic discharge (ESD) protection procedures, per Section N of TP 76300MP, shall be followed when vacuuming electronic equipment.

   c) Bumping the vacuum cleaner into frames shall be avoided.

   d) The secondary air source (exhaust) coming from any vacuum cleaner shall be directed to previously cleaned surfaces. Exhaust air shall not hit unclean surface where the dust could be disturbed.
e) When vacuuming on cable racks or other area above frames, the Installation Supplier shall cover the frames with ESD-coated sheeting to prevent debris from dropping into the frames.

2. BUILDING FACILITIES AND CARE OF PREMISES

2.1. Access

2.1.1 Hours of access shall be specified in the Job Start Agreement before start of installation activity. Written agreement is not required when an SBC LEC employee accompanies the Installation Supplier for a site visit with no installation activity.

2.1.2 The Installation Supplier shall follow the directions from the SBC LEC Equipment Engineer regarding the use of ID cards and electronic card keys and all metal keys.

2.1.3 Installation Supplier personnel shall wear his/her own approved company ID and their own SBC approved Installation Supplier ID Card at all times while on SBC LEC premises. The cards shall be worn at or above the waist with the front side showing. The SBC LEC Representative may issue access cards and restrict Installation Supplier personnel to the facilities and dates specified on the card. Installation Supplier personnel shall surrender the card when so requested by the SBC LEC Representative.

2.1.4 Installation Supplier personnel shall sign the SBC LEC building register, where required, upon entering and exiting the facility.

2.2. Ceiling Inserts

2.2.1 The Installation Supplier shall not install ceiling inserts unless authorized by the SBC LEC Equipment Engineer.

2.3. AC Power, Heat and Light

2.3.1 The SBC LEC will provide electric power for all necessary purposes, with suitable outlets in areas in which work is to be performed. AC outlets located in equipment bays shall not be used for power tools. Heat and general illumination (of a permanent or temporary nature) in rooms in which work is to be performed or material stored, will also be provided by the SBC LEC.

2.3.2 The Installation Supplier shall provide temporary lighting for specific work operations. Use of fluorescent lights or other lights requiring ballast should be approved by the SBC LEC Representative prior to their use. However, in no case should fluorescent lights requiring ballast be used without an ACEG.

2.3.3 The Installation Supplier’s personnel shall make no adjustments to controls, thermostats or venting of the heating or cooling plant. Any adjustments needed shall be directed to the SBC LEC Representative.
2.4. Floor Space For Administrative And Equipment Storage Purposes

2.4.1 An agreement shall be reached with representatives of the SBC LEC and the Installation Supplier(s) as to the availability of suitable floor space at installation start and during progress of the installation work, to be used for the following:

a) Storing major items of material. Floor space in equipment buildings shall not be used as warehouse space. Material shall not be stored in such a manner as to exceed the safe floor load of the building. If storage space is not available for storing job material, the Installation Supplier shall provide temporary storage space in a SBC LEC approved area.

b) Administrative space and luncheon facilities.
   1. Administrative space will only be provided at the location where the installation activity is occurring. Telephone services and office furniture are not included.
   2. Food or drink shall not be brought into the equipment areas.

c) Storing tools and other property belonging to the Installation Supplier.

d) Restroom facilities and supplies such as towels and soap at all locations in which work is in progress.

2.4.2 The SBC LEC will not be responsible for:

a) Providing parking facilities for Installation Supplier’s vehicles without prior agreement.

b) The personal possessions of Installation Supplier’s employees (e.g., jewelry, tools, etc.).

c) Mail or equipment delivery service arrangements for the Installation Supplier.

d) FAX or telephone service without prior agreement. All toll calls or charges are the responsibility of the Installation Supplier. When telephone services are to be used only for equipment testing purposes, the SBC LEC Representative will arrange for the necessary services.

2.4.3 The Installation Supplier shall remove all trash and debris daily, or more often if required. The Installation Supplier shall not use SBC LEC trash containers without approval.

2.4.4 The use of radio frequency devices in equipment rooms containing telecommunications equipment is strictly forbidden. (i.e. cell phone, PCS, etc.).

2.4.5 Prior to entering a central office telecommunications equipment room, cellular and PCS telephones shall be turned completely off. Operation of these devices within central office telecommunications equipment rooms in any mode is strictly prohibited.

2.4.6 The use of cameras or two-way radios in equipment rooms is forbidden without SBC LEC approval.

2.4.7 Gas or electric welding/cutting equipment, torches or other open flame devices, and internal combustion engine-powered equipment will not be allowed in SBC LEC buildings without permission of the SBC LEC Representative.

2.4.8 The employees of the Installation Supplier will not be allowed to bring firearms or explosive devices, including powder actuated fastening devices, onto any SBC LEC premises.
2.5. Openings, Alterations And Repairs To Buildings

2.5.1 The Installation Supplier shall contact the SBC LEC Equipment Engineer if openings, alterations or repairs to buildings are required to allow material to be placed in position or to provide necessary openings and ducts for cables/conductors in the floors and walls.

2.6. Equipment Protection and Building Security

2.6.1 The Installation Supplier shall provide adequate protection of buildings and equipment. Such protection shall be of a nature to ensure against any possible damage, or wear and tear to, or degradation of operational, physical, chemical and/or electrical properties of buildings and equipment. The following examples of protection should be viewed as examples only and not as the only cases where protection is required:

a) An approved method of dust containment shall be used while drilling floors, walls, and ceilings. (See Section G of TP 76300MP for floor drilling requirements.).

b) Fiberboard (e.g., Masonite) or approved PVC floor mats shall be used to protect floors.

c) Existing equipment shall be protected, horizontally and vertically, to prevent damage during installation activities, as identified in the pre-start job meeting. The need for protection within a 10 feet sphere surrounding the equipment should be considered.

d) Fiberboard (e.g., Masonite) shall be used to protect equipment from physical damage.

e) Static resistant and fire retardant plastic sheeting or canvas shall be used to protect working equipment from dust and debris.

f) For protection of equipment that is cooled by either a forced air fan or a heat baffle, fiberboard, in the form of “pegboard” that is treated with approved flame-retardant shall be used. The pegboard shall be placed immediately before starting the daily activity and removed immediately after completion of the daily activity.

g) Stored cable reels shall be blocked or otherwise secured at all times to prevent their movement.

h) Cable shall not be dragged across unprotected flooring. The use of fiberboard or approved PVC floor mats shall be used as floor protection while running cable in the central offices.

i) Electrostatic discharge protective devices necessary for handling and storing circuit packs and other sensitive equipment shall be provided and used by the Installation Supplier.

2.6.2 Installation Supplier personnel shall avoid climbing, standing, or performing any installation or removal activity while on cable racks. If an installation or removal operation cannot be performed from ladders, protection for the cables shall be provided. The protection provided shall be fire retardant and of sufficient size and thickness to spread the load of the installer’s weight on the cables and prevent damage to sheathing of the top layer of cables.

2.6.3 The Installation Supplier shall post warning signage identifying overhead work activity in progress.
2.6.4 All frames waiting installation or transportation and not bolted in place shall be supported to auxiliary framing or building column with an approved supporting strap (2-inch trunk strap/web belt) in low seismic areas and two supporting straps in high seismic areas.

2.6.5 The Installation Supplier is responsible for Installation Supplier caused damages. The Installation Supplier shall correct the damage or reimburse the SBC LEC for repair of damage before final job acceptance.

2.6.6 The Installation Supplier shall not act as an agent of the SBC LEC.

2.6.7 The Installation Supplier shall guard against and take the necessary steps to prevent unauthorized visitors from entering that portion of the SBC LEC premise for which the Installation Supplier is responsible. Exterior openings (e.g. doors, windows, etc.) or interior security openings shall not be left open and unattended.

2.6.8 The SBC LEC may designate the particular gate and/or entrance to be used by the Installation Supplier to enter and leave the premises during installation activity.

2.6.9 The Installation Supplier shall comply with SBC LEC security policies by ensuring that the premises are locked and secured at all times. All security devices such as windows, screens, fences, doors, gates and other similar equipment shall be in place at all times, except when temporary removal is necessary for the installation of equipment. Any security equipment temporarily removed or disabled by the Installation Supplier shall be replaced at the end of each working day.

2.7. Drilling in Ceilings and Walls

2.7.1 A HEPA vacuum cleaner or drilling equipment equipped with a vacuum attachment shall be utilized when drilling holes in ceiling or walls.

2.7.2 If the drilling of holes in the ceiling or walls is within a 10-feet sphere or over working equipment, additional methods shall be utilized to isolate dust, debris or other air borne contaminates from central office equipment. These methods may include but are not limited to:

   a) Anti-static, fire retardant sheeting or canvas may be used to contain dust and masonry from central office equipment.

   b) Drilling with various containment devices designed to control dust, debris or other air borne contaminates from central office equipment (i.e. cone, plunger or sphere surrounding shaft of drill).

2.7.3 Methods utilized to isolate dust, debris or other air borne contaminates from central office equipment shall be addressed in a Job Start meeting.

2.8. Penetrating Waterproof Environments

2.8.1 Before drilling into any basement floor, basement wall, or power environment, the Installation Supplier shall determine from the SBC LEC Equipment Engineer whether waterproofing has been provided and the special requirements for anchoring equipment.
2.9. Cutting, Filing or Drilling of Metal

2.9.1 The Installation Supplier shall strictly control the cutting, filing or drilling of metal to prevent the introduction of metal filing and other contaminants in all central office equipment areas.

2.9.2 Any work activity that requires cutting, filing or drilling of metal shall be performed outside central office equipment area. The Installation Supplier shall have the SBC LEC Representative designate the location for this work activity.

2.9.3 The Installation Supplier shall maintain a clean work area by cleaning up the metal shavings and other contaminants as the work progresses.

2.9.4 Methods for cutting, filing or drilling of metal outside of central office equipment areas may include but are not limited to:

   a) A HEPA Vacuum cleaner shall be utilized to control metal filings and other contaminants.

   b) Cutting, filing or drilling activity shall be performed in a manner that will prevent metal filings and other contaminants from entering central office equipment areas (i.e. cutting, filing or drilling activity performed over and into boxed area outside of walkways)

   c) All surface areas of this material shall be wiped clean of all metal filings and contaminants before material is brought into central office equipment areas.

   d) Materials used for cleaning metal filings and other contaminates shall be disposed of outside the central office equipment area.

2.9.5 In unusual circumstances, where cutting, filing or drilling of metal can not be performed outside the central office equipment area, the following precautions shall be taken to prevent the introduction of metal filings and other contaminates into central office equipment.

   a) A HEPA vacuum cleaner and/or cutting, filing or drilling equipment equipped with HEPA vacuum attachments shall be utilized.

   b) Anti-static, fire retardant sheeting or canvas shall be utilized to control and contain metal filings and contaminates from central office equipment. Various methods of deployment of anti-static, fire retardant sheeting or canvas are acceptable depending on the work activity to be performed. Precautions shall be taken in all methods of deployment not to restrict airflow to central office equipment. Examples:

      1. Placing or draping anti-static, fire retardant sheeting or canvas adjacent to central office equipment in cutting, filing or drilling work area.

      2. Taping and forming anti-static, fire retardant sheeting or canvas in the metal cutting, filing or drilling work area to prevent metal filings or other contaminates from entering central office equipment.

      3. Placing an anti-static, fire retardant sheeting or canvas curtain around the metal cutting, filing or drilling work area to prevent metal filings or other contaminates from entering central office equipment.
4. When extensive metal cutting, filing or drilling activities are required, an anti-static, fire retardant sheeting or canvas partition wall shall be utilized to prevent metal filings or other contaminates from entering central office equipment.

3. COMPLIANCE WITH LAWS, RULES AND ORDINANCES

3.1. Permits And Rights-of-Way

3.1.1 The SBC LEC will provide the right-of-way, permits and authority for installation of equipment where the Installation Supplier is restricted from obtaining such right-of-way, permits, etc.

3.2. Laws, Rules And Ordinances

3.2.1 The Installation Supplier shall comply with all applicable federal, state, county and local laws, ordinances, regulations and codes.

3.2.2 The Installation Supplier shall comply with all applicable Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) regulations when dealing with hazardous materials and other work place hazards.

3.2.3 All work performed by the Installation Supplier shall be in compliance with the National Electrical Code (NEC) and all state, county and local codes.

3.2.4 In the job start meeting, the Installation Supplier shall discuss with the SBC LEC Representative any hazardous materials existing in the central office.

4. EQUIPMENT

4.1. Cross-Connections

4.1.1 SBC LEC personnel will normally be responsible for installing/removing cross-connect terminations before, during and following all installation activities.

4.1.2 If the Installation Supplier is instructed to install cross-connections as part of the installation activity, the cross-connect termination lists shall be furnished by SBC LEC.

4.2. General Cleaning

4.2.1 The Installation Supplier shall perform general cleaning of the equipment and storage areas (e.g., cleaning floors of debris, packing material, etc.) daily during the entire installation period on all types of installations.

4.2.2 The Installation Supplier shall ensure that all equipment is free of dust and foreign substances before being brought into an equipment area.

4.2.3 Cleaning should be scheduled and performed consistent with local requirements. The frequency of required cleaning is affected by the type of ventilation and the presence of filtering systems. The Installation Supplier shall post the Material Safety Data Sheet (MSDS) form for chemicals used in cleaning operation.
WARNING 1: All cleaners and polishes used on central office equipment must be silicone free.

WARNING 2: Spray cleaners should not be used unless specifically authorized by SBC LEC.

4.3. Test Equipment

4.3.1 The Installation Supplier shall use properly calibrated test equipment.

4.3.2 Test equipment owned by the SBC LEC for equipment maintenance will not be available for installation purposes except in specific cases where prior arrangements are made with the SBC LEC.

4.3.3 Any test equipment and/or spare equipment provided, as part of the job is the responsibility of the Installation Supplier. In most instances, the test equipment will not be turned over to the SBC LEC until the associated equipment is turned over. However, upon request, the SBC LEC personnel may have access to the test equipment to permit the checking of circuit features or to allow the testing of added equipment to which test circuits can access.

4.4. Installation Supplier Inventory and Inspections

4.4.1 The Installation Supplier shall make a visual inspection of all equipment and apparatus shipped to the job site (prior to installation) to identify any physical damage, defects or problems that may prevent its proper installation, maintenance and/or operation. The Installation Supplier shall notify the SBC LEC Representative verbally as soon as practical and in writing within 72 hours of the verbal notification for resolution when damaged or defective equipment is discovered.

4.4.2 The Installation Supplier shall inventory all equipment and material shipped to the job site prior to job start. Equipment and material received after job start shall be inventoried as well. Questions and/or shortages shall be directed to the appropriate SBC LEC Representative as specified in the job documentation.

4.4.3 All equipment reused from another job site and equipment relocated within the same job site shall be upgraded by the Installation Supplier to meet current TP 76300MP requirements (e.g. replace mechanical lugs and parallel taps with crimp type lugs and H-taps, remove old stenciling, replace aluminum lugs with UL approved copper lugs, etc.). Information on equipment drawings rated Manufacturer Discontinued (MD) or Addition and Maintenance (A&M) shall be superseded by the latest apparatus and wiring figures, drawings and requirements.
### TABLE B-1 – SUMMARY OF CHANGES IN SECTION B

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[END OF SECTION]
SECTION C -- INSTALLER SKILL LEVEL ASSESSMENT

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1. GENERAL

1.1. Introduction

1.1.1 This section provides criteria for qualifying the Installation Supplier’s personnel to perform installation activities.

1.1.2 SBC reserves the right to verify the installer’s skill level and review the Installation Suppliers qualification process.

1.1.3 Changes to this issue of Section C are summarized in Table C-1.

2. SKILL LEVEL REQUIREMENTS

2.1. Assessment of Installer Qualifications

2.1.1 Installers’ qualifications are categorized as Levels 1 through 4 as defined below. This skill level assessment is based on the installer’s years of experience in specific systems/environments and his/her ability to perform work operations/job activities associated with equipment installation activities.

2.1.2 If the Installation Supplier can demonstrate to the SBC LEC a documented program for qualifying an installer on specific work activities and specific systems, related to the level requirements indicated below, the Installation Supplier’s rating of its personnel will be accepted. The Installation Supplier shall participate in the SBC LEC’s supplier verification process, such as a Quality Program Analysis (QPA).

2.1.3 While the years of experience listed for an individual level is the recommended minimum for that level; advancement from one level to the next shall not be based solely on the installer’s years of experience. The Installation Supplier shall assure and concur that the installer has the appropriate skills and abilities to competently progress to the next skill level before the installer performs work operations/job activities associated with a higher level.

2.1.4 All levels require a complete understanding of the equipment installation requirements and procedures associated with the work operation/job activity being performed. In addition, installers at Levels 3 and 4 require a complete and in-depth understanding of the equipment installation standards and requirements of TP 76300MP.
2.1.5 The Installation Supplier shall assess and classify its personnel working on telecommunications equipment by skill level on each of the following systems/environments:
   a) Common Systems
   b) Analog Switch
   c) Digital Switch
   d) Transport
   e) Power Equipment

2.1.6 All Installation Supplier personnel shall carry in their possession and provide, upon request, identification of their skill level.

2.1.7 Once classified at a specific level on a system/environment, the installer shall perform only work operations/job activities associated with the assigned level unless properly supervised by an installer of the appropriate level.

2.1.8 A Level 3 or 4 installer shall directly supervise Level 1 and 2 installers. The in-charge or job supervisor shall be "on-site" to direct the Level 1 or 2 installers as necessary.

2.2. Skill Level Definition and Activities

2.2.1 Installers at Level 1 shall:
   a) Be directly supervised and instructed by an Installation Supplier's manager or Level 3 or 4 installer
   b) Be capable of performing addition or removal of non-powered or passive equipment/hardware
   c) Not perform Level 2 and above work operations/job activities unless properly supervised
   d) Not progress to Level 2 without a minimum of 1-1/2 years experience or documented equivalent proficiency, as determined by the Installation Supplier.

2.2.2 Installers at Level 2 shall:
   a) Have a minimum of 1-1/2 years experience, or documented equivalent proficiency, as determined by the Installation Supplier
   b) Be directly supervised and instructed by an Installation Supplier's manager or Level 3 or 4 installer
   c) Be capable of performing the following work operations/job activities:
      1. Addition or removal of non-powered or passive equipment
      2. Addition or removal of wiring and connections (on non-working equipment only and switchboard cable only)
      3. Lead verification
   d) Not perform Level 3 or Level 4 work operations/job activities unless properly supervised
e) Not progress to Level 3 without a minimum of 4 years experience or documented equivalent proficiency, as determined by the Installation Supplier.

2.2.3 Installers at Level 3 shall:

a) Have a minimum of 4 years experience, or equivalent as determined by the Installation Supplier and demonstrated to the SBC LEC, in the equipment system/environment (e.g. common systems, digital switch, transport, power) being worked on

b) Be capable of performing the following work operations/job activities without supervision or direction:
   1. Addition or removal of common systems equipment/hardware
   2. Addition or removal of wiring and connections (on non-working equipment only)
   3. Lead verification
   4. Analysis of job specifications and drawings
   5. Provide work assignments to crew
   6. Prepare the forms described in Section D and E of TP 76300MP
   7. Resolve job specification and/or drawing problems
   8. Correct office record drawings
   9. In-process and final quality inspections
   10. Able to communicate with the SBC LEC on all aspects of the job throughout the duration of the job.

c) Be capable of performing as the Installation Supplier’s in-charge person on jobs not specifically restricted to having a Level 4 person in charge as defined later in this section of TP76300MP

d) Not perform Level 4 work operations/job activities unless properly supervised

e) Not progress to Level 4 without a minimum of 6 years experience or equivalent as determined by the Installation Supplier and demonstrated to the SBC LEC, in the system/environment (e.g. common systems, digital switch, transport, power) being worked on

f) Not perform work operations/job activities on working equipment or circuits.

g) Job site supervision of subcontractor work.

2.2.4 Installers at Level 4 shall:

a) Have a minimum of 6 years experience, or equivalent as determined by the Installation Supplier and demonstrated to the SBC LEC, in the equipment system/environment (e.g. common systems, digital switch, transport, power) being worked on

b) Be capable of performing the same work operations/job activities as a Level 3 installer without supervision or direction
c) Be capable of performing as the Installation Supplier's in-charge person

d) Be capable of performing additions, removals, wiring connections, and modifications on working equipment and circuits

e) Level 4 work operations/job activities may include:

1. Circuit modifications
2. Software adds or upgrades
3. Power transition work
4. Addition or removal of batteries
5. Addition or removal of circuits on working power distribution sources
6. Equipment testing and turn-up
7. Overseeing volatile work activities
8. Job-site supervision of subcontractor work.
### TABLE C-1 – SUMMARY OF CHANGES IN SECTION C

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[END OF SECTION]
1. **GENERAL**

1.1. **Introduction**

1.1.1 Network reliability and the protection of service requires full coordination and cooperation between the Installation Supplier and the SBC LEC throughout the job. This section delineates the requirements for the Job Start Agreement (JSA) and the Method of Procedure (MOP), two important documents to facilitate job planning and coordination.

1.1.2 Changes in this issue of Section D are summarized in Table D-1.

1.2. **Service Interruptions**

1.2.1 The Installation Supplier shall plan all work to minimize service interruptions to existing customers.

1.2.2 A service interruption is defined as any one of the following conditions:

   a) Interrupts, severely impairs or denies service availability to one or more subscribers.
   
   b) Reduces the capacity of multiple access circuits where such reduction seriously impairs completion of offered traffic through an office.
   
   c) Interrupts or seriously impairs the proper functioning of equipment for customer billing.
   
   d) Interrupts or impairs in any way the functioning of national security circuits or emergency service such as 911.
   
   e) Interrupts or reduces power.

1.2.3 If an unplanned service interruption occurs, the Installation Supplier shall:

   a) Cease all work activity
   
   b) Immediately notify the appropriate personnel listed in the MOP
c) Assist in the restoration of service, at the direction of the SBC LEC

d) Provide a written report to the SBC LEC as directed.

2. **JOB START AGREEMENT**

2.1. **Preparation**

2.1.1 The Job Start Agreement (JSA) documents the start and complete dates for the job interval and serves as authorization to start the job.

2.1.2 The JSA is required on all jobs and shall remain current throughout the duration of the job.

2.1.3 The Installation Supplier shall complete and immediately forward the signed JSA to the SBC LEC Equipment Engineer.

2.1.4 A copy signed by both the SBC LEC and the Installation Supplier shall be available at the job site throughout the duration of the job.

2.1.5 The Installation Supplier shall negotiate the date of the JSA meeting with the SBC LEC Representative(s).

2.1.6 The Installation Supplier shall convene the JSA meeting with the SBC LEC Representative(s). The SBC LEC Equipment Engineer will be responsible for determining the SBC LEC Representative(s) for the JSA meeting, at which the job plans will be discussed and the JSA (Figure D-1) approved.

2.1.7 The JSA shall include in the General Job Description the location of the major equipment components being added on the job, (i.e. bay location, shelf with bay location and shelf designation, etc.).

2.1.8 At the JSA meeting, the SBC LEC Representative(s) and Installation Supplier shall discuss all items listed on the JSA. The JSA shall be completed and signed by both the SBC LEC Representative(s) and the Installation Supplier at least five (5) business days, unless otherwise negotiated, before start of the job.

2.1.9 At job completion, a copy of the approved JSA shall be included in the yellow wallet.

2.2. **Revised Completion Date**

2.2.1 It is recognized that, during the duration of a job, conditions arise which may have an adverse impact on the scheduled completion date. These conditions may be the responsibility of either the Installation Supplier or the SBC LEC and include, but are not limited to, changes in the original order, damaged equipment, shipping delays, labor, engineering omissions or errors, defective software and service or safety requirements.

2.2.2 As soon as the Installation Supplier determines that the scheduled installation completion date is in jeopardy, the Installation Supplier shall contact the SBC LEC Equipment Engineer.

2.2.3 When a new installation completion date has been negotiated between the Installation Supplier and the SBC LEC Representative(s), the specific reason for the new completion date shall be noted on a revised JSA. The revised JSA shall be checked “Revised”, signed, dated and distributed the same as the original JSA.
2.3. Post-job Job Start Agreement

2.3.1 After the Job Completion Report (see Section E of TP 76300MP) has been issued, the Installation Supplier shall complete a post-job Job Start Agreement if additional or corrective work associated with the original job is required. This post-job JSA shall have the “POST JOB” box checked to indicate that this is a continuation of an existing job.

2.3.2 The Installation Supplier shall forward the signed post-job JSA to the SBC LEC Equipment Engineer and have it available at the job site.

2.3.3 At completion of the work, all approved copies of the JSA(s) shall be included in the yellow wallet.

3. METHOD OF PROCEDURE

3.1. Introduction

3.1.1 The written Method of Procedure (MOP) is the document used to detail how, when and where work activities that pose a significant risk to service are to be performed. Such work activities are called volatile work activities.

3.1.2 The SBC LEC reserves the right to require a MOP for any work deemed by SBC as volatile work activity.

3.2. Volatile Work Activities

3.2.1 The following is a list of volatile work activities that shall be conducted during the “maintenance window”, normally between 10:00 PM and 6:00 AM unless otherwise directed by the SBC LEC.

a) All rearrangements of hot power equipment that include the addition, rearrangement or removal of power equipment, cable or terminations.

b) All rearrangements of timing equipment that include the addition, rearrangement or removal of either the input or output leads of a timing device.

c) All software upgrades and transition activity, including integration of major equipment components, except trunks and service circuits.

d) Backplane work, shelf replacement, processor hardware activity.

e) All relocation, recabling or other rearrangements of any currently in-service equipment.

f) All relocation, recabling or other rearrangements of site specific equipment that is unique and identified as critical to service.

g) All other work operations on building and telecommunications equipment that are considered to pose a significant risk to service.

3.3. MOP Preparation and Use

3.3.1 The MOP requirements are determined by the job documentation (Job Specifications, Drawings etc.), complexity and technology type (e.g., switch, transport, and power).
3.3.2 Unless otherwise authorized by the SBC LEC Representative, the Installation Supplier shall perform a walk-through at the job site with the SBC LEC Representative to identify and address specific requirements, special conditions and potential risks to service.

3.3.3 The Installation Supplier shall list the detailed work steps associated with the volatile work activity in logical sequence.

   a) The following work steps shall always be included:
      1. Notify the Alarms Surveillance Center about pending work
      2. Verify that no affected equipment alarm conditions exist.

   b) The following also shall be considered when developing a MOP (additional considerations may be necessary for unusual installations):
      1. Possible service problems and restoration procedures.
      2. The time the various steps will be performed and the equipment to be removed from service, including the number and schedule of circuits to be made busy.
      3. The responsibility (Installation Supplier and/or SBC LEC) for each work activity.
      4. The skill level of personnel performing the work outlined on the MOP.
      5. Protection required for the equipment
      6. Location and availability of spare fuses
      7. Notification to collocators affected by the work activities.

3.3.4 If the Installation Supplier is authorized to perform volatile work activity that is normally performed by SBC LEC, the responsibility shall be defined in the MOP.

3.3.5 Unless agreed upon by the SBC LEC Representative, the MOP shall be presented for signatures at least five (5) business days before the volatile work activity is to begin.

3.3.6 At the discretion of the SBC LEC Representative, a dry run of the installation activity plan may be held with the Installation Supplier to ensure that procedures described in the MOP match the physical layout of the system to be worked on.

3.3.7 No volatile work activity shall begin until both the SBC LEC and the Installation Supplier have signed the MOP. A verbal MOP is not acceptable.

3.3.8 A copy of the signed, approved MOP shall be available at the work site and readily accessible to Installation Supplier personnel while work is being performed.

3.3.9 The Installation Supplier shall provide a Level 4 representative on-site to oversee any MOP work performed by the Installation Supplier’s personnel or non-approved subcontractors.

3.3.10 The Installation Supplier shall not deviate from the approved MOP unless authorized in writing by the SBC LEC Representative.

3.3.11 The Installation Supplier shall adhere to the Safe-Stop Points (SSP), back-out procedures, and restoration procedures as detailed in the MOP.

3.3.12 The Installation Supplier shall stop the MOP activities if conditions are encountered or observed that have affected or will adversely affect service.
3.3.13  The MOP shall include adequate testing time after a transition or modification.

3.3.14  The Installation Supplier shall ensure that affected alarms have been checked both before and after installation activity for proper functioning.

3.3.15  After completing each detailed step, the Installation Supplier shall date and initial the step, and if on-site coverage is required, have the SBC LEC Representative initial and date each step.

3.3.16  At job completion, the approved MOP(s), including all required pages, shall be placed in the job folder (yellow wallet).
## TABLE D-1 – SUMMARY OF CHANGES IN SECTION D

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FIGURE D-1 – JOB START AGREEMENT

A reproducible Job Start Agreement form is provided on the following page.
JOB START AGREEMENT

This document establishes a firm work schedule for the start and completion of the job and authorizes the Installation Supplier to begin work. A MOP shall be issued before any Volatile Work Activity begins.

JOB INFORMATION:

CCLI __________________________ City __________________________ State __________________________
LEC TEO/CON No. __________________________ Project No. __________________________
LEC Equipment Engineer __________________________ Supplier Order No. __________________________
Installation Supplier __________________________

TASK /FRC __________________________ LOC or GEO/PAR __________________________ Tracking Code __________________________
(SBC provided)

FIRM SCHEDULE FOR WORK TO BE DONE AT THIS JOB SITE:
Actual Start Date __________________________ Scheduled Completion Date __________________________
Daily Work Schedule: Start Time __________________________ Stop Time __________________________

JOB DESCRIPTION:

REASON FOR REVISION:

Work shall not begin on this project until the designated SBC LEC Representative properly authorizes this Job Start Agreement and the following items have been discussed:

☐ Arrangements for building access
☐ On-site coverage
☐ Equipment to be installed, removed, and/or modified
☐ In-Service equipment affected, requiring a MOP before work begins
☐ Safety considerations
☐ Building and/or equipment protection during installation
☐ Cable penetrations (complete Cable Penetration Reporting Log)
☐ Storage of equipment, material, and tools
☐ Environmental permits, notifications, and floor drilling training
☐ Alarm installation, cross-connection leads, and testing responsibility
☐ Specific test requirements
☐ Target walk-through date (before or on completion date)
☐ Problem resolution contacts (immediate supervisor):
  Manager (LEC) __________________________ Tel. No. __________________________ Pager No. __________________________
  NOC/STC/TTC __________________________ Tel No. __________________________ Pager No. __________________________
  Manager (Supplier) __________________________ Tel No. __________________________ Pager No. __________________________

If a service interruption occurs, the Installation Supplier shall:
1. Stop all work operations immediately.
2. Notify local CO and/or ASC personnel of details immediately.
3. Not replace fuses or restore breakers without the direction of the SBC LEC.
4. Provide a written report to the SBC LEC as directed.

☐ Other pertinent factors unique to this project:

☐ Check box if the Job Start Agreement includes attachments.

Agreement has been reached on all items checked above. No deviations from this agreement will be allowed without the approval of the designated SBC LEC Representative.

*SBC LEC Rep. Signature/Title & Date __________________________
*Installation Supplier Signature/Title & Date __________________________

Other Signature (As required)/Title & Date __________________________
Other Signature (As required)/Title & Date __________________________

Installation Supplier shall distribute this completed form to: ☐ SBC LEC Equipment Eng. ☐ Yellow wallet
FIGURE D-2 – METHOD OF PROCEDURE

Reproducible MOP forms are provided on the following pages.
METHOD OF PROCEDURE

JOB INFORMATION:

CLLI ____________________ City ____________________ State ____________________
LEC TEO/CON No. ____________________ Project No. ____________________
LEC Equipment Engineer ____________________
Installation Supplier ____________________ Supplier Order No. ____________________

TASK /FRC __________ LOC or GEO/PAR ____________ Tracking Code ____________
(SBC provided)

MOP AUTHOR:

Skill Level ____________________ Telephone ____________________

GENERAL JOB DESCRIPTION:

DETAILED MOP SCHEDULE:

Start Date __________ End Date __________ Work Hours __________ To ____________________

AFFECTED COLLOCATORS NOTIFIED:

Yes N/A

Tracking No. (SBC LEC use)

Detailed list of equipment to be Added (A) / Removed (R) / Modified (M):
Where Volatile Work Activity is to be performed

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List of all Handbooks, Technical Documents, Bulletins, Flashes, Warnings related to work operations under this MOP:

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<th>Title</th>
<th>Issue</th>
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METHOD OF PROCEDURE

LEC TEO/CON No. ________________________________

If a service interruption occurs, the Installation Supplier shall:

1. Cease all work operations immediately.
2. Local CO and/or ASC personnel shall be notified of outage details immediately.
3. No fuses or breakers shall be replaced or restored without the direction of the SBC LEC.
4. Provide a written report to the SBC LEC as directed.

List sequence for notification of service interruption or degradation

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Installation Supplier Personnel working under this MOP

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The Installation Supplier shall not deviate from the approved MOP unless authorized by the SBC LEC Representative. The approved MOP shall be filed in the Yellow Wallet at the job site. Copies can be made for further distribution if requested. Asterisk (*) denotes mandatory signatures on all MOP’s. The Installation Supplier shall determine from the SBC LEC Representative whether additional signatures are required.

MOP APPROVAL

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METHOD OF PROCEDURE

LEC TEO/CON No. ________________________________

When the SBC LEC requires this page, it shall be completed and included with the previous required pages of the MOP.

DRY RUN

A Step-by-Step “Dry Run” of the Volatile Work Activities listed in the “Detailed Steps” portion of this MOP has been performed by the following representative(s):

The Installation Supplier’s personnel who will be performing the work activities:

Name: ______________________________________ Date: ________________

Name: ______________________________________ Date: ________________

Name: ______________________________________ Date: ________________

Name: ______________________________________ Date: ________________

Name: ______________________________________ Date: ________________

SBC LEC Representative and Installation Supplier responsible for the equipment/system being worked on:

*SBC LEC Rep. Signature: ________________________________ Date: ________________

*Installation Supplier Signature: ________________________________ Date: ________________

Yes ☐ No ☐ If there were changes as a result of the “Dry Run” were they incorporated into a revised, signed, and approved MOP?
**METHOD OF PROCEDURE**

LEC TEO/CON No.  ______________________________

**ASK YOURSELF QUESTIONS**

BEFORE ANY CRITICAL WORK IS PERFORMED, ALL PERSONS INVOLVED IN THE WORK OPERATION (S) COVERED BY THIS MOP MUST COMPLETE THE FOLLOWING ASK YOURSELF QUESTIONS, CHECK EACH BOX AND SIGN OFF AT THE BOTTOM.

<table>
<thead>
<tr>
<th>Check Box</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>6.</td>
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<td>11.</td>
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</tbody>
</table>

*SBC LEC Rep.*
Signature: ______________________________ Date: ________________

*Installation Supplier Signature: ______________________________ Date: ________________
**METHOD OF PROCEDURE**

LEC TEO/CON No. ________________________________

THE DETAILED STEPS OF THE WORK OPERATION SHALL BE LISTED AND COMPLETED SEQUENTIALLY:

<table>
<thead>
<tr>
<th>Step No.</th>
<th>Supplier</th>
<th>SBC LEC</th>
<th>*SSP</th>
<th>Description of Volatile Work Activities</th>
<th>Date</th>
<th>Time</th>
<th>Supplier</th>
<th>**SBC LEC</th>
</tr>
</thead>
</table>

INITIALS

* (SSP) Safe Stop Point

** If on-site coverage provided

Use additional pages if required to list detailed steps. MOP should also include relevant attachments.

Are there attachments to this MOP: Yes ☐ No ☐
1. GENERAL

1.1. Introduction

1.1.1 This section covers the preparation and use of required documentation of the job.

1.1.2 Changes in this issue of Section E of TP 76300MP are summarized in Table E-1.

1.2. General Requirements

1.2.1 The Installation Supplier shall use the current version of all forms, unless the SBC LEC authorizes the use of surplus stock forms.
2. **YELLOW WALLET AND LABEL**

2.1. **General**

2.1.1 The Installation Supplier shall provide the yellow wallet for the job. The yellow wallet is a standard accordion folder with cover, minimum size 9” X 12”, in which job documentation to remain at the site shall be filed.

2.1.2 The Installation Supplier shall complete a yellow wallet label, Figure E-1, and attach it on the outside cover of the yellow wallet.

2.1.3 The yellow wallet and all required documents therein shall remain at the job site at all times.

2.1.4 The Installation Supplier shall turn over to the SBC LEC Representative all technical manuals, practices, and drawings received with the equipment as specified in the contract.

2.1.5 The Installation Supplier shall leave a complete copy of the detail specifications, all office drawings (i.e. Tab/DB, floor plan, ACORN etc.) as well as a copy of all job forms, in the yellow wallet.

2.1.6 The Installation Supplier should ensure that an SBC LEC Representative signs the yellow wallet label.

3. **CABLE PENETRATION REPORTING LOG**

3.1. **General**

3.1.1 The Installation Supplier shall complete the Cable Penetration Reporting Log (Figure E-2) to document the cable penetration activity.

3.1.2 At the Job Start Agreement meeting, the Installation Supplier shall provide a list of the cable penetrations to be opened during the job and attached to the JSA.

3.1.3 The Installation Supplier shall record all cable penetrations that have been accessed during that day.

3.1.4 The Cable Penetration Reporting Log shall be placed in the yellow wallet at the completion of the job.

4. **JOB INFORMATION MEMORANDUM**

4.1. **General**

4.1.1 The Installation Supplier shall use the Job Information Memorandum (JIM) as a notification for additional information or for record purposes.

4.1.2 The JIM (Figure E-3) shall be used for those occasions when formal communications between the SBC LEC Equipment Engineer and Installation Supplier are necessary, including, but not limited to the following:

a) Additional material
b) Additional engineering

c) A change in the TEO or detail specification

d) Additional information

e) Request for additional Installation Supplier effort

f) Request for disposition of SBC LEC material

g) Approved deviation from SBC LEC standards on a per job basis

h) Document verbal agreements between the Installation Supplier and the SBC LEC.

4.1.3 The Installation Supplier shall not request from the SBC LEC Equipment Engineer any variances from the requirements outlined in this document related to firestopping and safety issues.

4.1.4 The Installation Supplier shall forward a copy of the JIM to the recipient and place a copy in the yellow wallet.

5. TEST RECORD

5.1. Equipment Tests

5.1.1 As an integral part of the installation, the Installation Supplier shall perform tests, in accordance with the SBC LEC testing requirements, to:

a) Test and verify all features and functions of the equipment provided, rearranged and/or modified to ensure that it is properly powered and it will operate properly when placed in service.

b) Ensure correct termination of all cable conductors and wiring by performing continuity tests.

c) Ensure that all required alarms work properly and are received at the local (If applicable) and remote alarm monitoring station. Responsibility for the testing of all required telemetry alarms (from Network Element to Alarm Surveillance Center) shall reside with the Installation Supplier of any element being added to the network. Alarm requirements are specified by TP 76900MP. The Installation Supplier shall coordinate with the SBC LEC Representative for required alarm cross-connection assignments.

5.2. Preparation and Distribution

5.2.1 The Installation Supplier shall maintain and complete a Test Record (Figure E-4) of the tests and inspections performed during the installation. All test results shall be recorded on the Test Record as the tests are completed.

5.2.2 If trouble is found it shall be recorded, listing the location of the circuit, failure that was indicated, the trouble found and the location of the trouble.

5.2.3 When the trouble is cleared, the Installation Supplier shall initial the “Tested By” column to indicate the trouble has been cleared.
5.2.4 If the equipment is determined to be free of trouble, the Installation Supplier shall record the letters “NTF” indicating No Trouble Found, in the “Trouble Found” column and enter initials in the “Tested By” column to validate that the test was performed and completed satisfactorily.

5.2.5 The approved Test Record shall be placed in the yellow wallet.

6. MATERIAL DISPOSITION RECORD

6.1. General

6.1.1 The Material Disposition Record (MDR) shall be used to record the transfer of tangible items from the Installation Supplier to the SBC LEC or Cluster Vendor (TAB/db corrected drawings). Turned-over items are listed on the MDR (Figure E-5) by the Installation Supplier and accepted by the SBC LEC Representative.

6.1.2 Removed equipment classified as reuse, salvage, junk and any hazardous or regulated material generated during installation shall be reported on a separate MDR.

6.1.3 The Installation Supplier shall be liable for those items that have not been turned over to SBC LEC.

6.1.4 The Installation Supplier shall complete a separate MDR (always required) to forward corrected drawings or to positively report that no drawings need correcting. The Installation Supplier shall distribute the MDR to the address(es) identified in the detail specification. In addition, a copy of the MDR shall be left in the job site yellow wallet.

6.2. Purpose

6.2.1 Examples of items that may be turned over using an MDR are:

   a) Office and equipment drawings
   b) Handbooks and pamphlets
   c) Spare circuit packs/plug-ins
   d) Test Sets/accessories
   e) Hand tools
   f) Maintenance kits
   g) Equipment not installed
   h) Scrap cable and wire
   i) Generic documentation
   j) Jumper wire
   k) Marked drawings
   l) Corrected specifications
   m) Corrected equipment order.
n) Floor tile drilling waste

6.2.2 Only one type of item shall be listed per line on the MDR.

7. JOB COMPLETION REPORT

7.1. Purpose

7.1.1 The properly authorized Job Completion Report (Figure E-6) serves as notification from the Installation Supplier that the job has been completed.

7.2. Job Completion Requirements

7.2.1 The Installation Supplier shall consider the job complete when all items described below have been complied with:

a) All equipment (i.e., bays, frames, circuits, etc.) specified in the detail specification(s) has been completely wired, adjusted, tightened, labeled or stenciled, tested or removed and is ready for service without exception.

b) An Installation Supplier quality performance audit of the installation has been completed; results of the audit documented in the yellow wallet, and written documentation that all defects and/or discrepancies have been corrected.

c) Spare parts (e.g., circuit packs, fuses, etc.) have been turned over to the SBC LEC and are in good working condition.

NOTE: Circuit packs shall be stored in the original protective shipping cartons to reduce the possibility of ESD damage.

d) Damage to buildings and grounds (e.g., walls, floors, driveways, fences, etc.) have been corrected.

e) Correction of Installation Supplier caused defects or damage to existing equipment.

f) Removal of temporary floor, wall and column protection placed by Installation Supplier.

g) Removal of Installation Supplier’s installation tools, surplus/excess equipment, excess material, and all other property.

h) All associated installation documentation, along with the detail specification(s) and the TEO, has been turned over to the SBC LEC Representative in the yellow wallet.

i) All removed or equipment not installed and/or material has been disposed of per detail specification(s) or SBC LEC equipment engineer’s instructions

j) Copies of all Job Start Agreements, MOPs, JIMs, Marked Prints, MDRs and Job Completion Reports, etc., have been distributed as required.

k) The Installation Supplier shall notify the SBC LEC a minimum of 5 days prior to test and acceptance.
7.3. **Job Completion Report Procedure**

7.3.1 The Installation Supplier shall notify the SBC LEC Equipment Engineer or SBC LEC Representative, as determined at the JSA meeting, of the completion of installation and request a job completion walk-through meeting at the job site, prior to the scheduled complete date of the job. The Installation Supplier shall provide a Job Completion Report at the start of the job completion walk-through meeting.

7.3.2 At the completion of every job, the SBC LEC Equipment Engineer or SBC LEC Representative and the Installation Supplier shall conduct a formal job completion walk-through during which a complete review of all details of the project will be performed. The intent of this review is to verify all work items outlined in the job specification were completed and installed according to TP 76300MP and all equipment added and/or modified is both operational and functional.

7.3.3 At the completion of the walk-through, the SBC LEC Equipment Engineer or SBC LEC Representative will either note the job as “Complete” or “Not Complete” and require the Installation Supplier to correct all defects or deviations from the specification as noted in the job completion walk-through. The job will not be noted as “Complete” until it is properly installed.

7.3.4 When the SBC LEC Equipment Engineer or SBC LEC Representative determines that the job has been completed, the Job Completion Report shall be signed.

7.3.5 The Installation Supplier shall distribute the Job Completion Report as indicated on the form.

7.3.6 The Installation Supplier shall electronically submit a list of jobs that were completed the previous month in the form of an Excel spreadsheet. This report shall be submitted to the SBC LEC Installation Quality organization no later than the fifth business day of each month.
<table>
<thead>
<tr>
<th>Change</th>
<th>Item in 11/01/2000 Issue</th>
<th>Item in this issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised</td>
<td>3.1.2</td>
<td>3.1.2</td>
</tr>
<tr>
<td></td>
<td>5.1.1(c)</td>
<td>5.1.1(c)</td>
</tr>
<tr>
<td></td>
<td>6.2.1(k)</td>
<td>6.2.1(k)</td>
</tr>
<tr>
<td></td>
<td>7.2.1(b)</td>
<td>7.2.1(b)</td>
</tr>
<tr>
<td></td>
<td>7.2.1(f)</td>
<td>7.2.1(g)</td>
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<tr>
<td>Deleted</td>
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<td></td>
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<tr>
<td>Added</td>
<td></td>
<td>2.2.3-2.1.6</td>
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<td></td>
<td></td>
<td>6.2.1(n)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.2.1(e,k)</td>
</tr>
</tbody>
</table>
ATTENTION SBC CENTRAL OFFICE PERSONNEL – Retain this wallet with all its contents (Documents, Drawings, Etc.) at the job site for 90 days after completion.

OFFICE:                CITY/STATE:
SBC LEC NO:            PROJECT NO:
SUPPLIER:              SUPPLIER ORDER NO:
SBC LEC EQUIPMENT ENGR:
JOB COMPLETION DATE:   COMPLETION WALK-THROUGH DATE:
JOB DESCRIPTION:

The following items shall be included in yellow wallet upon completion when applicable (please √ appropriate box):

- Job Start Agreement (JSA)
- Method of Procedure (MOP)
- Copy of SPEC and drawings
- Test Record
- Job Completion Report
- Storage Battery Charge Report
- Cable Penetration Reporting Log
- Internal Audit Documentation
- Other – JIM, ETC:
- NEA Floor Drilling Form
- TEO

SUPPLIER:              SBC REP:
Signature                Signature (Ensure all required documentation is enclosed)
DATE:                    DATE:

MDR # ________________ listing office drawings and tangible items left in C.O.
MDR # ________________ listing corrected drawings distributed per SPEC/Equipment Engineer
MDR # ________________ disposition of asbestos or presumed to contain asbestos residue
FIGURE E-2 – CABLE PENETRATION REPORTING LOG

A reproducible copy of the Cable Penetration Reporting Log form is provided on the following page.
JOB INFORMATION:
CLLI ________________________________ City ________________________ State_________________
LEC TEO/CON No____________________ Project No ________________________________
LEC Equipment Engineer ________________________________________________________________
Installation Supplier ________________________ Supplier Order No ___________________________

CABLE PENETRATION REPORTING LOG:
List all affected cable penetrations to be closed as required in TP 76300MP:

<table>
<thead>
<tr>
<th>CABLE PENETRATION LOCATION/ID</th>
<th>DATE OPENED</th>
<th>DATE CLOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>
FIGURE E-3 – JOB INFORMATION MEMORANDUM

A reproducible copy of the Job Information Memorandum (JIM) form is provided on the next page.
JOB INFORMATION

CLLI ____________________________________ City _______________________________ State_________________
LEC TEO/CON No __________________________   Project No _______________________________________________
LEC Equipment Engineer _______________________________________________________________________________
Installation Supplier _______________________________________   Supplier Order No ___________________________
JIM NO. ______________________________________

TO ___________________________________________ FROM __________________________
ADDR. _________________________________________ ADDR. __________________________
CITY _________________________________________ CITY __________________________
PHONE ______________________________________ PHONE __________________________

JOB DESCRIPTION

SUBJECT __________________________________________
DETAILS __________________________________________

ORIGINATOR ___________________________ TITLE __________________________
SIGNATURE ___________________________ DATE __________________________

RESPONSE __________________________________________

NAME ___________________________ TITLE __________________________
SIGNATURE ___________________________ DATE __________________________

Distribution: ☐ Yellow Wallet   ☐ SBC LEC Equipment Engineer
FIGURE E-4 - TEST RECORD

A reproducible copy of the Test Record form is provided on the following page.
## JOB INFORMATION:

- **CLLI:** ____________________  
- **City:** ____________________  
- **State:** ____________________  
- **LEC TEO/CON No:** ____________________  
- **Project No:** ____________________  
- **LEC Equipment Engineer:** ____________________  
- **Installation Supplier:** ____________________  
- **Supplier Order No:** ____________________

### LIST ALL TESTS PERFORMED

<table>
<thead>
<tr>
<th>BAY</th>
<th>SHELF PANEL</th>
<th>CIRCUIT NUMBER</th>
<th>DESCRIPTION OF TEST PERFORMED</th>
<th>DESCRIPTION OF TROUBLE FOUND OR “NTF”</th>
<th>TESTED BY &amp; DATE</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

- All Alarms associated with the above listed equipment were tested in accordance with TP76300MP

### ATTACHMENTS

- **SUPPLIER APPROVAL:**
  
  THE ABOVE TEST(S) HAVE BEEN PERFORMED AND ALL TROUBLE FOUND HAS BEEN CLEARED.

  ____________________          ____________________  
  SUPPLIER’S SIGNATURE         DATE

### LEC ACCEPTANCE:

- **THE APPROVED TEST RECORD SHALL BE FILED IN THE YELLOW WALLET AT THE JOB SITE. COPIES CAN BE MADE FOR FURTHER DISTRIBUTION IF REQUESTED.**

- **AT THE COMPLETION / ACCEPTANCE WALK-THROUGH, THE ABOVE LIST OF TEST(S) WAS VERIFIED TO BE A COMPLETE LIST OF TESTS REQUIRED FOR THIS JOB.**

  ____________________          ____________________  
  LEC REPRESENTATIVE         DATE
FIGURE E-5 – MATERIAL DISPOSITION RECORD

A reproducible copy of the Material Disposition Record form is provided on the following page.
### JOB INFORMATION:

<table>
<thead>
<tr>
<th>CLLI</th>
<th>City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEC TEO/CON No</td>
<td>Project No</td>
<td></td>
</tr>
<tr>
<td>LEC Equipment Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation Supplier</td>
<td>Supplier Order No</td>
<td></td>
</tr>
</tbody>
</table>

MDR Number: ____________

Page: _______ of ________

### TO:

<table>
<thead>
<tr>
<th>Location</th>
<th>Attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>City, State, ZIP:</td>
</tr>
</tbody>
</table>

### FROM:

| Address | City, State, ZIP: |

### Quantity | Material Name and Description | Corrected Drawing | Spec/PO | Item
<table>
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</table>

### Remarks: _______________________________________________________

<table>
<thead>
<tr>
<th>Remarks:</th>
<th>Equipment Manuals</th>
<th>Ckt Packs/Plug-ins</th>
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</table>

Corrected Drwgs □ Yes □ No

<table>
<thead>
<tr>
<th>Corrected Drwgs</th>
<th>Yes or No</th>
<th>Job Completion Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Supplier Signature:</td>
</tr>
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<td></td>
<td></td>
<td>Date:</td>
</tr>
</tbody>
</table>

**Other (Explain in Remarks)**

### Distribute to:

<table>
<thead>
<tr>
<th>LEC Equipment Engineer</th>
<th>Yellow Wallet</th>
<th>Shipment from Job Site</th>
</tr>
</thead>
</table>

**Received:**

<table>
<thead>
<tr>
<th>LEC Representative</th>
<th>LEC Equipment Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td>Date:</td>
</tr>
</tbody>
</table>

---

**Office Drawings**

**Test Set/Accessories**

**Other (Explain in Remarks)**
FIGURE E-6 – JOB COMPLETION REPORT

A reproducible copy of the Job Completion Report form is provided on the following page.
JOB INFORMATION:
CLLI ____________________ City ____________________ State ___________________
LEC TEO/CON No ____________________ Project No ____________________________
LEC Equipment Engineer ___________________________________________________
Installation Supplier ____________________________________ Supplier Order No ________

After proper authorization, this document serves as notification from the Installation Supplier of job completion.

Actual Job Completion Date _________________
Project Description ____________________________________________________________

REQUIRED DOCUMENTS:
_____ Material Disposition Record
_____ Test Records
_____ Marked Prints

The following individuals were present and participated in the final job review:

Name        Title
_________________________________________ ____________________________________________
_________________________________________ ____________________________________________
_________________________________________ ____________________________________________
_________________________________________ ____________________________________________

YES / NO
All equipment ordered in the above specification has been provided and/or installed, without exception, in accordance with the current TP 76300MP and is ready for service.
(Note: Even if accepted, this job is subject to SBC LEC quality audits.)

If NO is circled, list the exceptions below, and reschedule the job completion by issuing a revised Job Start Agreement.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

__________________________________________________________________________

Installation Supplier Representative (Sig)    Title    Date
_________________________________________ ____________________________________________

LEC Representative (Sig)    Title    Date
_________________________________________ ____________________________________________

This completed form (whether YES or NO is circled) shall be distributed to:
☐ SBC LEC Equipment Engineer
☐ Yellow wallet
SECTION F -- FIRE STOPPING

1. GENERAL

1.1. Introduction

1.1.1 This section covers the general requirements for opening and closing through-penetrations in floors and fire rated walls and protection of cable runs.

1.1.2 Changes in this issue of Section F are summarized in Table F-1.

2. REQUIREMENTS

2.1. General

2.1.1 Smoke and fire stopping is required at all through-penetrations in floors and fire rated walls. Through-penetrations in non fire rated walls shall not be fire stopped. The Installation Supplier shall contact the SBC LEC Equipment Engineer for questions regarding the fire rating of a specific wall.
2.1.2 Fire-stopping products made by different manufacturers shall not be used in the same cable hole or through-penetration. The exception to this requirement applies to smokestopping at the interior of cable bundles. It is acceptable to firestop a through-penetration with a product furnished by a supplier other than that which is/was used to smokestop the interior of the cable bundle.

2.1.3 When the Installation Supplier opens a cable hole, the Installation Supplier shall close and fire-stop the cable hole in accordance with this section.

2.1.4 The Installation Supplier shall comply with the following firestop management considerations:
   a) The Installation Supplier shall permanently close through penetrations at the end of each workday or at the completion of an installation/removal operation, whichever occurs first.
   b) The Installation Supplier shall update the Cable Penetration Reporting Log (see Section E).
   c) The installation Supplier shall not leave the premises while a through-penetration is open.

2.1.5 The following criteria shall be used to determine the method of fire stoppage to be used.
   a) The Installation Supplier shall replace non-approved firestop products with approved intumescent technology.
   b) When cable is added or removed from an existing through-penetration that uses mineral wool filled bags as the firestopping medium, the Installation Supplier shall replace the mineral wool bags with approved intumescent technology.
   c) Only approved intumescent technology shall be used to fire stop through-penetrations accessed during the job. Refer to BSP 800-005-200MP Appendix 1 for a listing of approved firestopping products.

2.1.6 If technical assistance is required for non-standard cable hole penetrations, the Installation Supplier shall complete the Request for Technical Assistance form at the end of this Section and forward as indicated on the form.

2.1.7 Conduits and pipes shall not be added to through-penetrations containing network interconnection cables. Conduit and pipes shall be run through a separate opening, which shall be firestopped with approved intumescent products.

2.1.8 Through-penetration covers shall be removed before installing new cable and removing dead cable. Cable(s) and conduit shall not be pushed or pulled through an opening without the removal of the cable hole covers.

2.1.9 The Installation Supplier shall provide adequate protection for open cable holes to protect personnel and equipment where there is danger of material or personnel falling through the cable opening. This may include barricades, warning signs and mechanical protection.

2.1.10 Waterproofing shall be installed under new cable hole sheathings and bottom cabled equipment frameworks in accordance with Figure F-1 using a bead of non-hardening gasket compound such as Permatex No.2.

2.1.11 The Installation Supplier shall ensure that all surfaces are clean and free of dust, grease, oil, loose materials, rust, or other substances, prior to applying intumescent putty or caulk.

2.1.12 The Installation Supplier shall ensure that firestopping products are prepared and used in accordance with manufacture's documentation before installation.
2.1.13 The edges of cut intumescent composite sheets and steel cover plates shall be deburred and free of sharp corners. The corners of composite sheets and steel covers shall be rounded to approximate a 1/8-inch minimum radius.

2.1.14 The steel cover plate and intumescent composite sheet shall not extend beyond the cable hole sheath.

3. SMOKE STOPPAGE ASSOCIATED WITH CABLE INSTALLATION

3.1. General

3.1.1 During cable installation, smoke stopping shall be achieved by filling the interior voids between the cables being installed with a non-hardening intumescent putty as described below and shown in the appropriate figures in this section.

a) Smoke stopping is required on both sides of hollow wall penetrations that are not equipped with metallic sleeves or are not framed on all four sides, except for figure F-12 applications. Smoke stopping for F-12 solid wall and four sided framed hollow wall applications shall be applied on the side of the wall providing the greatest ease of installation, preferably the network equipment side.

b) For floor penetrations, smoke stopping shall be applied at the top. Where smoke stopping has been previously applied at the bottom of the openings, all future smoke stopping shall be applied at the top of the opening.

c) The ends of all conduits, pipes, tubing, etc. used for routing cable and wire through fire rated building surfaces shall be sealed with a minimum of 1/4" depth of intumescent putty or be terminated in a relatively airtight enclosure.

3.1.2 Mini-coax bundles shall be treated as a single cable and shall be fire stopped as follows:

a) Each individual cable need not be individually wrapped with an intumescent putty pad.

b) Place a small amount of intumescent putty or caulk into the middle of the bundle to eliminate the void space.

c) Treat the banded mini-coax bundle as a single cable and firestop accordingly.

3.1.3 After installing cables and applying smokestopping material between the cables, the Installation Supplier shall tightly band cables together to compress the cable bundle and effectively join smoke stopping material to form an airtight seal. (See Figure F-2).

a) Cable bands shall be a 1/4-inch or larger nylon cable tie (preferred) or a minimum of 4 strands of natural wax fiber cord.

b) Cable bands shall be placed 1 ½ to 2 inches from cable hole covers and shall be visible for inspection.

c) The locking head of the cable tie shall be positioned at the side or rear of the cable rack.

d) Cable protection practices may require wrapping some cable types with a protective sheeting before they are banded together.

3.2. Smokestopping At 3M Firestops
3.2.1 The Installation Supplier shall apply approximately 2 linear inches of intumescent putty between the last existing layer and any new cables during installation so that all voids and valleys between adjacent cables are effectively filled to achieve an air tight seal.

a) The putty shall be applied in rope form approximating the size of interior cable voids to avoid unnecessary buildup of cable bundles. Do not wrap the cables with a putty strip.

b) Smoke stopping shall extend approximately 1-inch from both sides of the cable hole cover.

c) Smoke stopping shall also be applied to all cables restored to racks after cable mining operations.

3.3 Smokestopping At Hilti Firestops

3.3.1 Large openings shall be smokestopped as follows:

a) A single layer of CP-617 putty pads shall be firmly applied across the face of opening where cables will be installed. This layer of pads shall be minimally as wide as the opening's cable rack(s).

b) A single layer of CP-617 putty pads shall be firmly applied across each layer of cable in a manner that follows the curvature formed by adjacent cables.

c) All smokestopping putty pads shall extend a minimum of 5-inches below and 1-inch above the top surface of the building floor.

d) Circular openings and power cables larger than 1/0 shall be smokestopped in accordance with 3.2.1

4. FIRE STOPPING

4.1. General

4.1.1 Unless otherwise specified, the following fire stopping requirements apply to both wall and floor holes.

4.2. Continuous Slots Under Office Distributing Frames

4.2.1 The closing of continuous slots under office distributing frames, regardless of depth, may be accomplished in the following manner. See Figure F-9.

a) Work from below with covers in place. Use mineral wool batting of 3 or 4 inches thickness and cut 2 inches oversized to ensure a tight fit. Force mineral wool batting into the slot and press up against the covers to tightly pack all voids between vertical bundles of stub cables.

b) Insert mineral wool batting so that there are no vertical joints except at the stub cable. No bottom plates are required with this method.

c) Mineral wool batting installed over equipment area shall be wrapped in aluminum foil to minimize dusting problems. Cutting and wrapping should be done in an area other than the telephone equipment area.

d) Smoke stop all spaces between the cable and cover plates with intumescent putty.

NOTE: Eye protection and dust masks are mandatory for this operation.

4.3. Partially Occupied Continuous Cable Slots
4.3.1 The occupied portion of cable slots equipped with top and bottom cover plates shall be isolated from the unoccupied portion by installing a steel partition between the ceiling and floor surfaces. See Figure F-6.

   a) Partitions shall be made from 18-gauge sheet metal.
   b) There may be approximately ¼ inch of clearance between the partition and the sides of the cable hole for ease of installation. The partition shall be bolted to the lower channel using beveled washers and HHCS (hex head cap screws) or sheet metal screws and fender washers. Where a bottom steel plate exists in the adjacent cable hole, the partition shall be bolted to this steel plate approximately two (2) inches from each side.
   c) Apply a ½ inch bead of intumescent putty between the cable hole interior and both sides of the perimeter of the partition inside the cable hole, including the area around the channel framework.

4.3.2 A steel partition is **NOT REQUIRED** if less than 2 feet of cable slot remains unoccupied.

4.4. **Small Rectangular Floor Openings**

   4.4.1 The closing of occupied small rectangular openings up to 4 x 10-inches in size shall be accomplished in the following manner. See Figure F-10.

   a) Provide a temporary method of containment on one side (top or bottom, preferably the bottom) so that material can be packed against it.
   b) Pack all voids around the cables at the perimeter of the cable bundle to the full depth of the opening with mineral wool batting
   c) Plug the top of the hole with a layer of intumescent putty to a minimum depth of 1 inch.

4.5. **Fire Stopping Using 3M Products**

   4.5.1 The fire stopping of large rectangular cable holes using intumescent material, regardless of depth, shall be accomplished in the following manner. See Table F-2.

   a) Unless otherwise indicated for a particular fire stopping application, the space between cable and intumescent cover plates shall be 1/2 inch (±1/4 inch) in width.
   b) Intumescent sheets shall be installed with the galvanized steel side exposed.
   c) The bottom intumescent sheet shall be supported in one of three methods listed below, in order of preference:

      1. **Support stirrups** – Six stirrups shall be installed for support of a drop in intumescent sheet. When the cable hole is wider than 24 inches, additional stirrups shall be placed not to exceed 12 inches between stirrups. When cable growth is within ½ inch of the rear center stirrup, that stirrup shall be removed. When cable is mined beyond the mid-point of the rear of the cable hole, install a rear center stirrup. See Figure F-3.

      2. **Using a modified steel ceiling cover plate** – Cut the bottom steel cover plate to create a modified cover plate on the bottom of the cable hole using all existing and accessible fastener holes. A minimum of four bolts, one near each corner, is required to support modified ceiling plates at 1'-0" x 2'-0" openings. For new holes cut into existing floors, a bolt shall be placed within 2 inches of all corners. Additional bolts shall be placed around the perimeter and spaced not more than 8 inches apart. This arrangement will be used to support a drop in intumescent sheet (see Figure
3. Intumescent sheet attached to the ceiling substrate – Place a 3M GIS strip or a 1/4 inch bead of intumescent putty between the ceiling substrate and the bottom intumescent sheet. Bolt the intumescent sheet directly to the bottom cable hole cover support or substrate. A bolt with a 1 1/4-inch fender washer shall be placed within 2 inches of all corners. Additional bolts and fender washers shall be placed around the perimeter and spaced not more than 6 inches apart (see Figure F-11). (F-30 didn’t provide details of substrate fastening, F-11 does. Eliminates need for F-30)

4. Where possible, install a one-piece drop in intumescent sheet per Figure F-8, Section A-A, or Figure F-9, Section A-A. Multiple pieces shall be joined per seam strip Figures F-11 and F-13. For the stirrup arrangement secure the intumescent sheet with self-tapping 1/4 x 3/4 inch sheet metal screws and 1 1/4 inch fender washers. For the modified ceiling cover arrangement, secure the intumescent sheet with self tapping 1/4 x 3/4 inch sheet metal screws and 1 1/4 inch fender washers spaced at a maximum of 12-inch intervals.

d) Place a continuous dome of an approved intumescent putty around the cable bundle on the inside of the hole to fill the void between the cable bundle and the bottom intumescent sheet. This dome of putty shall extend a minimum of 1 inch out from the cable and 1 inch up from the bottom intumescent sheet. It shall be a minimum of ½ inch thick from the point where the cable bundle emerges from the intumescent sheet.

e) Seal the interior of the opening. Place a continuous ½ inch dome of approved intumescent putty around the perimeter of the bottom intumescent sheet and the side of the cable hole, as shown in Figure F-10. This shall include the space between the stirrups and the interior wall of the cable hole and wall and partition, if equipped.

f) Seal the top of the opening. Place a strip of 3M GIS or a ¼ inch bead of intumescent putty along the edge of the cable hole sheathing prior to installing the intumescent sheet. (See Figure F-10).

g) The top intumescent sheet may be comprised of multiple pieces. Apply a 1/4 inch minimum bead of intumescent putty along the butted edges. Cover the seam of the butted edges (which may extend entire width of opening) with a 2 inches wide, 28 gauge galvanized steel strip centered over the seam. Secure this steel strip with self-tapping screws spaced at 3 inches maximum on each side of the seam. See Figure F-11.

h) A 1/8-inch thick steel protective cover plate shall be used to protect the integrity of the putty seal between installed cable and intumescent sheet covers. The space between the protective cover plate and the cable shall be no closer than 1/2 inches and no farther than 4 inches. See Figure F-5.

i) When a steel protective cover plate is to be installed, a bolt shall be placed within 2 inches of all corners. Additional bolts shall be placed around the perimeter and spaced not more than 8 inches apart.
j) Where the steel cover plate does not cover the total perimeter of the top intumescent composite sheet, additional bolts with fender washers shall be provided through the exposed intumescent sheet on 6 inch centers to secure the top intumescent sheet to the cable hole sheathing. See Figure F-5.

k) Apply a continuous dome of intumescent putty around the cable bundle above the top plates. This dome of putty shall be packed tightly into the annular space between the cables and the intumescent sheet. The dome shall extend a minimum of 1 inch from the cable and up from the top of the cover plate. It shall be a minimum of 1/2 inch thick from the point where the cable bundle emerges from the plate.

l) Void (empty) openings shall be firestopped using single piece intumescent and steel cover plates.

4.6. Large Rectangular Wall Openings

4.6.1 Wall openings for all types of fire-rated walls and partitions shall be fire stopped in the following manner. See Figures F-12, F-13 and F-14.

a) Intumescent composite sheets shall be installed with the galvanized metal side exposed and shall be sized to provide a minimum 2-inch overlap around the perimeter of the opening.

b) Unless otherwise indicated for a particular fire stopping application, the space between cable and intumescent covers shall be 1/2 inch (±1/4 inch) in width so that a minimum of caulk or putty material is required to seal an opening.

c) Place a strip of 3M GIS or a continuous bead of an approved intumescent putty around the perimeter of the opening under the cover plates and the wall mating surface.

d) Where necessary the cover plate sheets may be pieced together, in order to fit around the cables, to form a continuous sheet. A 1/4-inch (minimum) bead of intumescent putty shall be applied along the seam of butted cover pieces. Cover the seam with a 2-inch wide, 28 gauge galvanized steel strip centered over the seam. Secure this steel strip with self-tapping screws spaced at 3-inch maximum O.C. on each side of the seam.

e) Framed cable holes in hollow walls shall be closed using intumescent sheet as a wall cover. The spacing of anchors shall be within 2 inches of corners and not exceed 6 inches on center, and anchors shall have minimum 1-1/4 inch fender washers.

f) Unframed cable holes in hollow walls shall be referred to the SBC LEC Equipment Engineer for upgrading.

g) Place a continuous dome of putty around the cable bundle as it exits the wall cover plate. This dome of putty shall be 1-inch minimum out from the cable along the cover plate and 1 inch out from the wall cover plate along the cable. It shall be a minimum of 1/2 inch thick at the gap where the cable bundle emerges from the wall cover plate.

4.6.2 Void (empty) openings shall be firestopped using a single piece composite sheet on both sides of the opening.

4.7. Circular Openings

4.7.1 Circular openings containing cable shall be firestopped in accordance with figures F-16 to F-18, and F-23.

4.7.2 Mineral wool batting shall be installed at the required 1" minimum depth.
4.7.3 Caulk and putty shall be installed at the required 1" minimum depth.

4.7.4 Non-metallic sleeves shall be equipped with the correct number of wrap strip layers or correct size of plastic pipe device. Refer to table F-18.

4.7.5 Apparatus surrounding non-metallic sleeves shall be sealed with putty at their interface with sleeves and building surfaces.

4.7.6 Openings in hollow walls shall be equipped with a properly constructed and sealed steel sleeve.

4.8. Non-metallic Pipe

4.8.1 Circular openings containing non-metallic pipe shall be firestopped in accordance with figures F-19, F-20 and F-24.

a) Putty shall be installed at the required 1/4 or 1" minimum depth.

b) Pipe shall be equipped with the correct number of wrap strip layers or size of plastic pipe device. Refer to table F-18.

c) Apparatus surrounding non-metallic pipe shall be sealed with putty at their interface with piping and building surfaces.

d) Openings in hollow walls shall be equipped with a properly constructed and sealed steel sleeve and packed with mineral wool batting.

4.9 Metallic Pipe

4.9.1 Circular openings containing metallic pipes shall be firestopped in accordance with figures F-22 and F-26.

a) Mineral wool batting shall be installed at required depth (if required).

b) Putty shall be installed at required depth.

4.10 Flexible non-metallic Tubing

4.10.1 Circular openings containing flexible non-metallic tubing shall be firestopped in accordance with figure F-23.

a) Tubing shall be equipped with the correct number of wrap strip layers or size of plastic pipe device.

b) Apparatus surrounding tubing shall be sealed at its interface with the tubing and building surfaces.

c) Voids between adjacent runs of tubing shall be equipped with the required depth of putty.

4.11 Void Openings

4.11.1 Void circular openings shall be firestopped in accordance with figure F-27.

a) Required mineral wool batting shall be installed at required minimum depth.

b) Caulk or putty shall be installed at required minimum depth.

c) Openings in hollow walls shall be equipped with a properly constructed and sealed steel sleeve in accordance with F-25.

4.12 Unventilated Bus Ways
4.12.1 The installation of unventilated bus ways through fire-rated floors and walls shall be such that any void between the bus way and the building surfaces are sealed with intumescent caulk or putty.

4.13 Fiber Optic Cable Troughs

4.13.1 Fiber optic cable troughs shall not be run through floor penetrations. Where they presently exist, the opening shall be firestopped in the manner shown in Figures F-15.

4.14 Covered Metallic Raceways

4.14.1 Covered metallic raceways that penetrate fire rated walls or floors are not recommended. However, where they are currently installed they shall be fire stopped at each floor in the following manner.

a) Smoke stop and band at floor level.

b) Pack the interior voids with wrapped mineral wool batting to a depth of four (4) inches.

c) Apply one (1) inch of intumescent putty above the mineral wool batting.

d) Complete and affix a Cable Hole Closed label to the raceway in a manner that ensures that the label will tear when the cover is opened.

e) Seal the perimeter of the raceway at its interface with the opening's cover with putty.

4.15 Firestopping Using Hilti Products

4.15.1 The firestopping of large through penetrations using Hilti FS-657 fire blocks shall be in accordance with Figures F-30 to F-33 as follows:

a) A single layer of CP-617 putty pads shall be firmly applied around the perimeter of the cable bundle and pressed into the curvatures formed by adjacent cables.

b) Putty pads shall extend a minimum of 5-inches into the opening and 1-inch from the floor/wall building surface. This layer of fire protection becomes the smoke stopping element of subsequent cable layers.

c) Fire blocks shall be cut to approximate any irregularities of the cable bundle’s shape to minimize the potential for air gaps in the opening and installed in overlapping (staggered) fashion to completely fill the remaining interior void of the through penetration.

d) Fire blocks shall be installed flush with the floor/wall building surface and extend 5-inches into the opening.

e) Air leaks in the fire block installation shall be sealed by wedging CP-617 putty pad or CP-618 putty stick material into detected air passages.

f) A 1/2-inch (min.) dome of putty shall be applied around the cable bundle and other penetrating items at their interface with the fire blocks. This perimeter dome of putty is required at both sides of wall openings.

g) A 1-inch wide strip of putty pad or a 1/4-inch bead of putty material shall be applied around the top perimeter of the cable hole sheathing at floor openings as indicated in Figure F-30.

h) Large floor openings shall be covered with a minimum 11 gauge steel cover that is cut to approximate the shape of the installed cable bundle ± 1/2-inch.
i) A 1-inch minimum dome of putty shall be applied around the entire perimeter of the cable bundle at its interface with the steel cover plate, cable rack and cable hole sheathing. This dome of putty shall overlap onto steel cable hole surfaces a minimum of 1/2-inch.

j) A colored Hilti Firestop Systems label shall be affixed to either front corner of the steel cover plate to distinguish it from a hole firestopped with composite sheets.

4.15.2 Wall openings having more than 4-inches of annular space between the cable bundle and the periphery of the opening shall be equipped with a wire mesh or sheet metal retention cover.

a) Installed covers shall not be closer than 1-inch or more than 2-1/2" from installed cable.

b) Mesh covers shall be fabricated from #16 gauge galvanized 2-inch square (max.) wire mesh.

c) Sheet metal covers shall be fabricated from #20 gauge (min.) galvanized steel.

d) Covers shall be fastened to the building surface with 1/4-inch fasteners and fender washers.

e) Fasteners shall be located within 2-inches of cable hole corners and spaced no more than 8-inches apart.

Circular openings

4.15.3 Circular openings shall be firestopped in accordance with Figures F-34 to F-44.

a) Mineral wool batting shall be tightly packed into the opening at the required minimum depth.

b) Fire blocks, caulk and putty shall be installed at the required locations and minimum depth.

c) Plastic pipe and sleeves shall be equipped with the required number of wrap strip layers or proper size of collar assembly.

d) Steel sleeves installed in hollow walls shall comply with the construction elements indicated in the relevant Figure reference.

Retrofitting 3M Firestops

4.15.4 Retrofitting 3M firestops with Hilti products shall be accomplished by:

a) The complete removal of all accessible 3M material except that used for smokestopping the interior of cable bundles.

b) The periphery of cable bundles and building surfaces shall be thoroughly wiped to remove as much 3M material as is practicable where contact with Hilti’s products is likely.

5. CABLE HOLE

5.1 Cable Hole Labeling

5.1.1 The SBC LEC approved cable hole labels (Figure F-7) shall be completed and affixed (on the network side) to an opening’s cover plate and sheathing upon completion of the fire stopping activity in a manner
that will cause the label(s) to tear when the cable hole cover is removed. The label is not required when drop in ceiling plates are utilized.

a) On wall openings, the label shall be affixed to the intumescent sheet and the building surface.

b) For multipiece covers, a label shall be affixed across all pieces that must be removed to add or remove cables.

c) At floor openings, a label shall be applied on each side of the steel cover plate (sides paralleling cable growth).

d) For intumescent sheets attached to ceilings, a label shall be applied on each side of the sheet paralleling cable growth.

e) Existing cable hole labels shall be removed in their entirety before affixing new labels.

f) An SBC LEC approved open cable hole label (Figure F-32) shall be completed and affixed to the cable hole opening. This label shall remain in plain view until such time the hole is permanently fire stopped and a certification label is attached.
REQUEST FOR TECHNICAL ASSISTANCE RESPONSE
FIRESTOPPING NON-STANDARD THROUGH-PENETRATION ASSEMBLY
TELECOMMUNICATIONS FACILITIES

Author's RFTA Ref. No. Date _______ Telco Job Ref. No. _________________ Office CLLI _______ Floor _____
Office Address ________________________________ Cable Hole Desig. _______________
SBC LEC Eqpt. Engr. _____________________________ Phone ____________________
Submitted By: ___________________ Company: __________________________
Phone: _________________ FAX: _____________________ Response Needed By: ______

Building Surface Construction: Floor ___ Wall ___ Thickness _______ F Rating (if known) _____ hr.
Framed/Hollow Wall _____ Concrete/Block Wall _______
Size Of Opening ____________ Describe Hole Lining/Sheathing If Any: __________________________

Use Of Space On Both Sides Of Opening: Side A: ___________________ Side B: _________________
Penetrating Apparatus (include cable bundle size if applicable): __________________________

Function Of Firestop: Permanent Closing _____ Re-enterable Closing _____
The problem/situation:

Proposed resolution:

Send Request To:
Area Manager - Common Systems Firestopping
Ph: 775-333-8553 FAX 775-333-4089 E-mail bm1924@sbc.com

Approved ___ Denied ___
Comments:
### TABLE F-1 – SUMMARY OF CHANGES IN SECTION F

<table>
<thead>
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<th>Change</th>
<th>Item in 11/1/00 Issue</th>
<th>Item in this Issue</th>
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<td>Hilti</td>
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FIGURE F-1 – TYPICAL WATERPROOFING OF LARGE HOLES IN FLOORS

- Non-hardening gasket compound such as Permatex No. 2
- Interior face of cable hole
- Sheathing or steel cover anchoring hole
FIGURE F-2 – APPLICATION OF CABLE BANDING FOR SMOKESTOPPING

- Nylon cable tie: min. 1/4" wide
- Min. 4 strands of waxed sewing cord
- Initial installation
- Subsequent installation through existing cable bundle or to existing cable band
- Smokestopping putty at interior voids
- ±2" from cable hole cover
- Cable band – to cable back stringer or around entire bundle which ever is more appropriate and convenient for protection of putty installation integrity.
FIGURE F-3 – CABLE HOLE SET-UP FOR COMPOSITE SHEET PRODUCTS USING
SUPPORT STIRRUPS (UL FB-3004 METHOD)

S/MS005–160 DET. 17 SUPPORT STIRRUP
OR NO. 18 GAUGE GALV. SHEET METAL
STIRRUPS FOR FLOOR THICKNESSES LESS
THAN 8” ARE FABRICATED LOCALLY OR
REfabrications of S/MS005–160 DET. 17

1/4 x 3/4” SELF TAPPING SHEET
METAL SCREW AND FENDER WASHER

INTUMESCENT DROP-IN COVER

CABLE HOLE SHEATHING

1/4–20 x 3/4” NHCS
HEX NUT AND WASHER
(LOCATED BY INSTALLER)

FLOOR DEPTH
8” AND GREATER

VERTICAL CABLE RACK FROM OVERHEAD SUPERSTRUCTURE
FOR VOID OPENINGS

SIDE A

A

A

SUPPORT STIRRUP
PREFERRED INSTALLATION

SUPPORT STIRRUP
ALTERNATE INSTALLATION

(DROP-IN COVER)

12.00
FIGURE F-4 – CABLE HOLE SET-UP FOR COMPOSITE SHEET PRODUCTS USING MODIFIED CEILING PLATE SUPPORT (UL FB-3004 EJ)
FIGURE F-5 – METHOD OF PROTECTING EXPOSED INTUMESCENT COVERS AT FLOOR OPENINGS

1/4–20 HHCS & FENDER WASHER

1/2" MIN.
4" MAX.

1/8" STEEL COVER PLATE
FIGURE F-6 – CABLE SLOT PARTITIONING ARRANGEMENTS

STEEL PARTITION MAY BE COMPRIZED OF TWO PIECES FASTENED TOGETHER FOR HEIGHT ADJUSTMENT PURPOSES

TWO 1/4" (MIN.) ATTACHMENTS TO CEILING PLATE OR BUILDING SURFACE
FIGURE F-7 – TYPICAL FIRESTOP LABELS

SBC LEC

THIS CABLE HOLE OPENED BY:

SUPPLIER NAME: ________________________________
LEC TEO #: __________ DATE/TIME OPENED: __________
SUPPLIER CONTACT NUMBER: ________________________

Open Cable Hole Label
(Black Characters On Green Background)
(A)

SBC LEC

THIS CABLE HOLE HAS BEEN PROPERLY FIRESTOPPED IN ACCORDANCE WITH TP76300MP

SUPPLIER'S NAME: ________________________________
LEC TEO #: __________ DATE CLOSED: __________
SUPPLIER CONTACT NUMBER: ________________________

Closed Cable Hole Label
(Black Characters On Orange Background)
(B)
FIGURE F-8—APPLICATION OF FIRESTOP LABELS

FIGURE F-9—FIRESTOPPING CONTINUOUS SLOTS UNDER OFFICE DISTRIBUTING FRAMES
FIGURE F-10 – FIRESTOPPING SMALL RECTANGULAR OPENINGS UNDER OFFICE DISTRIBUTING FRAMES

FIGURE F-11 – FIRESTOPPING LARGE FLOOR OPENINGS USING INTUMESCENT COMPOSITE SHEET PRODUCTS (UL FB-3004)
INSTALLATION REQUIREMENTS
SBC Local Exchange Carriers

Section F, TP 76300MP
October 1, 2001

[Diagram with labeled parts]

- Cable Tie
- 1/2" Min.
- Cable Hole Sheathing
- Putty along face of opening to fill voids at rear of cable bundle
- Smokestop
- Intumescent Putty Plate
- Minimum 1/2" bead of intumescent putty at perimeter of opening
- 1/4-20 HHCS & Fender Washer

[Diagram with labeled parts]
FIGURE F-12 – FIRESTOPPING LARGE WALL OPENINGS USING INTUMESCENT COMPOSITE SHEET PRODUCTS (UL FB-3004)
FIGURE F-13 – FIRESTOPPING NON-METALLIC PIPE IN LARGE RECTANGULAR OR CIRCULAR OPENINGS USING INTUMESCENT COMPOSITE SHEETS (OPENINGS UP TO 84 IN.²) (ULCAJ-2003)
FIGURE F-14 – FIRESTOPPING FLEXIBLE NON-METALLIC TUBING IN LARGE RECTANGULAR OPENINGS USING INTUMESCENT COMPOSITES SHEETS (UL CAJ-2030)
1. MPP+ Moldable Putty Pad
   1A. Interior of raceway lined with single 4" wide strip of MPP+ putty pad. A 4" wide strip to overlap top of raceway sides 1/2" and extend a minimum 1" from the wall surface.
   1B. A single strip of 2" wide MPP+ putty pad formed across top of 1/2" maximum cable pileup. Putty strip to extend a minimum 1" from wall surface.

2. CS-195+ Composite Sheet
   Installed per standard fastening and opening overlap requirements. Fixed and removable portion of cable hole cover cut to fit contour of raceway and installed cable. Space between covers and raceway to be ±1/2" to allow insertion of FS-195+ Warp/Strip around perimeter of raceway.

3. FS-195+ Wrap/Strip
   3A. Apply a single layer of FS-195+ Wrap Strip across the top of cable bundle. This layer of wrap strip to be relocated to top of cable bundle as additional cable is installed.
   3B. Raceway and installed cable enclosed by a single layer of FS-195+ Wrap Strip. Wrap strip to overlap top of either side of raceway and extend a minimum of 1" from wall surface.

4. MPS-2+ Putty Stix
   4A. A min. 1/4" bead of bulk putty to be installed around perimeter of FS-195+ Wrap/Strip to seal opening. Putty to be wedged into space between composite sheet and wrap strip so that wrap strip is held against raceway and installed cable. Putty to overlap composite sheet a minimum 1/4".
   4B. Additional putty to be applied around the exposed side of wrap strip to seal all gaps and spaces between wrap strip and raceway and to plug interior of raceway support channels.

5. 3MM Diameter Fiber Optic Cables
Maximum of 960 jumper cables per raceway (approximately 3/4 visual fill). Cables to be installed and layered with single layer of 2" wide MPP+ pad for every 1/2" of cable pileup until pileup nears 3/4 visual fill. Install 1 layer of FS-195+ Wrap/Strip at the top of cable pileup.
FIGURE F-16 – FIRESTOPPING CABLE IN CIRCULAR OPENING UP TO 6” DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-3021)

FIGURE F-17 – FIRESTOPPING CABLE IN CIRCULAR OPENING UP TO 4” DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS HAVING A NON-METALLIC SLEEVE – SLEEVE EXTENDS 2” OR LESS BEYOND BUILDING SURFACE (UL CAJ-3058 EJ)
FIGURE F-18 - FIRESTOPPING CABLE IN CIRCULAR OPENING UP TO 4" DIAMETER IN CONCRETE/MASONRY FLOORS AND WALLS HAVING A NON-METALLIC SLEEVE – SLEEVE EXTENDS MORE THAN 2" BEYOND BUILDING SURFACE (UL CAJ-3058 EJ)

TABLE F-18

<table>
<thead>
<tr>
<th>PVC</th>
<th>ENT</th>
<th>SQ. or Rectangle</th>
<th>No. of Wrap Strip Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 to 2&quot;</td>
<td>&lt;1-1/2&quot;</td>
<td>&lt;3 Sq. In.</td>
<td>1</td>
</tr>
<tr>
<td>2-1/2 to 3&quot;</td>
<td>1-1/2 to 2&quot;</td>
<td>3 to 7 Sq. In.</td>
<td>2</td>
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<tr>
<td>3-1/4 to 4&quot;</td>
<td>Bundles of &lt;2&quot; (7 max.)</td>
<td>&gt;7 Sq. to 12-1/2 Sq. In.</td>
<td>3</td>
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<tr>
<td>6&quot;</td>
<td></td>
<td>13 to 28 Sq. In.</td>
<td>2 Stacks of 3</td>
</tr>
</tbody>
</table>
| 8"         |           | >28 Sq. In.      | 2 Stacks of 4
FIGURE F-19 – FIRESTOPPING NON-METALLIC PIPE UP TO 4" DIAMETER IN A 7" MAX. DIAMETER CIRCULAR OPENING IN SOLID/HOLLOW FLOORS AND WALLS (UL CAJ-2001, CAJ-2226, WL-2092)

FIGURE F-20 - FIRESTOPPING NON-METALLIC PIPE UP TO 4" DIAMETER IN A 6" MAX. DIAMETER CIRCULAR OPENING IN CONCRETE/MASONRY FLOORS AND WALLS (UL CAJ-2002)
4" MAXIMUM DIAMETER NON-METALLIC PIPE

1/4" MINIMUM DEPTH OF PUTTY TO SEAL OPENING

1/2" LAYER OF PUTTY AFTER INSTALLATION OF WRAP STRIP ASSEMBLY TO COMPLETELY SEAL THE OPENING

1/4" MINIMUM BEAD OF PUTTY 1" INTO OPENING AROUND THE RACEWAY BEFORE INSTALLATION OF WRAP STRIPS AND SUPPORT

FS-195 WRAP STRIPS
(SEE TABLE F-19)

2.00

DEPTH OF OPENING

SPAN OF ANNULAR SPACE

INSTALLER FABRICATED SUPPORT STIRRUP
1" x NO.28 GAUGE GALV STEEL
SK-F-21

VIEW FROM BELOW

RACEWAY

WRAP STRIPS
1" OFFSET BETWEEN BUTTED ENDS OF EACH LAYER

SUPPORT STIRRUP
FIGURE F-21 – FIRESTOPPING METALLIC PIPE IN CIRCULAR OPENING OF CONCRETE/MASSONRY FLOORS AND WALLS (UL CAJ-1027)

MINERAL WOOL BATTING
1" MINIMUM DEPTH
TIGHTLY PACKED INTO OPENINGS WITH ANNULAR SPACES GREATER THAN 3/4"

INTUMESCENT PUTTY
1" MINIMUM DEPTH AT PERIMETER OF OPENING

1-1/2" MAX.

METALLIC RACEWAY

FIGURE F-22 – FIRESTOPPING FLEXIBLE NON-METALLIC TUBING IN CIRCULAR OPENINGS OF CONCRETE/MASSONRY FLOORS AND WALLS (UL CAJ-2028 & CAJ-2029)
FIGURE F-23 – FIRESTOPPING CABLE IN CIRCULAR OPENINGS OF HOLLOW WALLS
(UL WL-3031)
FIGURE F-24 – FIRESTOPPING 2" MAX. DIAMETER NON-METALLIC PIPE IN HOLLOW WALLS (UL WL-2097)

NOTE 1. SLEEVE TO BE 4" MAXIMUM DIAMETER EMT OR NO.28 GAUGE GALVANIZED SHEET STEEL. SLEEVE TO EXTEND 1/2" MINIMUM BEYOND WALL SURFACES. SHEET STEEL SLEEVE TO HAVE 2" MINIMUM OVERLAP ALONG ITS LONGITUDINAL LENGTH AND BE EQUIPPED WITH CABLE PROTECTION SUCH AS SLIT FLEXIBLE TUBING AT BOTH ENDS.

METALLIC SLEEVE

INTUMESCENT PUTTY
1/4" MINIMUM BEAD OF PUTTY AROUND SLEEVE AT INTERFACE WITH BUILDING SURFACE

SMOKESTOP

INTUMESCENT PUTTY
1" MINIMUM DEPTH AT PERIMETER OF CABLE BUNDLE

CABLE TIE

5/8" WALLBOARD, NUMBER OF LAYERS PER FIRE RATING OF WALL

MINERAL WOOL BATTING, DEPTH OF OPENING MINUS PUTTY DEPTH

NON-METALLIC PIPE CENTERED IN OPENING

INTUMESCENT PUTTY
1" MINIMUM DEPTH AT PERIMETER OF PENETRANT

F-79
FIGURE F-25 – FIRESTOPPING METALLIC PIPE IN HOLLOW WALLS (UL WL-1001, WL-1032)

FIGURE F-26 – FIRESTOPPING VOID CIRCULAR OPENINGS IN FLOORS AND WALLS (UL WL-3031 EJ)
F-30 – FIRESTOPPING LARGE FLOOR OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013)
F-31 – FIRESTOPPING LARGE WALL OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013)

#16 GAUGE x 2” (MAX.) GALVANIZED WIRE MESH
OR #20 GAUGE (MIN.) SHEET STEEL COVER AT
ANNULAR SPACES EXCEEDING 4-INCHES

1/4” FASTENERS AND FENDER WASHERS
SPACED 8” (MAX.) ON CENTER

PUTTY SEALING AIR LEAKS AS REQUIRED

CP-617 PADS AT PERIMETER
OF CABLE BUNDLE

1” DOME OF INTUMESCENT PUTTY AT
PERIMETER OF CABLE BUNDLE AND
CABLE RACK ON BOTH SIDES OF WALL

1” MIN.
2-1/2” MAX.
FIGURE F-32 – FIRESTOPPING NON-METALLIC PIPE AND TUBING IN RECTANGULAR OPENINGS USING INTUMESCENT FIRE BLOCKS (CBJ-8013 EJ)
FIGURE F-33 – FIRESTOPPING ADC FIBER TROUGH IN RECTANGULAR OPENINGS USING INTUMESCENT FIRE BLOCKS (WL-4039)

LEGEND

1. ADC FIBERGUIDE RACEWAY UP TO 4 X 12" IN SIZE.
2. CP-617 PUTTY PAD EVERY 1/2" OF PATCHCORD PILEUP OR EACH LAYER OF TIE CABLE. PADS TO EXTEND INTO OPENING A MINIMUM OF 5".
3. FS-657 FIRE BLOCKS INSTALLED IN OVERLAPPING FASHION.
4. MINIMUM 1" DEPTH OF CP-618 PUTTY AT INTERIOR OF RACEWAY SUPPORT CHANNELS.
5. MINIMUM 1/2" DOME OF CP-618 PUTTY AROUND PERIMETER OF RACEWAY AT ITS INTERFACE WITH FIRE BLOCKS.
FIGURE F-34 – FIRESTOPPING CABLE IN 6" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS (CAJ-3095)

CABLE TIE
SMOKESTOP
OPTIONAL STEEL SLEEVE
1/2" MIN. DEPTH OF FS–ONE SEALANT OVER 2" MIN. DEPTH OF MINERAL WOOL (THIS ARRANGEMENT FOR BOTH SIDES OF WALL OPENINGS)

FIGURE F-35 – FIRESTOPPING CABLE IN 4" MAX. DIAMETER OPENING IN SOLID FLOORS AND WALLS EQUIPPED WITH NON-METALLIC SLEEVE (CAJ-3084)
INSTALLATION REQUIREMENTS
Section F, TP 76300MP
SBC Local Exchange Carriers
October 1, 2001

FS—ONE SEALANT
(2" MINIMUM DEPTH)

CABLE TIE
SMOKESTOP

NON—METALLIC SLEEVE

1" MINERAL WOOL DAM

BOTH SIDES OF WALLS
FIGURE F-36 – FIRESTOPPING CABLE IN 4" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS EQUIPPED WITH NON-METALLIC SLEEVE EXTENDING BEYOND BUILDING SURFACE (CAJ-3084 EJ)

FIGURE F-37 – FIRESTOPPING NONMETALLIC PIPE 7" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS – SMALL ANNULAR SPACE (CAJ-2109)
FIGURE F-38 – FIRESTOPPING NON-METALLIC PIPE IN 6" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS – LARGE ANNULAR SPACE (CAJ-2294)
FIGURE F-39 – FIRESTOPPING METALLIC PIPE IN 6" MAX. DIA OPENING IN SOLID FLOORS AND WALLS – LARGE ANNULAR SPACE (CAJ-1276)

MINERAL WOOL BATTING
1" MINIMUM DEPTH TIGHTLY PACKED INTO OPENINGS

CP-618 PUTTY
1" MINIMUM DEPTH AT PERIMETER OF OPENING

METALLIC PIPE

FIGURE F-40 – FIRESTOPPING ENT IN 4" MAX. DIA. OPENING IN SOLID FLOORS AND WALLS (CAJ-3084 E.J.)

ENDS OF TUBING TO BE SEALED WITH 1/4" MINIMUM DEPTH OF PUTTY UNLESS THEY ARE TERMINATED IN A RELATIVELY AIR TIGHT AND NORMALLY CLOSED ENCLOSURE

MINERAL WOOL DAM

FS-ONE SEALANT
2" MINIMUM DEPTH

REQUIRED AT BOTH SIDES OF WALL OPENINGS
FIGURE F-41 – FIRESTOPPING CABLE IN 4” MAX. DIA. OPENING IN HOLLOW WALLS (WL-3111, WL-3112)

NOTE 1. SLEEVE TO BE 4” MAXIMUM DIAMETER EMT OR NO. 28 GAUGE GALVANIZED SHEET STEEL AND EXTEND A MINIMUM OF 1/2” BEYOND WALL SURFACES.

SHEET STEEL SLEEVE TO HAVE A 2” MINIMUM OVERLAP ALONG ITS LONGITUDINAL LENGTH AND BE EQUIPPED WITH CABLE PROTECTION SUCH AS A SLIT FLEXIBLE TUBING AT BOTH ENDS.

EMT SLEEVE TO BE PERMANENTLY GROUTED INTO OPENING. GROUT TO BE SAME THICKNESS OF WALLBOARD COVERING.

1/4” MINIMUM BEAD OF PUTTY AROUND SLEEVE AT INTERFACE WITH BUILDING SURFACE

1” MINIMUM DEPTH AT PERIMETER OF CABLE BUNDLE

CABLE TIE

5/8” WALLBOARD. NUMBER OF LAYERS PER FIRE RATING OF WALL

F-91
FIGURE F-42 – FIRESTOPPING NON-METALLIC PIPE IN 7” MAX. DIA. OPENING
IN HOLLOW WALLS (WL-2075)

NOTE 1. SLEEVE TO BE 4” MAXIMUM DIAMETER EMT OR NO.28 GAUGE SHEET STEEL.
SLEEVE TO EXTEND A MINIMUM OF 1/2” BEYOND WALL SURFACES.

SHEET STEEL SLEEVE TO HAVE A MINIMUM 2” OVERLAP ALONG ITS LONGITUDINAL LENGTH AND BE EQUIPPED WITH CABLE PROTECTION SUCH AS SLIT FLEXIBLE TUBING AT BOTH ENDS.

EMT SLEEVE TO BE PERMANENTLY GROUTED INTO OPENING. GROUT TO BE AS THICK AS WALLBOARD COVERING.

FIGURE F-43 – FIRESTOPPING METALLIC RACEWAYS IN HOLLOW WALLS (EJ)

METALLIC RACEWAY

1/2” MAXIMUM ANNULAR SPACE

5/8” WALLBOARD: NUMBER OF LAYERS PER FIRE RATING OF WALL

METALLIC RACEWAY

FS-ONE SEALANT

FULL THICKNESS OF WALL COVERING(S)
FIGURE F-44 – FIRESTOPPING VOID CIRCULAR OPENINGS IN SOLID FLOORS AND WALLS (EJ)

4" DIA. MAX.
SLEEVE OPTIONAL

FS-657 FIRE BLOCK – SINGLE PIECE
(1/2" LARGER DIA. THAN OPENING)
(BOOTH SIDES OF WALL OPENINGS)

1/2" MIN. FS-ONE
(BOOTH SIDES OF WALL OPENINGS)
7" MAX. DIA.
MINERAL WOOL BATTING
4" MINIMUM DEPTH

3/4" MIN. CP-618 PUTTY
(BOOTH SIDES OF WALLS)
4" MAX. DIA.
MINERAL WOOL BATTING

CAJ-0055EJ
CAJ-0058
CAJ-0070

(A)

F-93
1.0 GENERAL

1.1 INTRODUCTION

1.1.1 This section covers requirements for floor drilling procedures.

1.1.2 Changes in this issue of Section G of TP 76300MP are summarized in Table G-1.

1.1.3 These floor-drilling procedures shall be used when drilling in vinyl floor tile containing asbestos or presumed to contain asbestos.

1.1.4 The procedures shall also be used as a dust control practice when drilling in concrete and non-asbestos containing flooring.

1.1.5 The procedures described here apply to SBC LECs in the following states: Arkansas, California, Connecticut, Indiana, Illinois, Kansas, Michigan, Missouri, Nevada, Ohio, Oklahoma, Texas, and Wisconsin.
1.1.6 Changes to this issue of Section G are summarized in Table G-1.

1.2 REQUIREMENTS

1.2.1 The Installation Supplier shall adhere to all federal, state and local regulations regarding hazardous material/waste in addition to SBC LEC installation requirements.

1.2.2 The Installation Supplier shall coordinate with the SBC LEC Representative before any activity related to hazardous material/waste is started.

1.2.3 Installation Suppliers shall follow the Negative Exposure Assessment (NEA) floor tile drilling procedures when drilling in floors.

1.2.4 In the event of any of the following occurrences, the Installation Supplier shall immediately contact the SBC LEC representative who will contact the appropriate SBC organization:

<table>
<thead>
<tr>
<th>Type of Occurrence</th>
<th>SBC LEC will contact…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory agency inspector visit to site</td>
<td>SBC Corporate Safety (1-866-SBC-SAFE)</td>
</tr>
<tr>
<td>Accidental exposure to suspected asbestos</td>
<td>SBC Corporate Safety (1-866-SBC-SAFE)</td>
</tr>
<tr>
<td>Accidental release of suspected asbestos to the environment</td>
<td>Environmental Management (In Connecticut, Indiana, Illinois, Michigan, Ohio, and Wisconsin call 1-877-648-2073; In Arkansas, Kansas, Missouri, Oklahoma and Texas call 1-800-854-5825; In California and Nevada call 1-877-823-9833)</td>
</tr>
</tbody>
</table>

2.0 TRAINING

2.1 GENERAL

2.1.1 Installation Suppliers who perform these procedures on suspected/presumed/confirmed asbestos floor tile shall be trained in the NEA floor tile drilling procedures.

2.1.2 Unqualified Installation Suppliers shall not drill in suspected/presumed/confirmed asbestos containing floor tiles.

2.1.3 Training shall include, at a minimum:
   a) Annual Asbestos Awareness training;
   b) Annual Floor tile drilling procedure training; and
   c) Initial hands-on training of the NEA floor tile drilling procedure.

2.1.4 The Installation Supplier shall obtain the training from the appropriate trainer (Figure G-1).

2.1.5 Training shall be valid for a period of one year from the time of training.
2.1.6 Training shall be documented on a Training Attendance Form (Form G-1) and submitted to:

SBC NEA Management Center
2301 West Anderson Lane, Suite 205
Austin, Texas 78757
Phone: 512/380-6611
Fax: 512-380-9911

3.0 DRILLING HOLES IN FLOORS

3.1 GENERAL

3.1.1 The Installation Supplier shall use the NEA floor drilling procedures to drill in asbestos-containing or suspected asbestos-containing vinyl floor tile.

3.1.2 These procedures shall not be used by the Installation Supplier to perform core drilling or drill into asbestos-containing linoleum. Refer to Section G, Section 3.2 for details.

3.1.3 The procedures shall also be used as a dust control practice when drilling in concrete and non-asbestos containing flooring.

3.1.4 The Installation Supplier shall use the NEA floor drilling procedures only in the following states: Arkansas, California, Connecticut, Illinois, Indiana, Kansas, Michigan, Missouri, Nevada, Ohio, Oklahoma, Texas and Wisconsin.

3.1.5 Records of the asbestos content in flooring materials may be available for review. To access these records, the Installation Supplier shall call the following numbers to determine if the floor to be drilled contains asbestos, or is presumed to contain asbestos:

a) California, Nevada SBC LEC Representative
b) Connecticut 888/387-7638
c) Illinois, Indiana, Michigan, Ohio, Wisconsin SBC LEC Representative
d) Missouri, Oklahoma, Kansas, Arkansas 314/235-5949
e) Texas 214/464-2811

3.2 Floor Drilling Procedure

3.2.1 The following procedures shall be followed by the Installation Supplier for Solid-bit Floor Drilling in Asbestos Containing Vinyl Floor Tile.

a) Complete and fax the Negative Exposure Assessment (NEA) form (Figure G-2) to the NEA Management Center (512/380/9911) two days prior to using the NEA for floor tile drilling.

b) Place the completed NEA form in the yellow wallet at the job site.
c) Position the drill bit on the location of the hole to be drilled and apply an ample amount of debris encapsulant (LEPEC, shaving cream or shaving gel), covering about an inch of floor material around the drill bit.

d) Drill at slow speed until a hole is drilled into the concrete substrate to the required depth.

e) Stop the drilling and retract the bit slowly without disturbing the debris, concrete and encapsulant around the hole.

f) Wipe the debris, concrete and encapsulant off the drill bit and the floor with a wet cloth or paper towel. Place the cloth or towel, debris and encapsulant into a plastic bag and seal it. Place the sealed bag into another bag and seal it also.

g) Vacuum cleaners, of any type, shall NOT be used by the Installation Supplier to clean up asbestos containing or presumed asbestos containing material.

h) High Efficiency Particulate Air (HEPA) vacuum cleaners may be used to clean up non-asbestos concrete dust remaining in the holes.

i) Dispose the bagged debris as follows:

1. In Arkansas, Kansas, Missouri, Oklahoma and Texas -
   i. Place the double-bagged debris into a padded envelope and seal it. Mark the outside of the padded envelope “CO Drilling-Tile.”
   ii. Complete a MDR for drilling debris and place it in the yellow wallet.
   iii. Mail the padded envelope, via SBC LEC company mail, to:

   **11910 Shiloh Road, Suite 180, Dallas, TX.**

   Attach a copy of the MDR, attached to the outside of the padded envelope, with each shipment.

2. In Illinois, Indiana, Michigan, Ohio and Wisconsin -
   i. Place the double-bagged debris into a padded envelope and seal it. Mark the outside of the padded envelope “CO Drilling-Tile.”
   ii. Complete a MDR for drilling debris and place it in the yellow wallet.
   iii. Mail the padded envelope, via SBC LEC company mail, to:

   **36 South Fairview, 4th Floor, Park Ridge, IL.**

   Attach a copy of the MDR, attached to the outside of the padded envelope, with each shipment.

3. In Connecticut -
   i. Place the double-bagged debris into the trash.
   ii. Complete a separate MDR and place it in the yellow wallet.
   iii. Fax a completed MDR to 847/384-5999.

4. In California and Nevada
   i. Place the double-bagged debris into the trash.
3.2.2 The following procedures shall be followed by the Installation Supplier for Drilling in Other Asbestos-Containing Material:

a) If it is unknown whether the floor covering material contains asbestos, it shall be presumed to contain asbestos.

b) If the Installation Supplier encounters asbestos-containing linoleum or is required to core-drill through asbestos-containing flooring, the Installation Supplier shall contact the SBC LEC Equipment Engineer to arrange for a licensed asbestos abatement contractor to drill the holes or remove the asbestos-containing materials and properly dispose of the debris.

c) The Installation Supplier shall complete the MDR to document the disposition of the debris. The MDR shall be managed as described in Section G of this document and a copy placed in the yellow wallet.

3.2.3 The following procedures shall be followed by the Installation Supplier for Drilling in Concrete and Non-Asbestos Containing Flooring

a) To facilitate dust control, the Installation Supplier shall drill bare concrete and non-asbestos containing flooring in the same manner as the asbestos floor covering material; i.e., by utilizing the debris encapsulant.

b) The debris and the encapsulant, after being cleaned up with a wet cloth or paper towel, may be disposed of as ordinary trash.

c) High Efficiency Particulate Air (HEPA) vacuum cleaners shall be used to clean up concrete dust remaining in the holes.

d) A MDR shall be completed and placed in the yellow wallet to report the disposition of the non-asbestos containing residue.

e) Installation Suppliers who perform this process need not be trained in the Negative Exposure Assessment (NEA) floor tile drilling procedures.

4.0 DOCUMENTATION

4.1 General

The Installation Supplier shall use the following forms to document the Floor Drilling procedures described in this section:

a) Training Attendance Form (Figure G-1)

b) Negative Exposure Assessment Form (Figure G-2)

c) Material Disposition Record Form (Figure E-5, Section E)

4.2 NOTICE OF NON-CONFORMANCE
4.2.1 An Installation Supplier submitting invalid training or NEA documentation will receive a Notice of Non-Conformance (Figure G-3) which requires the Installation Supplier to correct the situation immediately.

4.2.2 Questions and requests for information may be forwarded to the NEA Management Center.
FIGURE G-1 – TRAINING ATTENDANCE FORM

A reproducible copy of the Training Attendance Form is provided on the following page.
Training Attendance Form

Asbestos Awareness and SBC Floor Tile Drilling Procedure

Date of Training: ____________________ Training Company: ______________________________

Trainer: __________________________________________________________________________

(Please Print Clearly) Name Company Phone Number

<table>
<thead>
<tr>
<th>Persons Trained</th>
<th>Last 4 Digits of Social Security Number or ID Number</th>
<th>Job Title</th>
<th>Phone Number</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

I do hereby certify that each person listed above has received “Asbestos Awareness” training and completed the training program entitled “Asbestos Floor Tile Work practices”. During “hands-on” training with non-asbestos floor tile and mastic, each person demonstrated the ability to drill holes in accordance with the procedure, “Hole Drilling with Encapsulant.” In my judgement, these individuals are qualified to safely and correctly perform the procedure as trained.

Signature          Date

Submit completed training form by mail to: NEA Management Center, 2301 West Anderson Lane, Suite 205, Austin, TX 78757, Fax: 512-380-9911
Important Note Regarding Qualified Trainers

Effective January 1, 2002 Installation Supplier’s Primary trainer(s) shall attend an annual refresher-training course administered by a Core training provider. Only Core Trainers and Primary Trainers shall conduct NEA drilling procedure training.

Core Trainers are trainers approved by SBC to conduct Asbestos Awareness and NEA Floor Tile Drilling Procedures. The list of Core trainers is available by contacting the NEA Management Center. Core trainers shall provide independent “Train the Trainer” courses valid for one year from the date the course is successfully completed.

Primary Trainers – Trainers who have attended the “Train the Trainer” course conducted by Core Trainers shall be considered “Primary Trainers.” Primary trainers are qualified to train and certify persons within their organization who will perform drilling using the NEA procedures. Primary trainers are also qualified to perform drilling themselves. Primary Trainers shall be qualified to conduct training for a period of one year from the date of training by Core Trainers.
FIGURE G-2 – 2002 NEGATIVE EXPOSURE ASSESSMENT FORM

A reproducible copy of the Negative Exposure Assessment Form is provided on the following page.
NEGATIVE EXPOSURE ASSESSMENT

For

DRILLING HOLES IN ASBESTOS-CONTAINING FLOOR TILE

A. Description of current job

Con./Project/TEO/Job # ________________

1. Description of work
   This work will be performed at________________________________________________________
   Location  City   State
   by employees of_____________________________________________________________________
   Name of employer
   based at___________________________________________________________________________
   Location  City   State

1. The procedure used for installation of equipment on asbestos-containing resilient floor tile includes drilling
   holes in the tiles, using shaving cream to control debris and fiber release. A procedure for this work practice is
   attached to this NEA. This NEA is not applicable to sheet vinyl linoleum with asbestos backing material.

2. Type and amount of material - Work will be performed on 9" x 9" and/or 12" x 12" resilient floor tile,
   installed on a concrete floor, and on the associated adhesive mastic.

3. Type and percent asbestos - The floor tile is presumed to contain asbestos and no samples have been taken for
   analysis.

4. Engineering controls - No engineering controls are required.

5. Worker's training and experience - Workers have completed a 2-hour Awareness Training course, plus
   training in use of the procedure in Section D. This training included "hands-on" exercises using non-asbestos
   floor tile similar to the asbestos-containing material on which the work will be performed.

6. Class of work - Class III work - Maintenance and repair on Class II material - resilient floor covering.
B. Initial Exposure Assessment (IEA) and Annual Updates

1. Initial Exposure Assessment (IEA) was completed on October 23, 1996
   a. Name of person performing IEA: Andrew F. Oberta, MPH, CIH, The Environmental Consultancy, Austin, TX, a licensed asbestos consultant (TDH License No. 10-5430).
   b. Was a project design completed for this project? Yes. Test procedures and air sampling procedures were prepared, and a drawing of the test facility was provided.
   c. Were engineering controls implemented as designed? Yes.
   d. Results of an 8-hr TWA: No 8-hr TWA exposures were calculated. The sample results in Table 1 are for the actual duration of sampling, which ranged from 20 to 230 minutes (average = 62). 8-hr TWA exposures would be less than the values in Table 1, all of which are below the PEL of 0.1 fibers/cc.
   e. Results of a 30-minute STEL: All of the EL samples are below the excursion limit of 1.0 fibers/cc.
   f. How were these samples analyzed? Phase Contrast Microscopy using NIOSH Method 7400.
   g. Are the results less than the PEL and the EL? Yes. Also, the 95% UCL is below the PEL and EL.
   h. Were the samples taken representative of all operations which will take place during the work? Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient floor tile.
Table 1. Summary of Personal Samples for Hole drilling with Shaving Cream taken on October 10, 17 and 23, 1996

<table>
<thead>
<tr>
<th></th>
<th>PEL samples</th>
<th>EL samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of tests</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>No. of samples</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Range, fibers/cc</td>
<td>0.0053 - 0.0114</td>
<td>0.0237 - 0.098</td>
</tr>
<tr>
<td>Average, fibers/cc</td>
<td>0.008</td>
<td>0.033</td>
</tr>
<tr>
<td>95% UCL, fibers/cc</td>
<td>0.012</td>
<td>0.062</td>
</tr>
</tbody>
</table>

2. Annual Updates have been conducted. The most recent is summarized below.
   a. Name of person performing update: Peter D. Cappel, Gobbell Hays Partners, Inc.
   b. Was a project design completed for this project? A test plan and air sampling strategy were prepared.
   c. Were engineering controls implemented as designed? No engineering controls were necessary, based on the Initial Exposure Assessment and four previous updates.
   d. Results of an 8-hr TWA: No 8-hr TWA exposures were calculated. The sample result below is for the actual duration of sampling, 88 minutes. 8-hr TWA exposures would be less than this value.
   e. Results of the EL: All of the EL sample results are less than the excursion limit of 1.0 f/cc.
   f. How were these samples analyzed? Phase Contrast Microscopy using NIOSH Method 7400.
   g. Are the results less than the PEL and the EL? Yes. Also, the 95% UCL is less than the PEL and EL.
   h. Were the samples taken representative of all operations which will take place during the work? Yes, provided that the workers receive training in using the procedure, that they use similar equipment and materials, and that work is limited to resilient floor tile.

Table 2. Summary of Personal Samples for Hole drilling with Shaving Cream taken on September 5, 2001*

<table>
<thead>
<tr>
<th></th>
<th>PEL samples</th>
<th>EL samples</th>
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</thead>
<tbody>
<tr>
<td>No. of samples</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Range, fibers/cc</td>
<td>0.022</td>
<td>&lt;0.036 - 0.052</td>
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<tr>
<td>Average, fibers/cc</td>
<td>0.022</td>
<td>0.041</td>
</tr>
<tr>
<td>95% UCL, fibers/cc</td>
<td>0.026</td>
<td>0.059</td>
</tr>
</tbody>
</table>

*Employer is responsible for obtaining current (within 12 months) air sampling data
C. Certification of Negative Exposure Assessment

Based on the information herein, worker exposures during the current job described in Section A are not expected to exceed the Permissible Exposure Limits, based on comparison of the current job to the Initial Exposure Assessment and annual updates described in Section B.

Name:__________________________________Signature:________________________________Date:_________
PRINT name of competent person

Last 4 digits of SS#___________________________  Phone Number:____________________________

Installer_____________________________[PRINT name]  ID Last 4 digits of SS#_____________________

Installer_____________________________[PRINT name]  ID Last 4 digits of SS#_____________________

Return Completed NEA Form to:

NEA Management Center
c/o NewFields
Fax: 512-380-9911   2301 W. Anderson Lane
Phone: 512-380-6611   Suite 205
Austin, TX 78757
D. Procedure for hole drilling through asbestos-containing floor tile with shaving cream

1. This procedure is used for drilling holes through resilient floor tile with an impact drill and masonry bit for installation of equipment.

2. The following equipment and supplies are required for this procedure: Impact drill with masonry bit, shaving cream, wet paper towels, marking pen, plastic sealable bags.

3. The impact drill shall be on a GFCI circuit and safety glasses shall be worn.

4. Before starting to drill, wet several paper towels and fold them flat.

5. Mark the location of the hole(s) on the floor tile.

6. Place a wet paper towel with a hole in the middle flat on the floor so that the mark shows through the hole.

Before continuing work, make sure that the immediate area is clear of all persons who have not completed the Asbestos Floor Tile training course.

7. Drill the hole(s) as follows:
   - Position the drill bit on the mark and apply the shaving cream, making a mound about two-inches in diameter and an inch deep around the drill bit.
   - Turn the drill on low speed and slowly drill through the tile into the concrete to the required depth.
   - If concrete dust or floor tile shavings become visible on the shaving cream, add more shaving cream.
   - Turn off the drill and slowly retract the bit without disturbing the debris, concrete dust and shaving cream around the hole.

8. Wipe the debris, concrete dust and shaving cream off the drill bit with a paper towel. Put the towel in a sealable plastic bag.

9. Pick up the paper towel with the dust and shaving cream. Use another wet paper towel to wipe up dust and shaving cream on the floor. Do not step on any dust or shaving cream. Put the towel in a sealable plastic bag.

10. Wipe the floor around the hole with a wet paper towel, holding it flat against the floor with the palm of your hand. Wipe ONCE in an S-pattern. Do not re-use the towel.

11. Wipe the floor again in an S-pattern, at right angles to the direction that you wiped the first time. Do not reuse the towel.

12. Continue wiping in alternating S-patterns until you cannot see or feel any dust or debris. Put all paper towels in sealable plastic bags as soon as you finish using them.

13. Drill the remaining holes. After you finish using this procedure, dispose of the plastic bags with the paper towels according to the instructions for the building you are working on.
FIGURE G-3 –NOTICE OF NON-CONFORMANCE

A copy of the Notice of Non-Conformance is provided on the following page.
SBC NEA MANAGEMENT CENTER

NOTICE OF NON-CONFORMANCE

TO: NEA Floor Tile Drilling Trainer

Re: NEA Floor Tile Drilling Training

Dear Trainer:

The NEA Management Center recently received documentation from you regarding the training of installers in the floor tile drilling procedure. Effective September 1, 2001 SBC revised the training protocols associated with floor tile drilling. Revisions to training procedures include the following:

1) Installers initially trained after November 1 must be trained by a “primary” trainer. Primary trainers are those that have attended train-the-trainer training conducted by an SBC approved core training provider (New Fields, Gobbell Hays, The Environmental Consultancy, ISHC, Design for Health or Forensic Analytical).

2) Annual refresher training for previously trained installers must be administered by a primary trainer.

3) All training must be recorded on a Training Attendance Form containing a certification statement and signature.

You have submitted documentation that does not in comply with these current requirements.

☐ Notification of training was not submitted on the proper signed form. Please submit proper form (attached).

☐ The person conducting the NEA training is not listed as a primary trainer.

The training record you have submitted will not be recorded on the training database until this issue has been resolved. Please complete and sign the attached form and/or have a primary trainer conduct the training or refresher.

If you have any questions you may contact the NEA Management Center at (512) 380-6611.

Thank you for your attention to this matter.

The NEA Management Center.
TABLE G-1 – SUMMARY OF CHANGES IN SECTION G

<table>
<thead>
<tr>
<th>Change</th>
<th>Item in 11/1/00 Issue</th>
<th>Item in this issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised</td>
<td>Entire section</td>
<td>Entire section</td>
</tr>
<tr>
<td>Deleted</td>
<td></td>
<td>------</td>
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<td>Added</td>
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</table>

[END OF SECTION]
SECTION H -- GROUNDING AND BONDING

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1. GENERAL

1.1. Introduction

1.1.1 This section covers the Grounding and Bonding requirements for Installation Suppliers performing services for the SBC LEC.

1.1.2 Changes in this issue of Section H are summarized in Table H-1.

1.1.3 This section contains workmanship requirements. It is based on the engineering, installation and material requirements for grounding and bonding contained in the following documents:

a) BSP 802-001-180MP, *Grounding and Bonding Requirements - Telecommunications Equipment, Power Systems, Central Offices and Other Structures*

1.1.4 Additional information on Grounding and Bonding (e.g. cabling, connectors, labeling, etc.) can be found in other sections of this document.

1.2. Definitions

1.2.1 The following terms are used throughout this section. Note: Where different terms are used for the same object, the SBC LEC(s) to which these terms apply are listed in brackets after the term.

**Bonding** - The permanent joining of metallic sub-sections to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

**Common Bonding Network (CBN)** - A set of interconnected objects that has one or more connections to a ground reference. This network, created by a multitude of connections, helps to ensure that the objects are at essentially the same potential when fault current flows through them. Building steel, water pipes, vertical and horizontal equalizer conductors, metallic raceways, raised floor systems, equipment frames and other conductive objects form a common bonding network when bonded together by intentional and incidental connections. This term is now used throughout this Section in place of “integrated ground plane”.

**Central Office Ground Bar (CO GRD bar)** - [Ameritech, Nevada Bell, Pacific Bell, Southwestern Bell Telephone] A bus bar that references the primary grounding system bus bar through the Vertical Riser. At least one of these bus bars is provided on each floor to permit the grounding of frames and power supplies, as required. See **Floor Ground Bar**.

**DC Equipment Grounding Conductor (DCEG)** - The conductor that bonds equipment frame, cabinet or other enclosure to the CO GRD system. The DCEG conductor may also bond an equipment unit within a frame, cabinet or other enclosure to the CO GRD system.

**DC System Grounding Conductor** - The conductor used to connect one side of a dc power source to the site’s grounding system. Example: In a -48 volt battery-type power plant serving central office equipment, the conductor between the positive (+) side of the plant and a point on the office grounding system.

**Equipment Ground** - Deliberately engineered conductors in communication systems and ac and dc power distribution systems to provide electrical paths of sufficient capacity to permit protective devices (e.g. fuses, circuit breakers) to operate effectively and to equalize potential between equipment.

**Floor Ground Bar (FGB)** - [SNET] See **Central Office Ground Bar**.

**Foreign Object** - Any electrically conductive surface that is part of the Common Bonding Network and is within 7 feet of a conductive surface that is part of the Isolated Bonding Network.

**Framework Ground** - This term replaced by DC Equipment Grounding Conductor.

**Grounded Conductor** - A system or circuit conductor that is intentionally grounded. Example: The conductor usually referred to, as the grounded conductor is the neutral conductor in ac circuits and the battery return conductor in dc circuits.
Grounding Conductor - A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes. Examples: The alternating current equipment ground (ACEG), also called the green wire, used to provide a fault current return path in ac power systems. The grounding conductors used to interconnect frames in transport equipment.

Ground Window - An imaginary, spherical area having a radius of 3 feet. This transition area contains, or is a portion of a bus bar that is the physical interface between the building’s common bonding network and isolated bonding network equipment.

Ground Window Bar (GWB) - [SNET] See Main Ground Bus.

Horizontal Equalizers - Conductors of relatively low impedance that interconnect:
Vertical risers in a building that is of a size that requires more than one vertical riser
The primary grounding system bus bar to equipment areas on the same floor
Battery return bus bars in dc distribution systems for some electronic switching systems

Integrated Ground Plane (See Common Bonding Network)

Isolated Bonding Network (IBN) - A set of interconnected objects that are referenced to ground at a single point. This network is insulated from contact with any other conductive member not part of the same bonding network. With only one point of ground reference, the possibility that the equipment will be used as a conductive path for transient currents from exterior sources is greatly reduced. This term is now used throughout this Section in place of "isolated ground plane".

Isolated Ground Plane - (See Isolated Bonding Network)

Listed - Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets appropriate designated standards or has been tested and found suitable for use in a specified manner.

Main Ground Bus (MGB) - [Ameritech, Nevada Bell, Pacific Bell, Southwestern Bell Telephone] A bus bar located within the ground window that provides a physical means of connection between the CO GRD system and the isolated bonding network served by the ground window.

Office Principal Ground Point (OPGP) - A bus bar normally located near the AC entrance switchgear. It functions as:
   a) the connection point for all main grounding conductors and earth electrodes
   b) the point of origin for the Vertical Riser
   c) When convenient, the COG for the floor where it is located.

Raceway - An enclosed channel designed expressly for holding wires, cables, or bus bars, with additional functions as permitted in the National Electrical Code (NEC).

Single Point Ground - A method used to ground a circuit at only one physical point.
Solidly Grounded - A method of grounding either a power supply or a frame that uses a grounding conductor connection in which no additional impedance has been intentionally connected in series with the grounding path.

Vertical Riser (VR) - This conductor, also called the vertical equalizer, extends ground reference from the office’s primary ground bus to one or more other bus bars in the office.

Note: The portion of this conductor that is routed horizontally between the office’s primary ground bus and the first connection to another bus bars in the office is also called the vertical riser.

2. GROUNDING SYSTEM CONDUCTORS AND CONNECTIONS

2.1. General Requirements

2.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with SBC LEC installation specifications.

2.1.2 All equipment shall be bonded to the appropriate grounding network before any other conductors are connected.

2.1.3 The Ground Window shall be within 1 floor of the isolated ground plane frames it serves.

2.1.4 All CBN grounding conductors shall be connected to the integrated side of the MGB. All IBN grounding conductors shall be connected to the isolated side of the MGB.

2.1.5 Except for hatch plate bonding conductors, vertical risers and horizontal equalizers described in this section, the direction of a grounding conductor's bend (e.g. towards a specific bus bar, etc.) is not restricted. The direction of the bend should be made for ease of installation and to maintain an acceptable bending radius.

2.1.6 Grounding conductors larger than #1/0 AWG shall be spliced or joined with compression-type H-tap

2.1.7 Compression-type butt splice (i.e., 180 degree) connectors shall not be used

2.1.8 The free ends of insulated conductors shall be covered with heat shrink end caps.

2.1.9 H-tap compression connectors on grounding conductors shall be protected using fire-retardant hard-shell or soft-shell covers.

2.2. Horizontal and Vertical Equalizers

2.2.1 All vertical and horizontal equalizer conductors shall be routed so that U shaped configurations are avoided.

2.2.2 Where U shaped turns are unavoidable, they shall be made with the greatest possible radius.

2.2.3 Vertical and horizontal equalizers shall be run exposed so as to afford visual inspection of the entire system and to provide access for adding connectors.

2.2.4 Cable supports and sleeves provided for routing of horizontal and vertical equalizer conductors shall not be used for routing of any type of cable or conductor other than
grounding conductors. Note: Horizontal equalizer conductors may be placed on the same cable brackets used to support other cables if secured to the opposite surface of the brackets.

2.2.5 Horizontal runs should be supported along the exterior of cable rack stringers or from framing bars by means of clips or similar devices that do not form a closed metallic ring around the conductor. Short runs through walls should be supported within 2” PVC plastic or other approved non-metallic conduit.

2.2.6 Vertical risers shall be run through floors in core-drilled holes or in 2” PVC plastic or other non-metallic conduit. If a cable hole is adjacent to the column supporting the vertical riser, the cable hole may be used in place of non-metallic conduit as long as a separation is maintained between the vertical riser and other conductors routed through the cable hole.

2.2.7 Vertical risers shall be secured to columns and walls using supports located approximately 2 feet from the floor, the ceiling, each side of any intervening bus bar, and at an interval of 2 feet (or less) between these points.

2.2.8 The vertical conductor may be supported by cable brackets or similar details fastened to Unistrut or other material that is anchored to a wall or column. An auxiliary support shall be provided on every other floor consisting of either wedge plugs in the top of sleeves or cable support grips suspended from J-bolts secured by anchors in the ceiling.

2.2.9 All cable connections to the vertical riser and horizontal equalizer shall be made with bends towards the COG/OPGP.

3. AC EQUIPMENT GROUNDING

3.1. Feeder and Branch Circuit Equipment Grounding System

3.1.1 An alternating current equipment grounding (ACEG) conductor shall be connected to an enclosure by one of the means listed in a) through g) below:

a) a ground bus bar
b) a terminal strip
c) a grounding bushing
d) a grounding clip
e) a screw fastener
f) the enclosure is surface mounted and direct metal-to-metal contact exists between it and the receptacle’s mounting yoke
g) the receptacle is cover-mounted and the enclosure and cover combination are listed as providing satisfactory ground continuity between the enclosure and the receptacle

Note 1: Grounding clips are normally used only at junction boxes and receptacle enclosures.

Note 2: A screw fastener (machine screw, nut, bolt, stud, etc.) must be used for no other purpose than to terminate ACEG conductors.
3.2. Extending ACEG Conductors

3.2.1 Since AC distribution systems are of different ages, it is likely that a system not originally equipped with a separate ACEG conductor will be encountered. It is often not feasible to place an ACEG conductor in the existing upstream feeder conduit or raceway. However, the conduit or raceway may be able to serve as the ACEG conductor. The point from which an ACEG conductor is extended will usually be an enclosure such as a:
   a) Distribution panel
   b) Pull box
   c) Junction box
   d) Receptacle box
   e) Lighting fixture.

3.2.2 Before any ac distribution system is extended or rearranged from a point in a distribution system not equipped with a separate ACEG conductor, the integrity of the ACEG system upstream from the enclosure shall be verified. This is done by determining whether an acceptable type of conduit or raceway has been used and by verifying the tightness of the fitting(s) used to fasten the conduit or raceway to the enclosure.

3.2.3 For existing distribution systems not equipped with a separate ACEG conductor, only the following types of conduit or raceway shall serve as an ACEG conductor:
   a) Electrical metallic tubing (EMT)
   b) Intermediate metal conduit (IMC)
   c) Rigid metal conduit
   d) Metal raceways listed for grounding.
   
   Note: If none of the above is present in the upstream feed to the enclosure, no circuit shall be extended from the enclosure until corrective action has been performed.

3.2.4 The ACEG conductors being added shall be terminated to the enclosure by one of the means described above.

3.2.5 If more than two ACEG conductors are being added (typically at a distribution panel), it is preferable to add a ground bus to the panel. This bus may be bonded to the panel using its mounting screws provided the paint is removed from the mounting surface of the panel and NO-OX-ID “A” anti-corrosive compound is applied to the bare metal.
4. COMMUNICATION SYSTEMS & MISCELLANEOUS EQUIPMENT

4.1. Frames, Bays, Cabinets and Units

4.1.1 All frames, bays, cabinets and units shall be properly grounded.

4.1.2 When a unit in a frame, cabinet or other enclosure requires a separate grounding conductor from the unit, the conductor shall be connected to one or more of the following:

a) A crimp type parallel tap to a grounding conductor of equivalent or larger size within the enclosure

b) The same point of connection on the enclosure metalwork as the framework grounding conductor if of equivalent or larger size

c) A grounding terminal (wire-wrap, solder, etc.) within the frame or cabinet

d) A crimp type parallel tap to a grounding conductor of equivalent or larger size outside the enclosure.

4.1.3 The 1” galvanized pipe often used as a means of support between the framework and the auxiliary framing may be used as the lineup grounding conductor for the extension of existing applications only. This method is not allowed for new lineups.

4.1.4 The external chassis ground, if provided on a unit, shall be utilized to ground the unit, except where SBC standard drawing indicates that the chassis ground connection is not required. If the SBC standard drawing indicates that a chassis ground is not required, a copy of the drawing shall be left in the yellow wallet.

4.1.5 Frame extensions shall be bonded to the existing frame via the threaded nut and bolt assemblies connecting the two sections. When frame extensions are provisioned with a #6AWG bond, this bond shall also be used.

4.2. Conduits, Raceways, and Other Bonds to the MGB/GWB

4.2.1 Metallic conduits and raceways containing ac circuits serving isolated bonding network equipment shall be routed through the ground window and bonded to the CBN side of the MGB/GWB. The ACEG conductor in the conduit shall also be bonded to the CBN side of the MGB/GWB.

4.2.2 The bond to the MGB/GWB shall be made using a minimum #6 AWG conductor no more than three feet in length. Figure H-3 shows one possible method to bond the conduit and ACEG conductors to the MGB/GWB. A mechanical connector may be used to create a collection point to provide a means to bond ACEG conductors, conduit, raceway and junction box (if used) and the #6 AWG bond to the MGB/GWB.

4.2.3 After passing through the ground window into the isolated bonding network, conduit may contact isolated bonding network metalwork, but it shall remain insulated from contact with members of the common bonding network.

4.2.4 All metallic conduits and raceways containing AC circuit conductors shall be intentionally bonded together to form an electrically continuous enclosure. Insulating bushings,
non-conductive unions, or any similar material or methods shall not be used in metallic conduits or raceways to interrupt their continuity.

4.2.5 Every conductor with continuity to both the common bonding network and the isolated bonding network, such as the shield of a coaxial cable, shall pass through the ground window and be bonded to the MGB/GWB with a conductor no longer than 3 feet.

4.3. Isolated Bonding Network Tests

4.3.1 Each frame or group of frames in the isolated bonding network shall have isolation tests performed in accordance with manufacturer’s instructions.

4.4. Insulation for Isolated Bonding Network Equipment

4.4.1 Insulating material shall be installed between a metallic object that is part of the isolated bonding network and material securing or fastening it to a metallic object that is part of the common bonding network.

4.4.2 Any metal detail extended above isolated bonding network equipment to support an object that is part of the common bonding network shall use insulation material to maintain separation between the two bonding networks.

4.4.3 Conduits that are part of an isolated bonding network shall be insulated from contact with common bonding network objects using two wraps of sheet fiber or bus bar insulators placed at all contact points.

4.5. Foreign Object Bonds

4.5.1 Common Bonding Network conductive apparatus located within 7 feet of the Isolated Bonding Network shall be bonded to the MGB/GWB with a No. 6 AWG conductor. Other large conductive objects (not associated with any network) that personnel may contact during their normal work activities while still in contact with an IBN device shall be bonded to the MGB/GWB. The CBN conductive apparatus and objects that shall be bonded include:

a) **Equipment Frames** – One No. 6 AWG is C-tapped or H-tapped to the lineup ground cable over each lineup of frames that are within 7 feet.

b) **Metallic stands, cabinets and desks** - Freestanding items placed in fixed locations such as metallic stands, desks and cabinets shall require bonding. Cabinets that are anchored to the walls or floor must be bonded as well as all metallic spare circuit pack cabinets.

c) **Ironwork** - Auxiliary framing, cable rack, threaded rods, stanchions, cable hole hardware, and other metallic supports and details shall be considered one unit; therefore, only one bond to the ironwork is required. This bond should be in a central location over the switch. In the event that different levels of auxiliary framing or cable rack are not interconnected by threaded rod or other metallic details over the isolated ground plane area, each level will be considered a separate unit and will require individual ironwork bonds.

d) **Lighting fixtures** - Lighting fixtures and the associated conduit are considered one unit and, therefore, only one bond to a lighting fixture is required.
e) **Air ducts** - When air ducts are separated by nonmetallic fittings, each section of duct must be bonded; otherwise, the entire duct system will be considered one unit and only one bond is required.

f) **Metallic raceway or conduit** - This includes conduit providing AC to building equipment and/or IBN equipment areas, and conduit used to run alarm wiring. Each conduit run must be bonded only once. Two-hole grounding lugs must be used by installing the Burndy-type GAR-TC Ground Connector, or installing two conduit clamps (refer to Figure K4). If several conduit runs are mechanically connected together, such as at the power distribution cabinet, a conduit box, or via conduit clamps secured to a unistrut support, only the cabinet, box or support requires the bonding connection, not the individual conduit runs.

g) **Building fixtures** - Large volume conductive objects such as air-conditioning units, AC power distribution cabinets, water coolers, water pipes, radiators, door frames and window frames shall be bonded. Doors and doorframes are considered one unit and do not require individual bonds. Pipes shall be grounded per figure K-4. Small Items that are not normally touched by personnel or that are generally considered portable do not require bonding. This includes fire extinguishers and holders, light switch and outlet receptacle cover plates, wastepaper baskets, desk lamps, venetian blinds, signs, dropped ceiling supports, etc.

4.5.2 Based on the specific building configuration and the number of foreign objects that require bonding, one or a combination of the following methods shall be used to accomplish the bonding of foreign objects. For all applications, "daisy chain" connections shall **not** be used:

a) **Collection Bus Bar** - When there are a number of foreign objects to be bonded, a collection bus bar can be used to gather the # 6AWG conductors from the foreign objects. A # 6AWG conductor shall also be used to connect the collection bar to the ground window. This method helps to minimize the number of terminations on the MGB/GWB. See figure H-1.

b) **Collection Conductor** - This method is similar to the collection bus bar above except a # 6AWG collection conductor will be used to gather the # 6AWG conductors from multiple foreign objects. Each conductor from the foreign objects shall be connected to the collection conductor using compression C-tap or H-tap connectors. The collection conductor can then be terminated on a collection bus bar or directly on the MGB/GWB. See figure H-2.

c) **Direct Connection** - When there are a limited number of foreign objects to be bonded, a direct connection can be made between the foreign object and the MGB/GWB using a # 6AWG conductor.

d) **Indirect Connection** - Similar results to a Direct Connection can be achieved by using any existing CBN metallic path that provides continuity from the foreign object to the MGB/GWB. Using figure H-4 as an example, the CBN ironwork above the IBN equipment is an extension of the ironwork above the CBN equipment. Bonding of the air duct is accomplished by a short connection to the ironwork within the IBN footprint. This ironwork in turn is connected to the CBN framework ground via the framework top
support details. The framework ground is then extended to the COG and on to the CBN side of the MGB/GWB.

5. RADIO SITES AND EQUIPMENT

5.1. Interior Ring Ground System

5.1.1 The peripheral conductor (also referred to as the "interior ring" or "halo ground") need not be installed as a single continuous conductor. Unnecessary splices should be avoided, but when installation is simplified by installing the peripheral conductor in segments, and segments are joined by an exothermic weld (preferred) or crimp type parallel connector, such segmentation is permitted.

5.1.2 Routing of the peripheral conductor through metallic objects that form a ring around the conductor, such as metallic conduits or sleeves through walls or floors, shall be avoided whenever possible. Non-metallic material such as PVC conduit is preferred for floor or wall penetrations. If non-metallic conduit is prohibited by local code, the peripheral conductor shall be bonded to each end of the metallic conduit.

5.1.3 To minimize impedance and incident of arcing, the peripheral conductor shall be installed with a minimum number of bends. Bends shall be made with the greatest practical radius, with a preferred radius of no less than 1 foot. When this is impractical, the minimum radius shall not be less than 6 inches. Use of 90-degree bends to avoid obstructions shall be avoided when lesser bends (e.g., 45 degrees) can be adequately supported.

5.1.4 The peripheral conductor shall be run exposed to allow inspection of the system and to connection of branch conductors. PVC conduit should not be used for support.

5.1.5 The peripheral conductor shall be located at a height from the floor that allows for convenient bonding of supplementary conductors. For 9'-0" frames, the recommended height is 9'-8".

5.1.6 Supports shall be provided at an interval of between 12 and 18 inches. Extra supports may be provided where the peripheral conductor may be distorted, such as at bonding points. When the peripheral conductor is not located on a wall, it should be supported from cable racks or auxiliary framing channels.

5.1.7 Supplementary conductors may be supported from cable rack stringers or framing channels using 9-ply waxed polyester twine, cable ties, clamps or clips. If clamp or clip supports are used, a type that does not require drilling of channels and stringers is preferred. All supports shall be placed at an interval of 12 to 18 inches. Removal of paint from the channel or stringer is not required when clamps or clips are used. Scratches in the finish shall not be painted, and clamps or clips shall not be painted. A job-fashioned detail may be used to route the conductor around obstructions at cable rack junctions or other points interfering with the conductor.

5.1.8 To minimize impedance, special attention must be paid to the direction of turns at all junctions of supplementary and peripheral conductors. At the junction nearest a hatchplate, the supplementary conductor shall turn in the direction of the hatchplate. The other end of the conductor shall turn in the opposite direction, toward a bond between the exterior ring ground and the peripheral conductor more remote from the hatchplate than the connection of the supplementary conductor.
5.1.9 When there is no significant difference in the length of the bond paths to a hatchplate from either end of a supplementary conductor, both ends shall turn in the direction of the hatchplate. When the building is equipped with more than one equipped hatchplate, the end of the supplementary conductor shall turn in the direction of the nearest hatchplate.

5.1.10 If one or more hatchplates are not equipped with waveguides, the supplementary conductor shall turn in the direction of the nearest equipped hatchplate. When coax or waveguide is added to the unequipped hatchplate, a second bond shall be made at the turn, in the opposite direction, to create a bi-directional turn. Note: Where doubt exists as to the correct direction for a turn, a bi-directional arrangement may be used. Universal application of bi-directional bonds is not recommended.

5.2. Unit Bonds

5.2.1 Grounding conductors routed along interior walls and units located next to such walls may be in proximity to other conductors or units mounted on the other side of the wall. When the peripheral or supplementary conductors that run on either side of a wall are bonded together at both ends, intermediate bonds may be omitted. Bonds to conductors on both sides of a wall shall be made to objects such as conduits or pipes that penetrate the wall.

5.2.2 Bends shall be made with the greatest practical radius. The bend radius should not be less than 1 foot.

5.2.3 Where unit bond conductors join peripheral or supplementary conductors, they should turn in the direction of the nearest hatchplate. A single conductor connecting two units to a peripheral or supplementary conductor may be used without regard to the direction of turns.
TABLE H-1 – SUMMARY OF CHANGES IN SECTION H

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FIGURE H-1 - Using a Collection Bus Bar to Bond Foreign Objects

MGB

C or H tap

Collection Bus Bar

Collection Bus Bar

#6 AWG from Collection Bar to MGB

#6 AWG to Foreign Objects
FIGURE H-2 - Using a Collection Conductor to Bond Foreign Objects

MGB

#6AWG from Collection Conductor to MGB

C or H tap connectors

#6AWG Collection Conductors

#6AWG to Foreign Objects
FIGURE H-3 - BONDING OF CONDUIT AND ACEG CONDUCTORS TO MGB/GWB

From AC distribution panel in the Common Bonding Network

#6 AWG

To loads in the Isolated Bonding Network

ACEG conductors

#6 AWG to MGB/GWB

Phase & Neutral Conductors
FIGURE H-4 - FOREIGN OBJECT BONDS TO NEARBY METALLIC OBJECTS

- Insulated from the floor
- Insulated from ironwork

Framing channels, cable racks, earthquake bracing, conduit, other metal objects

Air conditioning duct

#6 AWG bond

<7'

COMMON BONDING
NETWORK EQUIPMENT
- Mechanical bonds to ironwork, other objects

CO GRD bar/FGB

MGB/GWB in Ground Window

To CO GRD system

ISOLATED BONDING
NETWORK EQUIPMENT
- Insulated from the floor
- Insulated from ironwork
[END OF SECTION]
## 1. GENERAL

### 1.1. Introduction

1.1.1 This section covers the general requirements for the location, assembly and erection of cable and relay racks.

1.1.2 Changes in this issue of Section I are summarized in Table I-1.

1.1.3 This section delineates workmanship requirements. The following Bell Service Practices provide additional assembly details:

<table>
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<td>BSP 800-000-100MP</td>
<td>Hardware Products and Materials Specifications</td>
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<td>Cable and Wire Installation and Removal Requirements - Cable Racks and Raceways</td>
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<td>Floor Stanchion Supported Cable Rack System Requirements</td>
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<td>BSP 800-068-150MP</td>
<td>Equipment Framework Support Requirements</td>
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<tr>
<td>BSP 800-068-180MP</td>
<td>Storage Unit Bracing Requirements</td>
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## 2. REQUIREMENTS

### 2.1. General

2.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.
2.1.2 All ironwork installation described in this section shall conform to the SBC LEC seismic requirements. Except when noted otherwise, the requirements stated herein apply to all seismic risk zones.

2.1.3 Cut ends of auxiliary framing, cable racks, bolts, etc., shall have sharp or jagged edges removed.

2.1.4 Cut ends and damaged painted surfaces shall be repainted.

2.2. **Auxiliary Framing**

2.2.1 Auxiliary framing shall be uniform in length, at the correct height, properly located and level.

2.2.2 Clip type or through bolt splices can be utilized only in low seismic areas. If clip type splices are utilized they shall be:
   a) staggered at alternate runs, horizontally and vertically
   b) Limited to one splice between supports.

2.2.3 Where the ends of low level auxiliary framing extends beyond a support, the ends shall be equipped with a rubber finishing cap.

2.2.4 When short sections of auxiliary framing are used below the regular framing, rubber finishing caps shall be installed on the exposed ends.

2.2.5 Superstructure bracing shall be installed within the 30/60 degree slope maximum.

2.2.6 There shall be a minimum 5 inch clearance between the ends of auxiliary framing and any building surface or apparatus (e.g., HVAC ducting). Any building surface or apparatus shall be installed with a minimum 5-inch clearance to the auxiliary framing.

2.2.7 Auxiliary framing shall be supported at approximately 5 feet intervals, not to exceed 6 feet and shall not extend more than 30 inches beyond the last support. The support shall be:
   a) From the ceiling using 5/8 inch threaded rods or
   b) From the floor using 2 inch pipe stanchions or
   c) Wall supports using batten boards or
   d) Other approved methods.

2.2.8 Pipe stanchion floor flange shall be fastened to the floor with a minimum of two 1/4-20 flat head machine screws and associated floor anchors.

2.2.9 Auxiliary framing heights shall be measured from the floor to the bottom of the paired channels.

2.2.10 Auxiliary framing should be installed in 20-foot sections unless otherwise specified.

2.2.11 When through bolt splicing is utilized for auxiliary framing channels, six foot and longer in length, shall be drilled or punched with splicing holes at both ends before the auxiliary framing is installed into overhead environments.
2.2.12 Holes in auxiliary framing for splice purposes may be enlarged or elongated if, after drilling or punching, the holes do not line up with the splice. When the holes have been enlarged or elongated, flat washers shall be installed on splice bolts. The separation between the ends of spliced auxiliary framing shall not exceed 1/4 inch. Splices are not considered framing supports.

2.2.13 Unsupported ends of auxiliary framing, supporting cable rack, ladder track, conduit, etc., shall not extend past the last point of support more than 2 feet 6 inches.

2.2.14 When a square tube floor stanchion system is used, it shall be installed in accordance with instructions given in BSP 800-006-152MP.

2.3. **High Seismic Risk Zone Requirements**

2.3.1 Splices shall be the positive (through bolt) type.

2.3.2 The end of the auxiliary framing should extend at least 3 inches beyond the last point of support. If the distance from the end of the auxiliary framing to the last point of support (e.g. hanger rod, brace or cable rack attachment, etc.,) is less than 3 inches, a 3/8"-16 or larger bolt shall be installed through the ends of the auxiliary framing.

2.3.3 Stiffening clips shall be installed on no more than 2-foot centers between auxiliary framing supports. Stiffening clips may be omitted at locations where an earthquake brace, cable rack, or other clipped fastening, of 1/2 inch or larger, has been located.

2.3.4 Cable racks supported directly by auxiliary framing shall be attached with two J-bolts at each support.

2.3.5 Auxiliary framing supported conduit shall not be extended to wall-mounted switches, lights, outlets, etc. Approved flexible conduit or cable shall be utilized for this application.

2.4. **Cable Racks**

2.4.1 Where cable racks are directly attached to auxiliary framing, both stringers shall be bolted to the framing at each end of a run. At intermediate points, only one J-bolt is required at each auxiliary framing intersection. The J-bolts are to be staggered so that adjacent fastenings along the rack can be made on opposite sides of the rack. When short pairs of auxiliary framing are used to support cable rack extending beyond regular framing, or are used for the support of a frame, two J-bolts shall be used.

2.4.2 Space between ends of cable rack stringer shall not exceed 5/8 inch at splices.

2.4.3 Only one cable rack splice is permitted between any pair of supports and spliced sections are not permitted to extend beyond the last support.

2.4.4 Cable rack shall be supported at approximately 5 feet intervals, not to exceed 6 feet and shall not extend more than 30 inches beyond the last support.

2.4.5 There shall be a minimum 5-inch clearance between the ends of the cable rack and any building obstruction.
2.4.6 Formed fiber tubing shall be placed on all hanger rods directly supporting cable rack. 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.

2.4.7 Metallic cable rack pan shall be installed using the following guidelines:
   a) All junctions shall be overlapped a minimum of 3 inches. The bottom section of “pan” shall not extend more than three inches past the common cross member.
   b) Pan shall not extend past the end of the cable rack stringer or closing detail.
   c) Cable retaining horns on “panned” cable rack shall be installed on both sides of the cable rack on 18-inch centers, except at cable rack intersections.
   d) An overlapping arrangement of pans should be utilized to avoid cutting of pans.

2.4.8 Cable rack shall not be extended through a floor.

2.4.9 Distance between cable rack straps shall not exceed 9 inches. Additional support shall be provided as necessary to keep the cable from sagging.

2.4.10 The ends of cable rack sections shall be protected with rubber finishing caps

2.4.11 Cable racks shall not be supported by their cross straps.

2.4.12 Vertical racks on walls or columns shall be supported at the floor and shall have intermediate support with a maximum spacing not to exceed 5 feet.

2.4.13 Cable racks placed on floors shall be fastened with Z-clips on the inside of the rack stringers, at intervals not to exceed 5 feet.

2.4.14 For horizontal cable runs, the cable rack shall be placed with the cross-straps upward. A cable rack with solid bar-type stringers, smaller than 25 inches in width, may be inverted to gain necessary cabling heights due to fixed obstructions. Cable rack with reinforced straps shall not be inverted.

2.4.15 The flat bar of a cable rack turn assembly shall be secured by simple stitching to the cable rack as shown in Section J of TP 76300MP.

2.5 Conduits

2.5.1 Conduit shall be supported with material designed for the support of conduit, such as U-bolts, conduit clamps, conduit straps, etc. Hose clamps, cord, tie wraps and other similar material shall not be used to support conduit.

2.5.2 Rigid conduit and Electrical Metallic Tubing (EMT) shall be secured on a wall or ceiling every 10 feet and shall be supported within 3 feet of each outlet box, junction box, or cabinet. An outlet junction box that or cabinet is secured is considered a support. The use of EMT is permitted in applications where the EMT will not be subject to physical damage.

2.5.3 Liquidtight flexible metal conduit shall be secured and fastened to a support within 12 inches on each side of each outlet box, junction box, cabinet or fitting. No support is required when liquidtight flexible metal conduit is installed inside the base angle of frameworks. Three feet of unsupported liquidtight flexible metal conduit from a fitting is acceptable when flexibility of
the equipment is necessary or when the liquidtight flexible metal conduit serves lighting fixtures. Cord/tie wrap may be used to hold liquidtight metal conduit in place within a frame (not for support).

2.5.4 JMC flexible metal conduit shall not be used as a main fixed raceway for power conductors, except where flexibility of the raceway is required.

2.5.5 Conduit serving a junction box that does not contain a device and does not support fixtures shall be supported within 36 inches of the box, on two or more sides. If a junction box contains a device, all conduit shall be supported within 18 inches of the box.

2.5.6 Conduits secured to other than a wall or ceiling shall be securely fastened at intervals of approximately 5 feet, not to exceed 6 feet maximum. Conduit shall not extend more than 30 inches beyond the last support.

2.5.7 Unused knockouts in boxes and cabinets and all unterminated conduit ends shall be closed.

2.5.8 Conduit shall be placed so as not to block future cabling, ladders and equipment.

2.5.9 Proper clearance from pipes, duct work or heat generating equipment will be maintained to eliminate possible damage to cable.

2.5.10 Conduit shall be supported with material designed for support of conduit, such as conduit clamps, conduit straps, etc. Nylon cable ties, lacing cord or similar material shall not be used.

2.5.11 In high seismic areas, auxiliary framing supported conduit shall not be extended to wall mounted switches, lights, outlets, etc. JMC shall be utilized for this application.

2.5.12 Insulated couplings shall not be installed in AC conduit or raceways.

2.5.13 Conduit fittings shall be wrench tight.

2.5.14 All fluorescent type lighting fixtures over equipment areas shall be rigidly attached and shall not be supported with chains.

2.6. **Frames, Bays and Cabinets**

2.6.1 All frames taller than 7'-0" shall be top supported by attachment to the office superstructure. Top supports shall be provided along equipment lineups at each location where a primary run of office superstructure crosses the equipment lineup. A minimum of two top supports is required for each group of frames that do not span two runs of primary office superstructure. A frame group, or group of frames is defined as any number of individual frames that are rigidly bolted or otherwise junctioned together to form a structurally continuous unit of frames.

2.6.2 Frames 9'-0" and taller use a one-inch galvanized pipe to supplement adjacent frame junctioning requirements and for alignment and grounding purposes. One-inch pipes shall be clamped to the underside of each frame's top angle at two locations. The V bolts should be located to the left and right of frame center approximately 13 inches apart. Any attachments to overhead framing shall be in addition to the pipe supports. One-inch galvanized pipes will be furnished in 20-foot lengths whenever possible. Extra length not used for current fastening of frames shall be left for future frames. A minimum of 15 inches of pipe shall
always extend beyond the last frame installed for future growth unless that last frame is at the end of the lineup. The unused length of pipe shall be fastened to the auxiliary framing with frame support hardware above future frames. Where the pipe extends beyond the end of an existing or planned group of frames, it shall be fastened to the auxiliary framing with U bolts. A rubber cap shall be placed over the exposed ends of frame junction pipes. The junction of the pipes shall be bonded in accordance with Section H of TP 76300MP.

2.6.3 When the 1 inch galvanized junction pipe extends beyond the end of the frame, the end of the pipe shall be capped with a rubber finishing cap.

2.6.4 A frame taller than 7'-0" installed as an individual frame, i.e. not junctioned to any adjacent frames, or installed with spacers on both sides, shall have at least two points of support to the overhead superstructure.

2.6.5 High seismic frames, 7 feet tall shall be secured with 4 floor anchors.

2.6.6 7 Foot, Low seismic frames or frames installed that can not meet the high seismic framing requirements in BSP 800-000-101MP shall be secured with a minimum of 2 floor anchors in conjunction with top support. When this securing method is utilized all frames installed as individual frame i.e. not junctioned to another frame, or installed with spacers shall have at least 2 top supports to the overhead superstructure.

2.6.7 Unequal flange and network bay equipment frames taller than 7'-0" are secured by bracing to overhead auxiliary framing and floor anchored. Two floor anchors shall be placed as close as possible along centerline of uprights.

2.6.8 The uprights of adjacent frames and cabinets shall be joined together per manufacturer’s specifications and at the top and bottom to form a continuous lineup.

2.6.9 All frames, bays and cabinets to be installed shall be measured from reference points as identified on the floor plan.

2.6.10 Frames and cabinets shall be plumb and aligned to adjacent frames and cabinets to within 1/4 inch.

2.6.11 Frames and cabinets shall be level within 1/16 inch per foot. If shims are required, there shall be no more than a 1-inch shim stack.

2.6.12 If more than 50 holes in the floor are to be drilled for the job, the Installation Supplier shall scan for embedded metallic obstructions before drilling.

2.6.13 If an embedded obstruction (e.g., reinforcing bar) is encountered during floor drilling, drill another hole at an alternate location. If relocating the hole is not possible, contact the SBC LEC equipment engineer.

2.6.14 Frames, bays, cabinets, etc. shall be bolted to the floor using SBC LEC approved floor anchors.

2.6.15 End guards and guardrail closings shall be installed on all frame uprights at each end of the lineup.

2.6.16 End guards shall be secured in the front and rear.
2.6.17 End panels shall be placed on exposed frame uprights not located adjacent to another frame except at the end of the lineup.

2.6.18 Hinged doors or covers of cabinets shall not bind with adjacent covers or doors to such an extent that any cover or door cannot be readily opened without causing the adjacent cover or door to move. In addition, hinged doors shall not come in contact with any working equipment.

2.6.19 When equipment frames or cabinets are associated with hot slides, they shall be bolted to the floor in the temporary location.

2.6.20 All units mounted in frames, cabinets, or bays shall have a minimum of four screws used to secure the unit to the frame/cabinet/bay upright. Exception: Single mounting plate units may be mounted with two screws.

2.6.21 Battery stands, DC power distribution bays, rectifiers, and other network power equipment bays shall be secured with Hilti 16mm HSL anchors for high seismic risk locations or four (4) Hilti HDI ½ anchors for low seismic risk locations, or in accordance to quantities specified by the equipment manufacturer.

2.6.22 BDFBs shall be anchored with a minimum of 4 Hilti 12mm HSL size anchor.

### 2.7. Rolling Ladders And Tracks

2.7.1 Hanger rods or bolts used for direct support of ladder track shall be provided with cotter pins or self-locking nuts. Otherwise, the ends of conventional bolts shall be staked.

2.7.2 Ladder track shall be supported at approximately 5 feet intervals and not to exceed 6 feet.

2.7.3 Ladder track shall not exceed a maximum of 4 feet beyond the last track support.

2.7.4 The ladder stop bolt shall be installed a maximum of 3 feet beyond the last track support.

2.7.5 Ladder track supports, splices and handrails shall be free of burrs and sharp edges.

2.7.6 Handrails shall be located or relocated as follows:

a) When ladder serves distributing frame and other frames - locate to the side away from the frame.

b) When ladder serves frames on right side only - relocate to the left side.

c) When ladder serves frames on both sides - leave on the right side.

2.7.7 Rolling ladder shall have correct slant/direction with respect to the equipment lineup. Ladders will typically slant in a direction such that the foot is nearest the main cross aisle.

2.7.8 When a short section of track is required, the section shall be placed at some intermediate location in the track instead of at the end.

2.7.9 The track shall be assembled and aligned to ensure the proper operation of the ladder trolley and brake.

2.7.10 Sections of track shall be spliced as shown in Figure I-1. Figures I-2 through I-5 show additional ladder track details.
2.7.11 Ladder track shall be installed as level as possible.

2.7.12 Ladder stop bolt and bushings shall be installed on all ladder track ends and shall be equipped with a cotter pin or lock nut.

2.7.13 Ladder stop bolts shall be placed or relocated to ensure accessibility of equipment from rolling ladder.

2.7.14 Ladder stop bolts shall be placed or relocated so as to prevent the ladder from hitting anything (e.g., walls, water coolers, alarm panels, etc.).

2.7.15 Non-creep bolts shall be installed, burred and staked on all ladder track ends. If the track is extended, install a new bolt.

2.7.16 Ladder track splice screws shall be equipped with washer, burred and staked or secured with self-locking nut.

2.7.17 Fenders and wheel guards shall be provided on all ladders where they come into contact with the guardrail.

2.7.18 Brake shall be adjusted so that it operates properly.

2.7.19 Brake ropes shall be trimmed and clamped to remove risk of personal injury.

2.7.20 Ladders shall run free and clear of equipment.

2.7.21 Ladder tracks ends shall be equipped with rubber plugs.

2.7.22 A minimum clearance of 15 inches shall be maintained between the end of ladder track and walls, columns, etc., on the end toward which the ladder(s) slope, to facilitate installation and removal of the ladder trolley.

2.7.23 The gap between spliced ends of ladder track shall not exceed 1/8 inch.

2.7.24 Ladder track splicing sleeves shall be assembled with lockwashers and locknuts.

2.8. **Threaded Rods, Bolts, Nuts, Screws And Cotter Pins**

2.8.1 Bolts, nuts and screws used to secure parts or units shall be wrench tight.

2.8.2 The appropriate size bolt or rod shall be utilized.

2.8.3 The Installation Supplier shall cut the end of a bolt or rod that extends into the equipment or wiring area, or presents a personnel hazard.

2.8.4 The exposed end of the bolt or rod shall not exceed the diameter of the bolt or rod, except where personnel safety or equipment protection will not be compromised.

2.8.5 Bolts, screws or rods shall not be more than one thread under flush.

2.8.6 Both ends of bolts, screws or threaded rods shall be free of sharp edges and burrs.

2.8.7 The tips of all cotter pins shall be bent back until resting against the rod or bolt to prevent injury.

2.8.8 Self-locking nuts that have been loosened or removed shall not be reused.
2.8.9 Split nuts shall not be used.

2.9. **Unistrut Incorporated Within Auxiliary Framing**

2.9.1 Unistrut shall be at correct height, properly located and free of loose details.

2.9.2 Where unistrut extends more than three inches beyond a clip or support, the unistrut shall be equipped with a finishing detail.

2.9.3 When additional unistrut is placed below the regular framing, the ends shall be equipped with finishing details.

2.9.4 There shall be a minimum 5-inch clearance between the ends of the unistrut and any building obstruction.

2.9.5 Unistrut sections shall have at least 2 supports unless otherwise specified. The supports shall be at intervals not to exceed 6 feet and shall not extend more than 30 inches beyond the last support.

2.10. **Ceiling Hanger Rods**

2.10.1 Hanger rods shall be inserted into ceiling inserts a minimum of seven full turns.

2.10.2 If ceiling inserts are rusty or filled with concrete, the inserts shall be cleaned out with a 5/8"-11 tap.

2.10.3 A 5/8"-11 hex nut and a 1-3/4 inch outside diameter washer shall be used at the ceiling on all hanger rods and bolts, regardless of ceiling construction.

2.10.4 When hanger rods are installed through ventilating ducts additional 1-3/4 inch washers and 5/8"-11 hex nuts shall be installed at the bottom of the duct. Add sealing compound to seal any air leakage.

2.10.5 When used with beam clamps, threaded rods shall be screwed into the beam clamp until firmly seated, then backed away approximately one full turn to prevent binding, after which the lock nut at the ceiling shall be tightened.

2.10.6 Under no circumstances shall more than one splice be installed on a hanger rod. In no case shall threaded rod used for the support of mezzanine platforms be spliced.
### TABLE I-1 – SUMMARY OF CHANGES IN SECTION I

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FIGURE I-1--SPLICING SLEEVES FOR LADDER TRACK

.255" x .493" x .062 LOCK WASHER & SELF LOCKING NUT

1 2 2 R 1

1/4" -20 x 3/4" R H M SCR

BUT END OF TRACK TOGETHER WHERE POSSIBLE, BUT IN NO CASE SHALL ENDS OF TRACK BE MORE THAN 1/8" APART
FIGURE I-2--TRACK SUPPORT BRACKETS

VIEW A
CAST BRACKET

VIEW B
WELDED STEEL BRACKET

VIEW C
REINFORCED WELDED STEEL BRACKET

VIEW D
SHEET METAL BRACKET (ANGLE TYPE)

VIEW E
RELOCATION OF CREEPER BOLT WHERE INTERFERENCE FROM END OF THREADED ROD PREVENTS IT BEING INSTALLED IN REGULAR HOLE PROVIDED IN BRACKET (SHEET STEEL BRACKET SHOWN)

LADDER TRACK SUPPORT PER FIGURE 16-10, 13-17, 24, 25
CUT AWAY TO SHOWN BOLT CLEARANCE

5/16 IN. HOLE TO BE DRILLED ON 8 OF HANGER BRACKET AND TRACK BY INSTALLER

1/4-20 X 7/8 RHM SCR
SELF LOCKING NUT AND .493 X .062 LOCKWASHER

5/16 HOLE IN TRACK DRILLED BY INSTALLER
HANGER BRACKET
TRACK

1/4-20 X 3/4 RHM SCR
.255 X .493 X .062 LOCKWASHER

SELF LOCKING NUT
HANGER BRACKET
TRACK

5/16 HOLE IN TRACK DRILLED BY INSTALLER
HANGER BRACKET
TRACK

SELF LOCKING NUT
HANGER BRACKET
TRACK

S/16 HOLE IN TRACK DRILLED BY INSTALLER
SHIM
LADDER TRACK
HANGER BRACKET
FIGURE I-3--LADDER STOP AT SUPPORT BRACKET

SIDE OF SUPPORT SHALL NOT EXTEND BEYOND END OF TRACK

SOFT RUBBER BUSHING 1 1/4 OD

3/32 X 3/4 COTTER PIN

3/8-16 X 2 3/4 HEX BOLT

3/8-16 HEX NUT

SECT A-A
FIGURE I-4--TRACK SUPPORTED WITH SINGLE BAR DIRECTLY FROM CABLE RACK 2 FEET 1 INCH OR LESS WIDE

- 1/8 CLT
- 2" STGR
- 1 1/2" STGR
- 3/8"-16 x 1 1/2" SQ H M BOLT
- 2" x 1/2" BAR
- 1/2"-13 HEX. NUT
- 3/8"-16 HEX. NUT
- 3/32" x 3/4" COTTER PIN
- 5/16" HOLE IN TRACK & BAR DRILLED BY INSTALLER

1/4"-20 x 1 1/2" R H M SCR

LOCKWASHER

SELF LOCKING NUT

13/32" HOLES LOCATED AND DRILLED BY INSTALLER
FIGURE I-5--TRACK SUPPORTED FROM AND AT RIGHT ANGLES TO AUXILIARY FRAMING - SLOPING TRACK - 2 INCH DIFFERENCE IN AUXILIARY FRAMING LEVEL
[END OF SECTION]
SECTION J -- CABLEING

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1. GENERAL

1.1. Introduction

1.1.1 This section provides general and workmanship requirements pertaining to cable installation.

1.1.2 Changes in this issue of Section J are summarized in Table J-1.

1.1.3 Refer to the respective sections of TP 76300MP for additional requirements for power cable (Section M), CO grounding cable (Section H) and fiber optic cable (Section O).

1.2. General Requirements

1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all equipment added, rearranged or modified is properly installed and in conformance with SBC LEC installation specifications.
1.2.2 Standing on or applying excessive stress/pressure to cable on racks or equipment is not acceptable when installing, removing or securing cable and wire. Walking on top of installed cables shall be avoided.

1.2.3 Refer to Section F of TP 76300MP for instructions on fire and smoke stoppage, which shall be applied when cables are installed through any penetration.

1.2.4 Refer to Section O of TP 76300MP for instructions on fiber optic cable.

1.2.5 For cabling and panning purposes, vertical cable rack is defined as any cable racking that is not horizontal.

1.3. Switchboard and General Cable Routing

1.3.1 No deviations shall be made from the job cable routing specifications without the approval of the SBC LEC Equipment Engineer.

1.3.2 Storing excess cable on or in cable racks, compartments or ducts shall be avoided, except for the following reasons:

a) When the excess cable is five feet or less.

b) 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 pile-up is not concentrated at a single location.

c) 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.

d) When cable is equipped with apparatus that cannot be disconnected and reterminated in the field.

e) When storing all cable designated “Future” on the cable rack. Provide adequate length for ultimate termination.

1.3.3 Cables connectorized on both ends by the factory should not be longer than the measured route of the installed cable. Additionally, these cables shall not be longer than 10 percent over the measured length for the route of the installed cable. The maximum additional length shall be 10 feet. The Installation Supplier shall contact the SBC LEC Equipment Engineer for directions when pre-connectorized cables are too long.

1.3.4 For formed or connectorized cable, the Installation Supplier shall install the connectorized or formed end of the cable first; then trim excess cable to the measured length for the route of the installed cable.

1.3.5 For bulk cable, the Installation Supplier shall install the cable and cut off the excess to the proper length.

1.3.6 Excess cable associated with installation of equipment in a temporary location (such as in preparation for a hot slide) shall be stored or removed as directed by the SBC LEC Representative:
1.3.7 Cable slack shall not be stored on or near cable racks over distributing frames or DSX frames.

1.3.8 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.

1.3.9 Switchboard and power cables installed on vertical cable racks shall be limited so that the cable is not closer than 3 inches from the side of the cable hole.

1.3.10 The Installation Supplier shall support cable at cable rack breakoffs such that the maximum length of unsupported cable does not exceed 3 feet, except as follows:
   a) 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.
   b) Vertical cables in floor openings do not require support within the opening.
   c) Cable dropping off cable rack above distributing frames may be unsupported for a maximum length of 4 feet.

1.3.11 Cables shall not run over building obstacles (such as water pipes, conduit, air ducts, etc.).

1.3.12 Cable that has been previously in service shall not be reused unless directed otherwise by the SBC LEC.

1.4. Cable Diversity Requirements

1.4.1 When diversity is required, cable shall be routed as described below, in order of preference.
   a) Two separate and distinct cable routes between the network elements, via existing cable racks. No new racks shall be added just to provide diversity.
   b) A common cable route with cables run on opposite sides of the cable rack. For ladder type cable racks, the cables shall be secured every third strap. When panned cable racks are provided, the cable shall be loosely tied to the inside of the cable rack stringer every six feet.
   c) If the requirements listed above cannot be met, one of the cables shall be run in flex tubing.

1.4.2 Diverse leads run vertically within a bay/cabinet shall be run down opposite sides of the bay/cabinet.

1.4.3 Diverse leads, to the same network element, shall not cross at any point if physically possible.

1.5. Temporary Installations

1.5.1 All temporary cabling and wiring shall be run, in order of preference, on:
   a) Temporary racking
   b) Cable straps

1.5.2 Cabling shall not be suspended by lacing cord or nylon cable ties at any locations.
1.5.3 All temporary fiber optic cables shall be run using temporary raceways (spiral wrap, split harness protective sheathing, etc., will be acceptable for this application). Cables shall not be run over auxiliary bars, ladder tracks, light fixtures, threaded rods, etc.

2. CABLELING REQUIREMENTS

2.1. Common Items

2.1.1 When Multiple Conductor 734C coaxial cable is placed within the upright spacing of the unequal flange equipment bay, the outer jacket sheath of the cable shall be removed as close to the top of the bay as possible in order to minimize the additional cable congestion caused by this sheath. The individual 734C cable members do not require any sheet fiber protection and may be secured, in a bundle, directly with waxed twine.

2.1.2 Cable shall be formed and dressed so as not to allow cables to protrude out past the footprint of the bay.

2.1.3 Installed cables, hanging unterminated in equipment areas, shall be neatly coiled above the floor level and have their exposed ends insulated.

2.1.4 Cable and wire shall be installed neatly within the stringers of the cable rack.

2.1.5 P-wire and switchboard cable should not be installed on power cable rack unless directly associated with power circuits.

2.1.6 The Installation Supplier shall remove all cable tags before job completion, except tags designated “future” or tags left as directed by the SBC LEC Equipment Engineer.

2.1.7 Ribbon cable shall not be installed on cable rack. Panduit type plastic trough (or equivalent) shall be provided for interbay installation.

2.1.8 Cable entering equipment frames shall enter the framework in a manner that will not block access of future cable.

2.1.9 Cables within an equipment unit (i.e.; switch, etc.) shall meet the manufacturer’s requirements and may be non-tinned if so designated by the manufacturer.

2.1.10 Shop cabling requirements within the “foot print of the equipment” shall be as defined by the manufacturer. If these requirements conflict with the requirements given in TP 76300MP, the manufacturer’s requirements shall apply.

2.1.11 Exposed ends of power cables shall be insulated with heat shrink caps.

2.1.12 Exposed ends of grounding cables shall be insulated with electrical tape or heat shrink caps.

2.1.13 When H-taps are installed on grounding they shall be placed between cable rack straps.

2.1.14 Cables shall not be installed on blocked cable racks or runs.

2.2. Cable Protection

2.2.1 When installing cable, the Installation Supplier shall provide adequate protection to prevent damaging new and existing cable.
2.2.2 When cable and wire come in contact with sharp metal edges, the Installation Supplier shall use formed fiber or two layers of sheet fiber to protect against damage at the point of contact.

2.2.3 The Installation Supplier shall protect all cable at break-offs and cable rack stringers with formed fiber or two layers of sheet fiber.

2.2.4 Cable rack straps shall be protected with formed fiber or two layers of sheet fiber for power cable dropping through the cable rack.

2.2.5 When rubber, neoprene and other non-textile jacketed power cable are secured, 2 wraps of insulating fiber protection shall be applied to the cable sheath at each secured or banded location. This requirement does not apply to power wire or cable within a bay.

2.2.6 Fiber protection shall be placed on the cable rack cross straps at outside bends or offsets in cable racks.

2.2.7 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.

2.2.8 Individual 735 type cables (see Table J-4 or J-5) shall be protected where they are to be secured or banded. This protection shall be accomplished by the use of two layers of sheet fiber or one layer of outer sheathing from multiple coaxial cable (i.e., six-pack or twelve-pack). Coaxial cables within a multiple cable package (i.e., six-pack or twelve-pack) and individual 734 type cables do not require this additional protection, since the outer sheathing of the package provides sufficient protection.

2.2.9 Under no circumstances shall the securing stitch or nylon cable ties be pulled so tightly as to deform the protective covering.

2.3. Damaged Cables

2.3.1 Damaged cable sheathing 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.

2.3.2 Seriously damaged sections of cable sheathing shall 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.

2.3.3 Damaged power cable sheathing 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 rubber and electrical tape shall extend a minimum of 2 inches past the damaged section.

2.3.4 A run of cable shall be replaced if the number of damaged or spliced conductors exceeds 5% of total conductors.

2.4. Securing Cable

2.4.1 Cables and wires on horizontal cable racks shall be secured with 9 ply polyester twine at the first and last strap, and at intervals not to exceed 3 feet. See Table J-4.

2.4.2 Chicago or Kansas City stitches shall be used when securing cable with 9 ply polyester twine.
2.4.3 Cable installed on horizontal ladder type cable racks shall be sewn at break-off.

2.4.4 On vertical and inverted horizontal cable racks, cables shall be secured at every strap. See Table J-5.

2.4.5 All cables shall be dressed to avoid congestion and to permit accessibility to equipment.

2.4.6 All cables and wires shall be secured at the first support of frame or bay with 9 ply polyester twine.

2.4.7 All cables shall be secured with 9 ply polyester twine or nylon cable ties at the butt location of the cable. If the butt is not within 1 inch of the cable bracket, it shall be banded to the existing cables in the form.

2.4.8 When the cable butt is located below the lowest cable bracket in an equipment frame or bay, the length between the butt and the last bracket shall be no more than 10 inches.

2.4.9 The cables shall be secured at all cable brackets provided with the manufacturer’s equipment. The cables at these intermediate brackets may be secured with 9 ply polyester twine or nylon cable ties.

2.4.10 If cable is terminated at a point above the top bracket in the bay, the cable can be banded to the other cables at the point of break off, at the top of the bay or an L-type securing bracket.

2.4.11 Cable and wire shall be banded halfway between the cable rack and top support on the frame or bay when distances exceed 3 feet.

2.4.12 On cable rack with horns and pans the cable and wire shall be sewn only at break-off.

2.4.13 P-wire on panned cable racks shall be banded with 2 strands of twine approximately every 6 feet to prevent curling or drooping.

2.4.14 P-wire on panned cable racks shall be banded at points where the wire changes direction.

2.4.15 Cables on ladder type cable racks having retaining brackets used to separate high and low level transmission leads in carrier systems, shall not be sewn, except at turn-off points.

2.4.16 Excess 9-ply polyester twine shall be trimmed to a maximum length of 1/2 inch.
2.5. Distributing Frame

2.5.1 On distributing frames (vertical side) having transverse arms on 13-inch vertical centers, cable shall be secured at all transverse arms.

2.5.2 On distributing frames (vertical side) having transverse arms on less than 13-inch vertical centers, cable shall be secured at the first (top or bottom) transverse arm where cable enters the frame and at alternate arms, counting from the first arm. Also secure the cables which butt or turn-off at the arm before the butt or turn-off.

2.5.3 On distributing frames (vertical side) the cable shall be butted 1/2 inch below the transverse arm and place the cable butt in the fanning ring. If fanning rings are not used, protect the cable butt by placing fiber on the transverse arm and secure the cable butt with cord.

2.5.4 On distributing frames (horizontal side) cable and wire shall be secured at three places on the transverse arm: near the stiffening bar, at the center and near the butt location. On transverse arms 12 inches or less in length, cable shall be secured at two places.

2.5.5 On distributing frames (horizontal side) the cable shall be butted 2 inches from the rear of the terminal strip. Place a fanning ring or a 4 inches piece of fiber on the transverse arm under the cable butt and secure the cable butt with cord.

2.5.6 On distributing frames (horizontal side), fanning rings are not required when connectorized cable is installed.

2.6. Formed Cable

2.6.1 Formed cable shall be secured at a level that affords access to the equipment.

2.6.2 Wiring added to existing formed cable shall be secured at 2-inch intervals.

2.7. Nylon Cable Ties

2.7.1 Nylon cable ties can be used in place of 9 ply waxed polyester twine except as specified below.

2.7.2 Nylon cable ties may be used for temporary securing during the job. Upon completion of installation, nylon cable ties SHALL NOT be used for:

a) Securing cables to distributing frames
b) Banding or securing cable on cable racks
c) Banding together of cable installed in compartmentalized troughs/racks.
d) Banding or securing of coaxial cables
e) Banding or securing fiber optic jumpers
f) Securing cable to the top cable securing bracket on equipment frames
g) Securing battery and battery return cables at any location.

2.7.3 Nylon cable ties shall be of an adequate size, type, strength, etc. for the particular application.
2.7.4 Except where reusable nylon cable ties are provided by the manufacturer, tails of nylon cable ties shall be trimmed to within 1/32 of an inch.

2.7.5 The Installation Supplier shall use a tool specifically designed for tensioning and cutting of nylon cable ties. Side cutters or equivalent shall not be used.

2.7.6 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.

2.7.7 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 cable tie, twist or deform when pressure is applied to the head of the tie, then the tie has been applied too tightly.

2.7.8 Under no circumstances shall nylon cable ties have sharp or jagged cut ends protruding from the locking head. A nylon cable tie is considered to have sharp or jagged ends when it is sharp to the touch.

2.7.9 The locking head of nylon cable ties shall be positioned so as not to interfere with the installation or removal of apparatus or equipment, or the superimposing of additional cable or wire forms.

2.7.10 When cables/wire are added to a bundle secured with nylon cable ties, the existing tie shall be removed and the entire bundle secured with a new tie or 9-ply polyester twine. This requirement does not apply to firestopping banding requirements (see Section F).

2.7.11 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 installed.

2.7.12 Adhesive-backed tie wrap bases that rely only on the adhesive backing to attach to walls, columns, equipment, auxiliary framing, etc., shall not be used to secure cable or wire outside the confines of a frame.

2.8. **Bending Radius**

2.8.1 Cables shall not be sharply bent or twisted during a forming operation.

2.8.2 The minimum inside bending radius of switchboard, shielded and twin conductor cable is 5 times the cable diameter.

2.8.3 The minimum inside bending radius of non-bundled coaxial cable and bundled 734 type coaxial cable is 7 times the cable/bundle diameter.

2.8.4 The minimum inside bending radius of bundled coax (735 type) cable is 10 times the bundle diameter.

2.8.5 The minimum inside bending radius of power wire and cable is 7 times the cable diameter.

2.8.6 The minimum inside bending radius of fiber optic cable is 20 times the cable diameter.

2.8.7 The minimum inside bending radius of fiber optic jumpers/patchcords is 2 inches.
2.8.8 The minimum inside bending radius of Jacketed Metallic Clad (JMC) cable is five times the diameter of the cable measured on the inner side of the bend.

2.8.9 CO grounding system conductors should be installed with a minimum radius of one foot. If the one foot radius objective can not be met, a smaller radius is acceptable based on the following conditions:

a) For the #2 AWG peripheral conductor at a radio site the minimum bend radius shall be 6 inches.

b) For all other conductors, the minimum bend radius shall not be less than 5 times the finished diameter of the cable. Table J-7 provides the minimum bending radius, rounded up to the nearest inch, for the most common grounding conductor sizes based on the approximate diameter for rubber-covered wire (type, RHH, RHW).

2.8.10 Except for radio site hatch plate bonding conductors, vertical risers and horizontal equalizers described in this section, the direction of a grounding conductor's bend (e.g. towards a specific bus bar, etc.) is not restricted. The direction of the bend should be made for ease of installation and to maintain an acceptable bending radius. The Installation Supplier shall install all leads in continuous lengths. Reduction taps to terminate the cable in bays are allowed.

3. **POWER CABLING**

3.1. General

3.1.1 The Installation Supplier shall install all leads in continuous lengths. Reduction taps to terminate the cable in bays are allowed.

3.1.2 Exposed ends of power cables, while being installed, shall be insulated with tape or a tape secured heat shrink cap.

3.1.3 Secondary power feeds shall not be installed on the dedicated primary power cable rack.

3.1.4 The secondary battery and battery return leads are a pair and shall be installed closely coupled.

3.1.5 The secondary battery and battery return leads shall be installed on existing dedicated secondary power cable racks whenever possible.

3.1.6 For special synchronization power requirements, see Section T of TP 76300MP.

3.1.7 Secondary power feeds that are installed on panned cable racking shall be banded every six feet.

3.1.8 When connecting battery return cables to return bus bar in BDFBs, the Installation Supplier shall terminate the cables in such a manner as to allow future access for cable connections to the bus bar.

3.1.9 When connecting to BDFB fuse position studs, the Installation Supplier shall arrange cable in such a manner so as to not block access of future terminations.

3.2. **Sewing And Securing**
3.2.1 Power cable leaving cable racks, supports, and entering frames, racks or other equipment shall be supported at least every 3 feet.

3.2.2 The Installation Supplier shall comply with Table J-2 and Table J-3 for sewing power cable to the cable racks. The requirements apply to uniform size leads.

3.2.3 Power cable shall be secured on unpanned cable rack immediately before and after turns and changes in elevation.

3.2.4 For vertical power cable runs, the Installation Supplier shall install one power cable clamp per floor where three or more floors are involved. No clamps are required when power cable runs are one or two floors.

3.2.5 The Installation Supplier shall insulate the cables from the clamping bar by using an angle type insulator or by wrapping the cables with two (2) wraps of insulating fiber at the clamp.

3.2.6 Power cables terminations shall be supported and/or secured in such a manner as to prevent stress on the connection.

3.3. **DC Cable Routing**

3.3.1 Unfused battery conductors and their accompanying battery return leads, such as those between the batteries and power boards, shall not be run on panned racks.

3.3.2 Unfused battery conductors and their accompanying battery return leads, such as those between the batteries and power boards, shall not be run with other conductors.

3.3.3 Primary battery and battery return leads shall be run on unpanned dedicated power cable rack.

3.3.4 Unless authorized by the SBC LEC Equipment Engineer, power cable within the primary distribution system (within the power plant or between the power plant and the first point of distribution) shall not be run on cable racks equipped with cable retaining brackets or horns.

3.3.5 The battery and battery return leads are a pair and shall be run closely coupled.

3.3.6 The BDFB battery conductor need not be paired with the battery return conductor for the portion of the run to and from the MGB if a significant amount of additional cable for the battery conductor is required to maintain pairing. See Figure J-2 (b) and (c). The return conductor must be closely coupled (to itself) along the route to and from the point where it leaves the route of the battery conductor and the connection to the MGB. Where significant conductor length is not a factor, the battery and battery return conductors shall remain paired. See Figure J-2 (a).

Note: When the battery return conductor is longer than the battery conductor, the size of the battery return conductor shall be adjusted, if necessary, to meet any voltage drop requirements.

3.3.7 The battery return conductors of a circuit serving common bonding network equipment may be connected directly to the CBN side MGB as in Figure J-2 (b) or, to save space on the MGB, they may be bonded to the MGB with a conductor not exceeding 3 feet in length. This is shown in Figure J-2 (a) and (c).
Note 1: One bonding conductor may be serially connected, using crimp type parallel connectors, to more than one battery return conductor, provided the bonding conductor is no longer than 3 feet.

Note 2: The bonding conductor shall be the same size as the battery return conductor for sizes up to #1/0 AWG. Larger conductors may be bonded using a #1/0 AWG.

3.3.8 BDFBs are used to distribute one or more dc voltages to network equipment. The battery return bus bars on early BDFBs were in electrical contact with the framework of the BDFB. All new BDFBs should have the bus bar insulated from the framework.

3.3.9 If a BDFB is more than one floor from the floor on which its serving power plant's dc system grounding conductor is connected to the CO GRD system, the BDFB's battery return bus bar shall be connected to the CO GRD system on the floor on which the BDFB is located. The conductor shall be sized at 750 kcmil, and may be connected directly to a CO GRD bus bar or to a 750 kcmil CO GRD horizontal equalizer.

Note: Plants with insulated battery return bus bars may be intentionally referenced to ground on a floor other than that containing the power plant. This is preferred if it avoids placing bonds between BDFB battery return bus bars and CO GRD.

3.3.10 The DCEG conductor for BDFBs shall be a minimum #1/0 AWG conductor, and shall be connected directly to a CO GRD bus bar or tapped to a horizontal equalizer of equal or greater size.

3.3.11 Exposed ends of power cables, while being installed, shall be insulated with tape or a tape secured heat shrink cap.

3.3.12 Secondary power feeds shall not be installed on the dedicated primary power cable rack.

3.3.13 The secondary battery and battery return leads are a pair and shall be installed closely coupled except when being referenced to the Ground Window.

3.3.14 The secondary battery and battery return leads shall be installed on existing dedicated secondary power cable racks whenever possible. For special synchronization power requirements, see Section T of TP 76300MP.

3.3.15 Secondary power feeds that are installed on panned cable racking shall be banded every six feet.

3.3.16 When connecting battery return cables to return bus bar in BDFBs, Power Boards (PBDs etc.), the Installation Supplier shall terminate the cables in such a manner as to allow future access for cable connections to the bus bar.

3.3.17 When connecting to BDFB fuse position studs, the Installation Supplier shall arrange cable in such a manner so as to not block access of future terminations.

3.4. AC Cable Routing

3.4.1 Metallic Armored Clad (MAC) and BX cable shall be replaced with Jacketed Metallic Clad (JMC) cable or conduit whenever AC circuits are rearranged, except within bay end guards and AC outlet extensions within the base of the bay.
3.4.2 JMC cable shall be placed on a separate pathway segregated from DC power cables and switchboard cable, or secured to cable rack stringer, auxiliary framing or cable brackets over equipment areas.

3.4.3 AC armored cable shall never be placed on cable racks containing any other type of cable.

3.4.4 AC power cable not placed in metallic conduit, flexible raceways or JMC shall not be run through cable hole penetrations containing switchboard or DC power cables.

4. CABLE RACK LOADING

4.1. Blocked Cable Runs
4.1.1 When blocked cable runs in cable racks or cable penetrations are encountered, the Installation Supplier shall contact the detail engineer for instructions.

4.1.2 A cable hole shall not be filled beyond 75 percent of its capacity, and cables shall not be placed closer than 3 inches from edges.

4.1.3 When a cable hole reaches capacity no more cable shall be run through the cable hole and the floor plan shall be marked to reflect blocked conditions.

4.1.4 The Installation Supplier shall report a blocked cable hole to the SBC LEC Engineer, fill out a JIM reporting the blocked condition and place a copy of the JIM in the yellow wallet.

4.2. Cable Pileup
4.2.1 Installation Suppliers shall immediately notify the SBC LEC equipment engineer when 75 percent of the cable pileup capacity of a cable rack or a portion of a cable rack has been reached. See Table J-6.

4.2.2 Cables run on panned racking equipped with cable horns shall not exceed the height of the cable horn or the requirements that are stated in Table J-6, whichever is less.

5. GROUNDING SYSTEM CONDUCTORS

5.1.1 All grounding system conductors shall be routed on and secured to:
   a) A cable rack or cable bracket containing only grounding conductors
   b) The side or bottom of ironwork details or cable rack containing other cable types
   c) The surface of ceilings, columns, or permanent walls.

Note 1: Grounding conductors may be placed on the same cable brackets used to support other cables if the grounding conductors are secured to the surface of the bracket opposite that used to secure the other cables.

Note 2: Some equipment manufacturers allow grounding conductors routed within their equipment systems to be routed with other conductors, typically dc power conductors. When a system is approved for use, the routing requirements of the equipment vendor may apply.
5.1.2 When grounding conductors are routed on the side or bottom of cable racks or other ironwork or surface of ceilings, columns or walls, the conductors shall be secured at an interval of approximately 12 inches. When cable brackets are used for support, they shall be placed at an interval of approximately 18 inches.

5.1.3 When a horizontally run grounding conductor is placed on a cable bracket or other support detail, the conductor shall be secured to each bracket or support detail using nylon cable ties or 9-ply waxed polyester twine.

5.1.4 When a cable bracket or other support detail is placed under a horizontally run grounding conductor, the conductor shall be secured to each bracket or support detail using nylon cable ties or 9-ply waxed polyester twine. (see Figure J-1):

   a) Grounding conductors up to and including #1/0 AWG may be secured to the sides of cable rack stringers, auxiliary framing bars, threaded rods and other ironwork details with nylon cable ties or 9-ply waxed polyester twine.

   b) Grounding conductors larger than #1/0 AWG shall be secured to the sides of cable rack stringers, auxiliary framing bars, threaded rods and other ironwork details with 9-ply waxed polyester twine.

5.1.5 Grounding conductors secured to the underside of cable racks shall be secured to alternate cross straps with 9-ply waxed polyester twine.

5.1.6 The exterior surface of conduits or raceways containing ac power conductors shall not be used to support grounding system conductors.

5.1.7 Several methods of supporting grounding conductors, including vertical and horizontal equalizers, and typical material are shown in ED-97729-11, Protective Grounding Systems for Central Office Equipment. The use of support methods similar to those shown in this drawing is acceptable.

5.1.8 Unless expressly required by local code, CO grounding system conductors (other than ACEG conductors) shall not be run in metallic conduit. If a CO grounding system conductor is placed in metallic conduit, raceway or sleeve more than three feet in length, it shall be bonded to the conduit, raceway or sleeve at each end with a minimum #6 AWG conductor.

5.1.9 When metal clamps are used to support or secure CO grounding conductors, the clamps shall not completely encircle the conductor. The metallic continuity shall be interrupted by non-metallic hardware, a cable tie or 9-ply waxed polyester twine. The phrase completely encircle applies primarily to ferrous metal cable clamps. It does not apply to an opening or “ring” formed by a combination of interconnected metallic objects such as cable racks, auxiliary framing, threaded rods, etc., unless the length (l) of this opening is more than 3 times its diameter (D). Examples of openings that do not create complete encirclement of a grounding conductor are:

   c) Where the conductor is routed through a metal cable hole cover instead of a floor sleeve (l is typically < ¼", D is typically > 1 ½“)

   d) Where the conductor is on a cable rack and passes through the opening formed by the cable rack’s stringers and straps (l is typically <3", D is typically > 18“)
e) Where the conductor passes through an interior wall constructed with sheet metal studs
   (I is typically < 8", D is typically > 48")

f) Arrangements similar to (a) through (c) above.
### TABLE J-1 – SUMMARY OF CHANGES IN SECTION J

<table>
<thead>
<tr>
<th>Change</th>
<th>Item in 11/1/00 Issue</th>
<th>Item in this Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised</td>
<td>2.4.9</td>
<td>2.4.9</td>
</tr>
<tr>
<td></td>
<td>2.8.2-9</td>
<td>2.8.2-9</td>
</tr>
<tr>
<td></td>
<td>4.1.1</td>
<td>4.1.1</td>
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<tr>
<td>Deleted</td>
<td>2.1.7</td>
<td></td>
</tr>
<tr>
<td>Added</td>
<td></td>
<td>1.2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.3.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.4.1-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.1.14</td>
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<td>3.1.5-6</td>
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<tr>
<td></td>
<td></td>
<td>4.2.2</td>
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### TABLE J-2--HORIZONTAL RESTING RUNS (POWER)

<table>
<thead>
<tr>
<th>Size of Copper Cable</th>
<th>Sew at Strap</th>
<th>Number of Cord Strands</th>
<th>Ultimate Number of layer</th>
<th>Cable Per Stitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 MCM-750 MCM</td>
<td>alternate</td>
<td>4</td>
<td>any number</td>
<td>2</td>
</tr>
<tr>
<td>No. 1/0-350 MCM</td>
<td>alternate</td>
<td>2</td>
<td>any number</td>
<td>2</td>
</tr>
<tr>
<td>No. 6-1</td>
<td>every</td>
<td>2</td>
<td>any number</td>
<td>4</td>
</tr>
<tr>
<td>No. 14-8</td>
<td>every</td>
<td>2</td>
<td>any number</td>
<td>any number bundled</td>
</tr>
</tbody>
</table>

### TABLE J-3--VERTICAL RUNS AND/OR INVERTED HORIZONTAL RUNS (POWER)

<table>
<thead>
<tr>
<th>Size of Copper Cable</th>
<th>Sew at Strap</th>
<th>Number of Cord Strands</th>
<th>Ultimate Number of layer</th>
<th>Cable Per Stitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 MCM-750 MCM</td>
<td>every</td>
<td>4</td>
<td>any number</td>
<td>1</td>
</tr>
<tr>
<td>No. 1/0-4/0</td>
<td>every</td>
<td>4</td>
<td>any number</td>
<td>1</td>
</tr>
<tr>
<td>No. 6-1</td>
<td>every</td>
<td>2</td>
<td>any number</td>
<td>2</td>
</tr>
<tr>
<td>No. 14-8</td>
<td>every</td>
<td>2</td>
<td>any number</td>
<td>1 inch diameter bundle max</td>
</tr>
</tbody>
</table>

### TABLE J-4--HORIZONTAL RESTING RUNS (SWITCHBOARD AND COAXIAL)

<table>
<thead>
<tr>
<th>Diameter of Cable</th>
<th>Type</th>
<th>Sew at Strap</th>
<th>Number of Cord Strands</th>
<th>Cable Per Stitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1/2&quot;</td>
<td>round</td>
<td>every fourth</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>over 1/2&quot; to 3/4&quot;</td>
<td>round</td>
<td>every fourth</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>over 3/4&quot; to 1&quot;</td>
<td>round</td>
<td>every fourth</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>over 1&quot;</td>
<td>round</td>
<td>every fourth</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>(735 type)</td>
<td>mini-coax</td>
<td>every fourth</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>(734 type)</td>
<td>coax</td>
<td>every fourth</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>
### TABLE J-5--VERTICAL RUNS AND/OR INVERTED HORIZONTAL RUNS (SWITCHBOARD AND COAXIAL)

<table>
<thead>
<tr>
<th>Diameter of Cable</th>
<th>Type</th>
<th>Sew at Strap</th>
<th>Number of Cord Strands</th>
<th>Cable Per Stitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1/2&quot;</td>
<td>round</td>
<td>every</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>over 1/2&quot; to 3/4&quot;</td>
<td>round</td>
<td>every</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>over 3/4&quot;</td>
<td>round</td>
<td>every</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>(735 type)</td>
<td>mini-coax</td>
<td>every</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>(734 type)</td>
<td>coax</td>
<td>every</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

### TABLE J-6--CABLE CAPACITY OF STANDARD CABLE RACKS (5'-0" Support Spacing)

<table>
<thead>
<tr>
<th>Rack Width</th>
<th>Normal Capacity</th>
<th>75% Rule Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Capacity (In.²)</td>
<td>Pileup (inches)</td>
</tr>
<tr>
<td>1'-0&quot;</td>
<td>132  132</td>
<td>12   12</td>
</tr>
<tr>
<td>1'-3&quot;</td>
<td>168  210</td>
<td>12   15</td>
</tr>
<tr>
<td>1'-8&quot;</td>
<td>228  285</td>
<td>12   15</td>
</tr>
<tr>
<td>2'-1&quot;</td>
<td>288  360</td>
<td>12   15</td>
</tr>
</tbody>
</table>

Note (1) In.² capacity is based on the rack width minus 1" for stringer attachment hardware.

Note (2) According to the above a new switch or other equipment entity having 500 In.² of secured interconnecting cable to other network elements requires a minimum of three 1'-8" via cable rack paths (500/171 = 2.9 racks @ 75% capacity).
TABLE J-7 – MINIMUM BENDING RADIUS FOR GROUNDING CONDUCTORS

<table>
<thead>
<tr>
<th>Grounding Conductor Size</th>
<th>Minimum Bending Radius (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 AWG</td>
<td>2</td>
</tr>
<tr>
<td>4 AWG</td>
<td>3</td>
</tr>
<tr>
<td>2 AWG</td>
<td>3</td>
</tr>
<tr>
<td>1/0 AWG</td>
<td>4</td>
</tr>
<tr>
<td>4/0 AWG</td>
<td>4</td>
</tr>
<tr>
<td>750 kcmil</td>
<td>7</td>
</tr>
</tbody>
</table>

FIGURE J-1 - USE OF CABLE TIES TO SECURE GROUNDING CONDUCTORS
Grounding Conductor

Cable Tie

Approximately 12"

Framing Channel

Grounding Conductor

NOTE: Grounding conductors larger than #1/0 AWG must be secured with sewing twine.

Cable Tie

Approximately 18"

Cable Rack Stringer

Cable Bracket

Grounding Conductor

(any size)
Figure J-2 Bonding of Battery Return Conductors of Shared Power Plant to the MGB

A - From Power Plant
B - To CBN BDFB
C - Battery Return Conductors
D - Battery Conductors
E - MGB

(a) Closely Coupled

(b) to (b) or (c)
[END OF SECTION]
## SECTION K -- WIRING AND CONNECTING

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<td>K-10</td>
</tr>
</tbody>
</table>

### 1. GENERAL

#### 1.1. Introduction

1.1.1 This section covers the requirements for wiring, fanning and forming switchboard cable, treatment of loose wires and the requirements for soldered, coaxial, ABAM, compression/crimp type, quick connect and solderless wrapped connections.

1.1.2 Changes in this issue of Section K are summarized in Table K-1.
2. GENERAL REQUIREMENTS

2.1. General

2.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

2.2. Connecting

2.2.1 Sufficient length shall remain in all wires after connecting operations are completed so that they may be reskinned and reconnected if necessary.

2.2.2 All connections shall be made to ensure proper electrical operation of equipment.

2.2.3 All connections shall be wrench tight, and/or torqued to manufacturer's specifications if applicable.

2.2.4 Any connector drilled with two fastening holes shall be secured using both holes.

2.3. Reused Equipment

2.3.1 Reused or relocated equipment that has wire wrap terminals which meet quality standards, but were soldered previously, shall be cleaned of solder so new solderless wire wrapped connections can be applied. Wires on these terminals will not require soldering if all other connecting requirements are met.

2.4. Mechanical Connections

2.4.1 Mechanical connections (thread pressure type) shall not be installed unless authorized by the SBC LEC Equipment Engineer. If the original factory equipment has mechanical connections, the connections shall be tight and not stripped.

3. SPECIFIC REQUIREMENTS

3.1. Wire and Cable

3.1.1 Only SBC LEC approved wire and cable shall be used.

3.1.2 Only wire and cable that is compliant with the generic and/or specific requirements as applicable shall be used (reference PBSDs and BSPs).

3.1.3 Wire and cable shall be dressed in such a manner as to avoid excessive strain and congestion, to ensure accessibility for maintenance and future applications and to maintain clearance between terminals and secured to wiring brackets, if provided.

3.1.4 Spare and unused wire shall be left long enough to reach the ultimate circuits being served, then placed in a PVC tube or folded back and sewn to the existing form.

3.1.5 The Installation Supplier shall use color coded wiring in accordance with the detail engineer’s wiring diagrams.
3.1.6 Tip and ring conductors shall be paired. Single leads and split pairs are not acceptable for tip and ring applications.

3.1.7 The normal twist of wires (such as tip and ring pairs) shall be left in place between the butt and connection point. Because of various equipment configurations, it may not always be practicable to keep the twist in place to the actual connection point. In these cases, the last twist in the wire should be as close to the connection point as possible or at a point where one of the wires leaves the form.

3.1.8 P-wire shall not be spliced.

3.1.9 Splices shall not be made within conduits.

3.2. Distributing Frame

3.2.1 Fanning rings shall be placed on transverse arms that are equipped with a terminal strip. Fanning rings are not required when connectorized terminal strips are provided.

3.2.2 Loose wires not held in place by fanning rings shall be banded at each point of breakout with cord and protected with fiber.

3.3. Soldered Connections

3.3.1 Solder shall be rosin core, 60 percent tin and 40 percent lead (or an equivalent lead free solder) having a melting range of 360-370 degrees F.

3.3.2 Soldered connections shall have a smooth bright appearance with the wire fused to terminal and completely covered with solder. Connections should be checked for cold solder joints.

3.3.3 A minimum of one and one quarter turns shall be made on all soldered wrapped connections.

3.3.4 Wires connected at perforated terminals shall be brought through the hole from below or from the left, bent against the terminal and away from the apparatus.

3.3.5 Wire terminals with holes, notches and semi-tubular terminals shall be filled with solder.

3.3.6 Wire ends shall be cut off a maximum 1/16 inch from the terminal.

3.3.7 Minimum clearances between soldered connections and adjacent metal work shall be 1/32 of an inch.

3.3.8 Minimum clearances between adjacent soldered connections shall be 1/64 of an inch.

3.3.9 Shiner length between insulation and point of contact with the terminal shall not exceed 1/8 of an inch.

3.4. Coaxial Cable and Connectors

3.4.1 Coaxial cable shall not be spliced.

3.4.2 Only approved coaxial cable and connectors shall be used.
3.4.3 Only approved coaxial cable connector crimping tools with registered dies shall be used. Coax crimps shall be embossed with the vendor ID.

3.4.4 Pin height and continuity (for open and shorts) shall be verified on every installed coaxial connector.

3.4.5 There shall be no cracks or evidence of double crimps on the outer sleeve.

3.4.6 Crimps shall not extend onto the tang area.

3.4.7 The crimped outer sleeve shall exhibit six flat surfaces with no fins or excessive rounding at the 60-degree corner bends.

3.4.8 Coax cable leaving the BNC connector shall not start bending within 2 inches or 10 times the diameter of the cable as measured from the end of the ferrule, which ever is greater.

3.4.9 The ferrule shall be butted against the connector body.

3.4.10 The braided shield shall not be exposed at either end of the ferrule.

3.4.11 The Installation Supplier shall ensure that all coaxial connectors are locked.

3.5. **Shield Connection**

3.5.1 The shields of shielded cables shall be cut, positioned and bonded to ground as specified in the job documentation.

3.5.2 Shielded cable and wire shall have the shield ground bonded at one end only. This bonding will be at the equipment (originating) end unless the product design specifies otherwise. See Section T for requirements specific to synchronization.

3.5.3 Exposed shields of shielded cable shall be protected with two half-lapped layers of electrical tape or heat shrinkable sleeving.

3.5.4 On shielded switchboard cable, the drain lead shall be protected by applying sleeving material.

3.6. **Quick-Connect**

3.6.1 Only one wire shall be engaged in each terminal.

3.6.2 Only solder sleeve type splicing connectors shall be used for splicing individual leads.

3.6.3 Conductors shall not be placed on deformed terminals.

3.6.4 Previously terminated wire ends shall not be re-terminated. Cut them off and use new ends.

3.6.5 Wire ends shall protrude 1/16 inch beyond edge of clipped terminal.

3.6.6 Wire ends shall clear adjacent metallic parts by 1/32 of an inch minimum.

3.6.7 Textile-insulated wire shall not be terminated in slotted beam terminals.

3.7. **Solderless Wire Wrapped**
3.7.1 Solderless wire wrapped connections on square terminals shall conform to Figures K-2 and K-3 unless the length of the pin on the backplane does not allow for the minimum number of wraps. Common defects are illustrated in Figure K-3.

3.7.2 Pigtail connections shall not exceed 3/32 of an inch. This distance is measured from the last contact of the bare portion of the wire with the terminal.

3.7.3 Wire wraps shall be made using the tool sized to the wire gauge.

3.7.4 On terminals that are not square, 26-gauge wire shall have a minimum of 8 turns.

3.7.5 Overlapped turns shall not be counted in the number of turns of a connection.

3.7.6 Wire of gauges 28, 30 or 32 shall have one wrap of insulation in addition to the required number of wraps.

3.7.7 All connections not meeting the requirements of Figure K-2 shall be reskinned and reconnected. Connections that cannot be rewrapped shall have a minimum of one and one half wraps for 20, 22, 24 gauge and wire shall be soldered except on equipment backplanes.

3.7.8 When solderless wrap terminals are used for cross connections, a defective wire connection shall not be soldered. The defective connection shall be removed and replaced by a satisfactory solderless wrapped connection.

3.7.9 The Installation Supplier shall not solder 26 through 32 gauge wire.

3.7.10 Exposed uninsulated wire (shiner) shall not exceed 1/8 inch.

3.7.11 Clearance between connections and adjacent metal work shall be 1/32 of an inch minimum. The wire end projection shall not violate the minimum clearance.

3.7.12 Clearances between adjacent connections shall be 1/64 of an inch minimum. The wire end projection shall not violate the minimum clearance. Wire wrap terminals on blocks, backplanes, etc. shall be straight and not bent.

3.7.13 When adding a second wire-wrap connection to a wire-wrap terminal that has a soldered connection, the Installation Supplier shall also solder the new connection.

3.7.14 The first connection on a terminal that will support multiple wire wraps shall be placed to the rear of the terminal to allow for future connections.

4. CONNECTORS

4.1. 710, 711 and Similar Type Connectors

4.1.1 All compression connectors shall have an inspection hole between the tang and the barrel.

4.1.2 Connectors terminating on a battery post or battery plate shall not have an inspection hole.

4.1.3 Cable may be spliced using modular splicing apparatus. These splices shall be done in accordance with the manufacturer’s specification. The SBC LEC Equipment Engineer shall approve any use of these connectors.
4.1.4 The index strip shall have two wires in each slot.

4.1.5 Both halves of the connector body shall be fully latched. If not self-latching, or fitted with locking screws or securing clips, the two halves shall be secured on each end with 9-ply polyester twine, except when they need to remain readily available for rapid opening (e.g., for dial-to-dial conversion activity).

4.1.6 The cap shall be fully latched to the connector body and index strip.

4.1.7 When connectors are placed on cable racks or pressed into adjacent cables they shall be covered with heat shrink tubing.

4.1.8 Cables fitted with connectors, but not connected, shall be secured with waxed fiber cord so that the cables will not protrude into the wiring aisle behind the bay.

4.1.9 When modular splicing connectors are used on a COSMIC or a conventional type distributing frame, the connectors shall be spaced as to allow for cable growth, maintenance work, etc.

4.2. Connectorized Cables

4.2.1 The ends of connectorized cables shall be positively secured to the corresponding mate connector or backplane connector. In the event the screw, clip, or other interlocking device designed for the specific connector cannot be used, the male and female ends shall be secured with cord or tie wraps.

4.2.2 Connectorized cables (such as with Amphenol connectors) shall not be connected together in cable troughs or on cable racks.

4.2.3 Connectorized cables connected to the rear of units shall be secured with waxed fiber cord so that the cables will not protrude into the wiring aisle behind the bay.

4.3. Terminal Type Connectors (#10 Awg And Smaller)

4.3.1 Connections made to screw type terminals with #10 through #26 gauge tinned copper wire shall be made using the correct color coded insulated type terminal.

4.3.2 Only one terminal type connector shall be placed under a screw or bolt.

4.3.3 The proper size connector shall be used for the wire size being terminated, as detailed in the manufacturer’s specifications. Only one wire end shall be terminated in a terminal type connector (lug).

4.3.4 Terminal type connectors (lugs), except #26 - #24 gauge, shall be NRTL listed. All terminal type connections shall be made of tin plated copper, have a welded seam and have an insulated barrel.

4.3.5 Use the following color coded terminals for the following size wire:

- Yellow/Amber terminal: #26-#24 wire*
- Red terminal: #22-#18 wire
- Blue terminal: #16-#14 wire
- Yellow terminal: #12-#10 wire
4.3.6 The terminal shall have one (1) crimp applied. The crimping tool shall have a full cycle ratchet mechanism that provides a complete crimp before the tool can be removed.

4.3.7 Wire ends shall protrude a minimum 1/16 inch beyond the end of the barrel.

4.4. **Power Connections**

4.4.1 The Installation Supplier shall not modify connectors.

4.4.2 Mechanical connections (thread pressure type) shall not be used unless the device is designed to utilize mechanical lugs only.

4.4.3 C-Taps shall not be used on power leads.

4.4.4 Mechanical "H" taps shall not be used on DC power leads.

4.4.5 H-taps shall be crimped with the circular die. H-taps with side taps may be used, and the side taps do not require a filler (a section of bare wire of the appropriate size); however, the branch requires a filler if not used.

4.4.6 H-Taps shall have a Chicago stitch on the power cables from three to six inches from the H-Tap, and any bend of any connected cable will be past this stitch with a radius of 7 times the cable diameter or greater. Cable bends shall be formed before crimping the H-Tap or after the cable is stitched to avoid placing stress on the connection.

4.4.7 H-taps installed on power cable shall be placed between cable rack straps.

4.4.8 H-taps shall not be placed inside power bays, BDFBs or other power distribution bays.

4.4.9 The Installation Supplier shall verify that all contact surfaces are not damaged.

4.4.10 All battery and battery return connections shall be torqued to specification.

4.4.11 The Installation Supplier shall verify proper polarity before landing cables (no battery reversals). Before establishing the connection verify that less than 0.05 volts exists between the components being connected.

4.5. **Compression Connections Power--#8 AWG and Larger**

4.5.1 All contact surfaces shall be cleaned by using a non-metallic, abrasive pad, wiped clean with a clean, dry cloth and have a thin coat of NO-OX-ID "A" anti-corrosive compound applied.

4.5.2 The proper connector, wire, die and crimping tool shall be used as a system to make an acceptable circumferential (e.g., hex) crimp. Normally the same manufacturer's equipment is utilized to form the system and maintain a Nationally Recognized Testing Laboratory (NRTL) listing. All crimping tools must have a feature that ensures positive compression.

4.5.3 The Installation Supplier shall apply crimps in such a manner as to allow inspection of the compression type connectors such that:

a) The connector shall be marked to indicate:
1. The NRTL listed wire size.
2. The location of crimps.
3. The proper die color code.
4. The NRTL and the manufacturer’s trade mark.

b) The completed crimp should be available for inspection and shall exhibit the following:

1. The crimp should emboss the die code sharply into the connector.
2. The number and location of crimps must exactly match the connector.
3. If the die generates corners or flashing they must be uniform and thin, excess flashing must be removed.
4. The connector shall not be covered with a heat shrink, unless the heat shrink is clear.

4.5.4 All connectors shall be constructed of tin plated copper, except as noted below. Aluminum connectors shall not be used.

4.5.5 When tinned plated connectors are connected to bus bars a thin coat of NO-OX-ID “A” anti-corrosive compound is required.

4.5.6 Lead coated connectors shall be used when connecting to flooded type batteries unless terminal plates are used, or otherwise specified by the manufacturer. NO-OX-ID “A” anti-corrosive compound is required.

4.5.7 All connectors shall be the two (2) hole crimp type lugs except when connecting to a fuse post in a power bay or when the equipment specification drawing requires a single hole lug. Single hole lugs require an external tooth or split-ring lock washer between the bolt or screw head and the connector, except when connected to a fuse post where a flat washer is also required.

4.5.8 The proper size connector shall be used for the wire size being terminated as detailed in the manufacturer’s specifications. Only one (1) wire end shall be terminated in a lug; do not double lug. Larger wires shall not have strands removed to fit smaller connector. Wires shall not be folded to fit connectors.

4.5.9 Compression type connectors shall not be attached to wire ends by soldering.

4.5.10 Wire/cable insulation shall be cut back so that, when inserted, the wire/cable extends to the full length/depth of the connector barrel or groove as viewable in the inspection hole.

4.5.11 The skinner (bare wire) shall be inserted into H-taps the entire length of the H-tap.

4.5.12 The maximum shiner (space) shall be no greater than 1/16 inch between the end of the barrel and the cable insulation butt. If the shiner is greater than 1/16 inch, the space shall be covered with clear heat shrink tubing. If battery cables have manufacturer applied heat shrink tubing, it is permissible for the connector inspection window and compression crimps to be covered.

4.6. Grounding Conductors
4.6.1 Unless otherwise specified, all grounding and bonding conductors shall be connected by two-hole crimp type (compression) connectors with lockwashers between the lug and securing nuts.

4.6.2 Mechanical connectors, fittings, or connections that depend solely on solder shall not be used.

4.6.3 Connections to cold water pipe or conduit shall use a Burndy type GAR-TC or equivalent connector (See Figure K-5).

4.6.4 Unplated metallic surfaces shall be prepared to a bare, bright finish before joining. A thin layer of corrosion preventive compound such as NO-OX-ID “A” anti-corrosive compound shall be applied to the unplated surface. If a connector is to be secured directly to a painted surface, the paint shall be removed down to bare metal and a thin layer of a corrosion preventive compound such as NO-OX-ID “A” anti-corrosive compound shall be applied to the bare metal surface. The bare metal shall be visible for inspection completely around the lug.

4.6.5 External tooth lockwashers will be allowed between the lug and contact surface on one-hole grounding lugs with conductor size No. 8 AWG and smaller. Under this circumstance, removing paint and application of NO-OX-ID “A” anti-corrosive compound is not required. A lockwasher is always required between the lug and screw head. Verification of a locking-type washer shall be by visual inspection. See Figure K-5.

4.6.6 Two grounding connectors shall not be connected back-to-back on a ground bar unless:

a) The equipment served by both conductors will be completely de-powered before the securing hardware is loosened (e.g. connections at a bus bar or an equipment enclosure), or

b) A sufficient length of the conductor that will not be permanently disconnected is both available and accessible to attach a temporary bond around the securing hardware (e.g., connections at a CO ground bar or other bus bar).

4.6.7 Bolts, nuts, screws, threaded pressure devices, raceway fittings and every ground system connecting or securing device shall be free from corrosion, properly assembled, correctly tightened and accessible for inspection. Within buildings, exothermic welding may be used at water pipes, connections to grounding system bus bars and bonds to building steel. In occupied areas within a building, the use of exothermic welds shall be restricted to those methods that use “smokeless” or “low smoke emitting” processes, such as the EXOLON® process from Erico Products, Inc.

4.6.8 At all bus bars, the end of every CO grounding system conductor whose far end termination is not readily apparent shall be equipped with a 145P tag (or equivalent) identifying the termination point of the opposite end of the conductor.

4.7. Lockwashers for Grounding Connections
4.7.1 This section applies primarily to the use of lockwashers with the securing hardware for connectors used to terminate the framework grounding conductor to equipment frameworks, cabinets and other enclosures.

4.7.2 When a lockwasher is required, one of the following shall be used:
   a) An external tooth type (ETLW) or A split ring (helical spring) type.
   b) When required between the surface of a one-hole connector and the surface, to which the connector is secured, the lockwasher shall be an external tooth type. See Figure K-1.
   c) Unless specified otherwise by the manufacturer, all types of lockwashers shall be Grade 2 or higher and shall have a zinc or cadmium electroplate finish.

4.7.3 This section applies primarily to the use of lockwashers with the securing hardware for connectors used to terminate the framework grounding conductor to equipment frameworks, cabinets and other enclosures.

4.7.4 These requirements apply when lockwasher information has not been furnished by another part of this document, a standard drawing, a manufacturer’s drawing or a detailed specification.

4.7.5 When a lockwasher is required, one of the following shall be used:
   a) An external tooth type (ETLW), or
   b) A split ring (helical spring) type.

4.7.6 When required between the surface of a one-hole connector and the surface to which the connector is secured, the lockwasher shall be an external tooth type. See Figure K-1.

4.7.7 For a fastener and nut arrangement (through-bolt) or a nut only arrangement (when a stud is used), a lockwasher shall be placed between the nut and the surface to which it mates.

4.7.8 For a fastener only arrangement (tapped hole), a lockwasher shall be placed between the fastener head and the surface to which it mates. See Figure K-1.

4.7.9 Unless specified otherwise by the manufacturer, all types of lockwashers shall be Grade 2 or higher and shall have a zinc or cadmium electroplate finish.

4.7.10 Additional hardware information may be found in BSP 800-000-100MP, Common Systems – Hardware Products and Materials Specifications.

4.8. DC Power - General Connecting

4.8.1 Power lead connections shall not be stacked.

4.8.2 The Installation Supplier shall not stack (piggyback) connectors on the same side of the bus bar. For a single network element with multiple feeds, it is acceptable to attach the battery return leads to the ground bus bar back to back (sandwiching the bus bar between the two ground return lugs). For installing multiple network elements with multiple feeds per element, it is also acceptable to combine “A” feeds (ground return leads) and “B” feeds in back to back
arrangements (again, provided the bus bar is sandwiched between the combined “A” leads and combined “B” leads).

4.8.3 Battery return leads shall be connected to the battery return bus bar associated with the same BDFB, FB, etc., as the related battery leads.

4.8.4 Unless otherwise indicated in the detail specification, fuse post stiffeners are required when connecting #1/0 power cable to fuse panel studs of BDFBs or secondary power distribution frames.

4.8.5 Cables larger than #1/0 shall not be connected to the load side of BDFBs or secondary power distribution frames.

4.8.6 The Installation Supplier shall apply NO-OX-ID “A” anti-corrosive compound to all connections of dissimilar metals to inhibit future corrosion. Cable ends shall be coated with the anticorrosive compound before making a crimp connection. All unplated connectors, braid straps, bus bars, etc., shall be brought to a bright finish and then coated with the anticorrosive compound before they are connected. Application of the anticorrosive compound shall be done in such a manner that a treated connection is easily distinguishable from an untreated connection. The anticorrosive compound shall be applied sparingly but with adequate amounts to indicate that the compound has been applied.
# TABLE K-1 – SUMMARY OF CHANGES IN SECTION K

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FIGURE K-1 - APPLICATION OF LOCKWASHERS
FIGURE K-2-- SOLDERLESS WIRE WRAPPED CONNECTIONS

20 GA = .032"
22 GA = .025"
24 GA = .020"
26 GA = .016"
28 GA = .013"
30 GA = .010"

.045 SQUARE
FIGURE K-3 – SOLDERLESS WIRE-WRAPPED CONNECTIONS

Physical Turns of Bare Wire

Start Of Turn

1 2 3 4 5 6

ONE SOLDERLESS CONNECTION

TWO SOLDERLESS CONNECTIONS

THREE SOLDERLESS CONNECTIONS

Connection Near Base of Terminal When Odd Number of Terminals are Connected

Note: When surface strapping is specified, connect the incoming lead at the base of the terminal and use a similar strapping arrangement.
FIGURE K-4--SOLDERLESS WIRE WRAPPED CONNECTIONS - DEFECTS

**INSUFFICIENT TURNS**

- .008” SPACE
- .015” SPACE

**SEPARATION EXCEEDS .010”**

**EXCESSIVE SHINER LENGTH**

- Over 1/8”

**BULGED TURNS**

- .012”

**NO 4 ADJACENT TURNS**

**OVERLAPPING – OVERLAPPED TURNS DISCOUNTED**

- .003” SPACE
- .006” SPACE

**SEPARATION EXCEEDS .005”**

**MORE THAN ONE BULGED TURN**

- “D”

**OVERLAPPING TURNS**

- “E”

**SEPARATION EXCEEDS .010”**

- “C”

**INSUFFICIENT TURNS**

- “A”

**EXCESSIVE SHINER LENGTH**

- “B”

**NOTE:** A SCALED SKETCH DEPICTING TYPICAL SOLDERLESS WRAPPED CONNECTION OF 24 GUAGE DEFECTS “A” THRU “F.” 28 GUAGE DEFECT SHOWN IN “G”
Figure K-5 - Pipe Ground Connector

- Burndy Type GAR-TC Ground Connector
- #6 AWG to 750 MCM max. ground wire
- Two hole lug (3/8" Bolts on 1")
- Hex nut
- Conduit or Pipe
- Bolt w/nut & washers Burndy cat. no. TMH-239 (order separately)
- Conduit or Pipe
- #6 AWG to 750 MCM max. ground wire
- Two hole lug
- Lock washer
- Flat washer

Method to Connect Two-Hole Grounding Lug to Conduit or Pipe (Section 5.20.13)
1. GENERAL

1.1. Introduction

1.1.1 This section contains requirements for and the description of the different classes of equipment designations.

1.1.2 Changes in this issue of Section L are summarized in Table L-1.

1.2. Requirements

1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.2.2 The Installation Supplier shall clean the surface to be designated. If necessary, wipe the surface using a clean rag and a non toxic cleaner, to remove any dust or oil that may be present, and touch up the painted surface with appropriate (type and color) paint.

1.2.3 All designations shall have the correct information, be at the proper location, legible from a normal distance and viewing position, the proper color, and conform to the existing office designation pattern.
1.2.4 All designations shall be sized per Table L-2.
1.2.5 When it is necessary to reduce the expected size of a designation due to insufficient space, the Installation Supplier shall use the largest size lettering that will fit in the designated area.
1.2.6 All designations shall be properly aligned and spaced.
1.2.7 145P tags shall be located outside the cover or heat shrink tubing.
1.2.8 Designations on 145P tags shall be sized to allow for all information needed but shall be no smaller than 1/8th inch. Both sides of the 145P tag can be utilized.
1.2.9 Codes and designations shall not be hand written.

1.3. **Stamping**
1.3.1 Stamping shall be accomplished using a rubber stamp of the appropriate size.
1.3.2 The following color patterns for designations shall be used:
   a) Black characters on light colored surfaces
   b) White characters on dark colored surfaces
   c) Red characters for Caution notices
1.3.3 All lettering and numbering shall be neat, properly aligned and applied using the correct amount of ink without smudging.
1.3.4 Rub-on stencils are not acceptable on terminal strips.

1.4. **Labeling**
1.4.1 If the SBC LEC authorizes labeling, Identification and designation for all batteries, battery racks, primary power equipment and associated 145P tags located in the power room or power plant vicinity shall be done with manufacturer recommended labeling. The labeling shall be applied as to adhere for the life of the equipment and use color stable, high contrast lettering. Stamping or stenciling is an approved method as required by the SBC LEC.
1.4.2 Cable hole designations shall be stamped, not labeled.
1.4.3 All labels shall be on clear, black or white backing, or as manufacturer provides. Lettering shall be black or white, in contrast to the backing.
1.4.4 Labeling shall not be placed where they are exposed to repeated physical contact.
1.4.5 When applying a label to a textured or smooth surface, a piece of plastic or rubber shall be used to press the label to conform to the textured surface. This can be visually verified when the label changes from a slight haze to a clear finish.
1.4.6 Labels shall be placed so that they do not peel or lift but remain permanently affixed.
1.4.7 Labels shall not be utilized to augment existing stenciling, with exception of fuse and sync record books. The Installation Supplier may either add the new information with a stencil or remove all of the existing stenciling and replace it with a new label. On equipment units including end guards, consistent labeling or stenciling shall be done on a line-by-line basis.
1.4.8 If adhesive labels are provided by the manufacturer, the Installation Supplier shall verify that the information shown is correct.

1.4.9 The use of thermal transfer technology tape systems is limited to applications on smooth, nonporous surfaces. This tape shall not be used on ripple-finished surfaces or any other irregular surfaces.

2. EQUIPMENT TYPES

2.1. Common Items

2.1.1 The front and rear of frames and bays shall be designated with the bay number.

2.1.2 The front and rear of equipment positions shall be designated with name and number.

2.1.3 When designation cards are furnished for the top of the bay, the bay name and number shall be placed on the designation cards.

2.1.4 When bay designation cards are not furnished, the bay designation shall be placed on the base cover if it is not blocked from view by equipment. If the bay designation can not be placed on the base cover; it shall be placed on the left upright at approximately 5 feet above floor.

2.1.5 The Installation Supplier shall designate equipment code (CLEI) on front of frames or units.

2.1.6 The Installation Supplier shall verify that all plug-in units provided with the equipment being installed are equipped with bar code labels that provide for the automatic identification of the unit. The labels shall not be damaged and shall be located so that the bar code can be electronically scanned when the plug-in is in its in-service position. No markings shall be placed over the bar codes.

2.1.7 Except in power rooms, end guards shall be designated to indicate all equipment in the line up in order of appearance. Manufacturer's end guard designations shall be utilized when provided.

2.1.8 Dedicated cable racks reserved for specific purposes (power, unfused power cable, fiber optics, etc.), except switching equipment cable racks, shall be designated. Designations shall be placed on the outside of both stringers at the beginning, end and at intervals not to exceed 10 feet on horizontal cable rack. These designations shall specify the purpose for which the cable rack is dedicated, followed by the word “ONLY” (e.g., Power cable only, unfused power cable only, fiber optic cable only, etc.). Designations shall be made approximately 5 feet 6 inches from the floor on vertical cable rack. If the cable rack is dedicated to fiber optics and is yellow or orange, the cable rack need not be separately identified.

2.1.9 The year the job completed, the TEO/CON number and the Installation Supplier’s name shall be stenciled or labeled on the front of all new equipment units. If space does not permit the placement of this information on the front of the unit, then the information may be placed on the frame upright adjacent to the equipment unit. The TEO/CON number may be placed only once on a fully equipped bay. If placed only once on a fully equipped bay this information
shall be placed on the top left or bottom left upright of the bay. It shall be placed on each unit of a partially equipped bay. The labeling format should be as in these examples: '00 NX76235; '00 10705980. Distribution frame blocks and other minor items do not require the placement of a “Year Installed” and “TEO/CON number.”

2.1.10 Designations shall not be placed on removable doors, covers or finishing details, unless no other area is available. If designations must be placed on removable covers, the relay rack and shelf designation shall be placed on each cover. The shelf designation shall also be placed on the shelf itself.

2.2. Transport

2.2.1 When communication panels are to be added, which are to be multipled to an existing panel, the multiple destinations shall be designated on the rear of both the new and existing panels.

2.2.2 145P tag(s), with far-end termination details (e.g., shelf/bay/DF block, circuit number, TRMT/RCV, etc.), shall be placed on the unterminated end of cables reserved for future use (by the SBC LEC) or for collocation interconnection (by the CLEC).

Note: In the case of CLEC cables, the DS0 cable tag needs to include what is stenciled at the MDF block. CLEC cable name and Line Splitter if stencil includes Line Splitter, e.g., XXX01 (cable name) 1-100, 101-200, etc. (pairs), OE 001(bay). 01(shelf)-001-100 (ports), CP001 (bay). 01(shelf)-001-100(ports). For DS3 cables, the Transmit and Receive leads must be tagged separately.

2.2.3 The Installation Supplier shall designate on all transport equipment bays or shelves, with a label, visible from the front of the bay, showing the far end destinations for all conductors leaving the bay or shelf.

2.3. AC Power

2.3.1 AC power service cabinets shall be designated with name, number, voltage and type of service, e.g., PWR DISTG SERVICE CAB 001 208V AC 60 HZ 3PH 4W.

2.3.2 AC power service cabinet circuits shall be designated beside the circuit breaker or on the designation card with the location of the circuit being served and the circuit breaker amperage.

2.3.3 All hardwired AC powered equipment shall be designated with the location of power source and the circuit breaker number of the power source.

2.3.4 All AC outlets and light switches shall be designated with the location of power source and circuit breaker number or inverter frame location. AC power strips with multiple outlets (such as those used with data mountings) shall be designated once near the first outlet on the strip.

2.3.5 Voltage on all AC outlets shall be designated for voltages greater than 120 volts AC.

2.3.6 End guards for all aisle switches shall be designated with a direction arrow to indicate which aisle the switch controls.

2.3.7 “Disconnect AC Before Opening” shall be designated or labeled on trolley coupling or end cap.
2.3.8 All AC circuits originating in miscellaneous or building electrical panels shall be designated on the panel schedule card.

2.4. DC Power

2.4.1 The Installation Supplier shall designate fuse panels with row designation and voltage designation.

2.4.2 Fuse capacity pins shall be installed at all fuse positions that are designed to hold fuse capacity pins. The pins shall be color coded to match the fuse installed and located directly adjacent to the associated fuse. Where the fuse position is not designed for fuse designation pins, this information shall be designated on the fuse position of the fuse panel.

2.4.3 The Installation Supplier shall ensure that miscellaneous bay mounted fuse panels have a fuse record book, fuse assignment card or plate mounted on the bay upright adjacent to the fuse panel.

2.4.4 The Installation Supplier shall record equipment additions, amperages and fuse positions on the fuse designation card, record book, or bay mounted designation plate.

2.4.5 Fuse record book covers shall be designated with “Fuse Record” and bay location.

2.4.6 The Installation Supplier shall stamp, label or type added circuits on fuse record book sheets with black ink, or use lettering guide with permanent black ink. A marking pen may be used.

2.4.7 Correction fluid shall be used to remove circuit information from the fuse record book for circuits removed from fuse panels.

2.4.8 The fuse record sheet shall be retyped after a maximum of 5 handwritten additions, removals or corrections. Replacing pages shall be of the same size as existing pages.

2.4.9 The battery rack shall be designated with:
   a) String ID
   b) Number of cells, Battery manufacturer model
   c) Battery manufactured date
   d) Date installed
   e) TEO/CON Number, and the Installation Supplier’s name
   f) Battery rack manufacturer and model number

2.4.10 The battery stand shall be designated to indicate the selected temperature reference “TR” cell and the position number of each cell.

2.4.11 Alarm fuses in BDFBs not mounted adjacent to the discharge fuse shall be designated to associate them with discharge fuses.

2.4.12 All fuse and circuit breaker locations shall be designated with frame location, load, and, if applicable, fuse panel number or equipment unit.
2.4.13 Fuse or circuit breaker numbers shall be designated on the front and back of the panel.

2.4.14 Fuse and circuit breaker positions shall be designated to indicate the fuse/circuit breaker capacity and the equipment served.

2.4.15 At the BDFB, power load (e.g., A, B, C or D) shall be designated on the shelf (panel).

2.4.16 The Installation Supplier shall designate on the front of BDFB (under meter, if applicable) the size and location of the primary fuse or circuit breaker feeding the BDFB.

2.4.17 Unless the SBC LEC Equipment Engineer instructs otherwise, BDFBs shall be numbered from bottom to top, starting with “1.” On horizontal panels the count will start at the bottom left and go to right.

2.4.18 Bus bars outside the power plant area shall be designated with potential and group designation (such as “-48V Load A,” “Battery Return,” etc.) in 3/4-inch lettering.

2.4.19 External BDFB battery return bus shall be stamped with the BDFB designation and the hole position numbers (first, every fifth, and last, on each bar).

2.5. 145P Tag Requirements for DC Power

2.5.1 All 145P tags shall be secured with waxed cord, with a sufficient pigtail to allow the tag to be rotated for viewing. Tags equipped with metal rings shall have the ring removed.

2.5.2 Except as noted below, the Installation Supplier shall place 145P tags or equivalent, with the far end designation, on all battery and battery return leads. For leads connected to the battery return bus bar, the associated fuse number shall also be designated on the 145P tag.

a) When a network element is installed in a bay and the battery and battery return leads run to a fuse panel within the same bay, the Installation Supplier shall update the fuse designation card or fuse record book, indicating designation of shelf. 145P tags or equivalent are not required on battery and battery return leads at the network element or fuse panel.

b) When a network element is installed in a bay and the battery and battery return leads run outside the bay to a fuse panel in a different bay, the Installation Supplier shall place 145P tags or equivalent on the battery and battery return leads at the rear of the network element showing far end designation. 145P tags or equivalent are not required at the fuse panel if the fuse panel is equipped with designation card or fuse record book. Update the designation card or fuse record book.

c) Battery and battery return leads internal to switching systems do not require 145P tags.

2.5.3 The Installation Supplier shall place 145P tags or equivalent on ground cable terminations; however, grounding conductors do not require identification of short runs when both ends are clearly visible from a point on the floor. The tag shall be designated to show the far end termination.

2.5.4 Any unterminated ends of power cable shall be equipped with a 145P tag designating the far end termination.
2.6. BITS Shelves

2.6.1 Building Integrated Timing Supply (BITS) shelves shall be labeled in accordance with Figures L-1 and L-2.

2.6.2 Shelf labels shall be placed on the front face panel of the BITS shelf in accordance with Table L-2.

2.6.3 Cable markers for “far-end identification” shall be placed on the cable 2 to 6 inches from the butted end of the cable at both the BITS end of the circuit and at the network element end of the circuit.

2.6.4 All cable markers shall be white with black letters. The cable marker may be a wrap around applique that covers the lettered portion with clear plastic, or a clear heat shrink tubing (heated/shrunk) shall be used as a permanent protective cover.

2.6.5 The Installation Supplier shall type, stencil or write with the use of a lettering guide (never handwritten) all designations on the cable markers and in the BITS record book.

2.6.6 “P” or “S” shall indicate primary and secondary designations.

2.6.7 The cable marker at the network element shall contain the far end terminating location of the BITS shelf including the bay, shelf, slot and port.

2.6.8 The cable marker at the BITS shall contain the far end terminating location. For a single timing lead to an entire bay (i.e. D4, SLC 96 bays etc.), the bay location designation is sufficient. If multiple leads are supplied for timing within a single bay (i.e. SONET ADMs, SLC SERIES 5 bays etc.), each termination shall be individually addressed. SONET ADM designations shall include the bay and shelf locations.

2.6.9 The Installation Supplier shall attach a sync assignment record book to the bay upright at or near the BITS clock.

2.6.10 The Installation Supplier shall designate in the BITS record book the far end termination. If a BITS record book is not available, the Installation Supplier shall request the record book from the detail engineer.

2.7. Distributing Frames

2.7.1 The vertical side of distributing frames shall be designated as follows:

a) Designate the first, last, and each fifth vertical (i.e. 1, 5, 10, 15…) with the shelf letter (i.e., A, B, C …P) on the vertical stiffening bar between the transverse arms for each shelf. The label or stamp should be placed between the transverse arm of the vertical being identified and the next higher vertical (i.e. the label for vertical 5 would be placed between the transverse arms of verticals 5 and 6). When the terminal strip is added, designate the shelf letter on the lower right front of the terminal strip.

b) Designate the 7th (G) shelf from the floor with the vertical number at the end of the transverse arm for each vertical (i.e. 1, 2, 3…). When a terminal strip is added, designate the vertical number on the lower right front of the terminal strip.
2.7.2 The horizontal side of the distributing frame shall be designated as follows:

a) Designate the first, last, and each fifth vertical (i.e. 1, 5, 10, 15…) with the shelf letter (i.e., A, B, C …P) on the horizontal stiffening bar between the transverse arms for each shelf. When the terminal strip is added, designate the shelf letter on the lower right front of the terminal strip.

b) Designate the fourth (D) and the tenth (K) shelf with the vertical number on the horizontal stiffening bar between the transverse arms. When the terminal strip is added, designate the vertical number on the lower right front of the terminal strip.

c) Where the shelf and vertical designations intersect, designate the location with the shelf letter first, followed by the vertical number, (i.e., D1, D5, D10…).

2.7.3 Cable board designations shall include vertical number, cable number, cable pair count, pair gain number and pair gain count.

2.7.4 The Installation Supplier shall stamp or label distributing frame terminal strips and/or covers as instructed in the TEO or drawings. When new equipment is added, the inside covers shall be updated. The minimum requirements are:

a) Functional lead designation for each circuit type (at least one row per terminal strip)

b) Circuit designation (by name or drawing number)

c) Equipment location (relay rack number, etc.)

2.7.5 For cables going to CLECs, the Installation Supplier shall stamp or label distributing frame terminal strips and/or covers with the CLEC name, CLEC CLLI, cable designation, and first and last pair numbers.

2.7.6 “Tip” designation shall always precede the “Ring” designation.

2.7.7 The cable pair information shall be designated on COSMIC frames designation cards.

2.8. Grounding Designations

2.8.1 The Installation Supplier shall place 145P tags or equivalent on ground cable terminations; however, grounding conductors do not require identification of short runs when both ends are clearly visible from a point on the floor. The tag shall be designated to show the far end termination.

2.8.2 The Installation Supplier shall designate bars associated with the CO grounding system or isolated bonding network with the functional designation of the bar in 3/4-inch lettering. This includes the CO Ground Bar, Main Ground Bar (MGB), Office Principal Ground Point Bus (OPGPB), etc., and collection bars or splice plates such as Integrated Collection Bar (ICB), Integrated Ground Splice Plate (INGSP), Frame Bonding Equalizer (FBE), etc. A sign at the bus bar may be used instead of stamping at the discretion of the SBC LEC Representative.
3. FIBER OPTIC LASER WARNING LABELS

3.1. Requirements

3.1.1 Fiber optic laser warning labels shall be installed in a permanent, conspicuous location on the front of equipment added, containing fiber optic lasers.

3.1.2 Most manufacturers of fiber optic equipment supply warning labels with their equipment. When warning labels are supplied with a frame, bay or unit, the labels shall be applied per the manufacturer's specifications.

3.1.3 Main runs of fiber-optic cable racks, ducts or troughs shall be stamped or labeled "Fiber-Optic Cables Only" (or similar wording) at 10-foot intervals on both sides of the cable rack, duct or trough. Each cross aisle cable rack, duct, or trough shall be marked on both sides. Markings shall be in a contrasting color to the rack, duct or trough with letters sized no less than 5/8 of an inch high. On multi-duct troughs the designations shall be at the top of the divider on both sides of the fiber duct.

4. OTHER DESIGNATIONS

4.1. General

4.1.1 Digital system cross connect (DSX) panels shall be stamped or labeled with network element connection information as leads are terminated on the panel (not required on rear). At a minimum, the following information shall be provided on designation strips of the DSX panel:

a) Frame/module name and number or relay rack number.

b) Circuit number (such as channel, bank, repeater, multiplexer, fiber terminal, etc.).

c) Jack positions shall be labeled with the first, last, and at least every fifth jack with its associated circuit number within the group.

d) On DSX-3 modules, one unused designation area shall be left for SBC LEC use.

e) Place a circuit limit designation (brackets) when designating frame terminal strips or DSX jacks. This designation shall indicate the beginning and end of circuit terminations. It shall also be used to separate group, sub-group, functional and numeric designations.

4.1.2 Fiber distribution frame shelves shall be stamped or labeled according to manufacturer's specifications. If the manufacturer does not provide specifications, designations shall be provided as follows:

a) On the front of the shelf, fiber couplers will be labeled starting with coupler 1 at the top left of the shelf, and coupler 6 at the bottom left, and continuing to coupler 67 at the top right and coupler 72 at the bottom right of the shelf.

b) On the rear of the shelf, fiber couplers 1, 6, 31, 36, 37, 42, 67 and 72 shall be labeled.

4.1.3 For fiber distribution frame shelves cross connected to equipment units, the labels on the front cover of the shelf shall be designated to include the frame identification and unit number of the shelf.
4.1.4 All fiber optic conductors shall be identified by label or tag at each end in all switching equipment.

4.1.5 On the vertical side of distributing frames, circuit numbering within the block all shall be from top down. On the horizontal side, circuit numbers shall be numbered from left to right (facing the front of the terminal strip).

4.1.6 At all bus bars, the end of every CO grounding system conductor whose far end termination is not readily apparent shall be equipped with a 145P tag (or equivalent) identifying the termination point of the opposite end of the conductor.

4.1.7 Certain CO grounding system conductors shall be equipped with a brass or plastic laminate tag with the phrase “DO NOT DISCONNECT” designated on the tag. The letters shall be 3/16” minimum. The following conductors shall always be equipped with this tag:

a) Conductors from earth electrodes  
b) Grounding conductors at a water pipe  
c) Grounding electrode conductors from a house service panel or other source of a separately derived system (transformer, UPS, etc.)  
d) Horizontal equalizer connections at a bus bar  
e) Vertical equalizer connections at a bus bar  
f) Both ends of a power plant's DC system grounding conductor  
g) Both ends of grounding conductors between a protector frame and an office bus bar.  
h) Conductor serving a cable entrance facility.  

Note: The other side of a DO NOT DISCONNECT tag may be used as a destination tag.

4.2 Cable Hole Designations

4.2.1 Through –penetrations shall be uniquely identified as follows;

a) The cable hole designation shall be stamped or stenciled on the top steel cover and face of sheathing channel of floor openings.

b) The cable hole designation shall be stamped or stenciled on the covers and walls on both sides of wall openings.

c) Cable hole designations shall be centered horizontally approximately 2 inches from front edge of cover (bottom edge of wall covers).

d) Designations on cable hole sheathings shall be centered horizontally just below the top of the sheathing assembly.
TABLE L-1 – SUMMARY OF CHANGES IN SECTION L

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### CHARACTER SIZE REQUIREMENTS IN INCHES

Refer to paragraph L1.2.5 if requirement cannot be met.

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FIGURE L-1—BITS SHELF LABELING FORMAT

NOTE 1: Only Master will have DS1 inputs and Remote Master shelves will have Composite Clock Inputs. Expansion shelves will get their synchronization from the associated master shelf via a ribbon cable or any timing bus extension.
FIGURE L-2—BITS SHELF LABELING FORMAT (CONTINUED)
SECTION M -- POWER

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1. GENERAL

1.1. Introduction
1.1.1 This section covers the general requirements for the installation of power equipment and associated systems.

1.1.2 Changes in this issue of Section M are summarized in Table M-1.

1.2. General Requirements
1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.2.2 The Installation Supplier shall verify (with a multimeter) the absence of voltage on the battery and battery return leads before connecting the leads.

1.2.3 The Installation Supplier shall verify (with a clamp-on ammeter) the absence of current for each power lead to be removed.

1.2.4 Power equipment and bus bars shall be protected any time there is installation activity in the immediate vicinity. See Section B.

1.2.5 The Installation Supplier shall record BDFB load readings on the BDFB Load Demand Worksheet and forward the worksheet to the SBC LEC Power Engineer on every job that adds circuits to the BDFB. Instructions and worksheets are available on the EXTRANET Web Site, https://sw11.pacbell.com/common-sys/.

1.3. Removal Of DC Fuses Or Opening DC Circuit Breakers
1.3.1 Unless stated otherwise in the MOP, the Supplier shall not remove a fuse or open a circuit breaker serving energized equipment. The SBC LEC Representative is responsible for opening the circuit on energized equipment.

1.3.2 The Installation Supplier shall ensure that all circuit breakers that are spare, unassigned, or reserved for future equipment are in the "Off" position.

1.4. DC Circuit Protection Devices
1.4.1 Fuses and circuit breakers shall be of the type and capacity as indicated in the job documentation. Under no circumstances shall tandem or ganged DC circuit breakers ever be applied (two breakers applied in parallel in order to increase the capacity).

1.4.2 Only Bussman Telpower® -type fuses shall be used on DC circuits.

1.4.3 Unless otherwise instructed, the Installation Supplier shall install all fuses to make the equipment operational.

1.4.4 Dummy fuses shall be installed at all open faced and GMT type vacant fuse positions.

1.4.5 Cartridge and knife type fuses shall be coated with a thin film of NO-OX-ID “A” anti-corrosive compound.
1.4.6 Blade type fuse position contacts shall be coated with a thin film of NO-OX-ID “A” anti-corrosive compound prior to fuse installation (on contact surfaces only).

1.4.7 The use of any fuse reducer shall require the authorization of the SBC LEC Power Equipment Engineer.

1.4.8 Spare fuses shall be placed in the spare fuse holder. If a spare fuse holder is not provided, spare fuses shall be turned over to the SBC LEC Representative at job completion.

1.4.9 On BDFB and power boards, all local alarm wiring for associated fuses/circuit breakers shall be tested in accordance with Section E of TP 76300MP.

1.4.10 Connecting hardware shall be installed on all fuse posts.

1.4.11 Fuses and circuit breakers shall not be installed or activated on unterminated leads (power wire/cable).

1.4.12 The largest fuse to be used in a BDFB shall be no larger than 150 Amps.

1.4.13 The Installation Supplier shall verify that all contact surfaces are not damaged.

1.5. **Battery Post**

1.5.1 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's recommended procedures for cell post cleaning and preparation differ from those specified in this section, then the Installation Supplier shall contact the SBC LEC Equipment Engineer for direction.

1.5.2 All contact surfaces of battery post and contact areas of intercell connectors shall be cleaned and coated with a thin film of NO-OX ID "A" anti-corrosive compound.

1.5.3 All cell post connections shall be made with the proper tools and shall be tightened to the manufacturer’s torque requirements.

1.5.4 When lead-plated details and/or details with elongated holes are used, flat lead-plated washers shall be used under the nut and under the bolt head.

1.5.5 On new battery string installations, all nuts, bolts and washers shall be stainless steel, unless specified otherwise by the manufacturer. Stainless steel (316 or higher alloy) is required, and the washer shall be 1/8 inch thick. Lockwashers shall not be used on battery posts.

1.5.6 Inter-cell connection and attachment hardware shall be reused when possible. When replacement is required, like hardware shall be used when installing less than a full battery string.

1.5.7 The threaded portion of bolts on intercell connectors shall not be installed to have exposed threads past the nut more than the equivalent diameter of the bolt.

2. **DC BUS BARS**

2.1. **Assembly**
2.1.1 The Installation Supplier shall use zinc plated or copper finished bus bar joint, fastening and support bolts, screws, nuts, washers, clips, etc.

2.1.2 Bus bar runs shall be supported on a maximum of 6 feet 0 inch centers. Each length between joints shall be supported twice. In high seismic zones, bus bar runs shall be supported on both sides of a mechanical splice.

2.1.3 Bus bar runs supported by ceiling inserts, threaded rod and/or auxiliary framing channels shall be braced, both side and lengthwise, according to the SBC LEC’s seismic requirements.

2.1.4 Bus bar runs shall be installed at least one foot from metal pipes, cable racks, auxiliary framing channels, etc., unless approved by the SBC LEC Equipment Engineer. In no case shall this distance be less than three inches.

2.1.5 The bus bar shall be insulated from all supporting ironwork with approved insulators.

2.1.6 Exposed 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 be protected, in order of preference:
   a) With non-combustible covers, or
   b) Have each bus bar and its associated cable connectors wrapped with two half lapped layers of plastic insulating tape.

2.1.7 Bus bars installed temporarily shall be bolted in the temporary location.

2.2. Bus Bar Connecting

2.2.1 Aluminum bus bars or details shall not be connected directly to heat producing devices. Examples are:
   a) Circuit breakers
   b) Fuse terminals
   c) Switch terminals
   d) End cells

2.2.2 Aluminum bus bars shall not be tapped for fastening terminal lugs or for fastening bar to bar. Use through bolts, clamp joints or threaded inserts.

2.2.3 High spots, sharp edges and burrs shall be removed from all electrical contact areas, before assembly, to maximize continuity. Contact surfaces shall be flat.

2.2.4 Plated contact surfaces shall be cleaned without using abrasives and coated with a NO-OX-ID “A” anti-corrosive compound.

2.2.5 All non-plated contact surfaces shall be cleaned with a fine abrasive material then coated with a thin film of NO-OX-ID “A” anti-corrosive compound.

2.2.6 The overlap at a bus bar joint shall be no less than the width of the bus bar.

2.2.7 For bus bars, flat washers shall be used under the nut and under the bolt head. In addition, a lockwasher shall be used under the nut.
2.3. **Bus Bar Clamps**

2.3.1 Clamps that have a bus bar contact surface concave in shape are defective and shall not be used.

2.3.2 Bus bar clamp bolts shall be equipped with self-locking pal nuts. Non-self-locking nuts shall be torqued per the Manufacturers specifications before applying a pal nut. The pal nut shall be applied with the smooth (flat) side in, open side out, run up to the regular nut, tight and take up only one quarter turn with an insulated wrench. On larger clamps, lock nuts may be provided instead of pal nuts. The lock nuts shall be tightened until tension is snug against the regular nut.

2.4. **Taping**

2.4.1 Two overlapping wraps of plastic electrical insulating tape, (e.g., Scotch 33 or Scotch 88) (when required) shall be applied when taping bus bars with battery potential.

2.4.2 The Installation Supplier shall tape the portion of the battery return bar in close proximity to live untaped exposed terminals, studs, etc. In power rooms or in power board lineups containing power exclusively, taping is not required.

2.4.3 Bus bars, studs, nuts and details having 150 volts or more to ground shall be taped with 2 layers of friction tape, unless protected by enclosures or barriers.

2.4.4 Power panels and power boards having 150 volts or less shall have exposed details taped when located in open type frames, racks, boards and bays. In power rooms or in power board lineups containing power exclusively, taping is not required.

3. **STORAGE BATTERIES**

3.1. **General**

3.1.1 Batteries shall not be unpacked until the battery stand installation is complete and the Installation Supplier is ready to install the batteries.

3.1.2 The Installation Supplier shall not place cells of different manufacturers in the same string. Unlike strings, however, may be placed in parallel.

3.1.3 When cells in a string are replaced, the replacing cells shall have the same ampere-hour capacity, the same number of plates and shall have the same manufacturer.

3.1.4 Battery cells shall not be moved using the intercell connectors, cell posts or covers.

3.2. **Cautions**

3.2.1 While batteries are being charged, the Installation Supplier shall post temporary warning signs in conspicuous locations near the batteries as follows:

**WARNING:** BATTERY GASES ARE FLAMMABLE. NO SPARKS OR OPEN FLAME NEAR CELLS.
3.2.2 If a cell does not have an operative anti-explosion feature, and it is necessary to open the circuit at the battery, observe the following precautions:

a) Provide maximum ventilation.

b) Allow the cell to stand at least 1/2 hour on open circuit or on float voltage. If the cell has vent plugs, remove them.

3.3. **Shipping Batteries for Removal or Reuse Move to Section V.**

3.3.1 When batteries are removed for non-reuse, procedures described in section V shall be followed.

3.3.2 Vents shall be covered with a shipping cap.

3.3.3 Filling tubes shall be plugged and terminals shall be protected against short circuits with tape, caps or protective packaging.

3.3.4 Each container or unit shall be marked with proper identification and address of the assignee and consignor. Also a label, 4” x 4” with the word “corrosive” shall be applied to each container or unit.

3.4. **Cell Unpacking, Cleaning And Inspection**

3.4.1 Flooded battery cells shall remain in their protective packaging or be protected from damage until commencement of battery installation.

3.4.2 All cells shall be cleaned and neutralized thoroughly as soon as practical after they arrive on the job. Use a wet cloth in a baking soda solution, squeeze out sufficiently, and wipe thoroughly to neutralize cell top and sides. Ensure that posts, post holes and post seals are thoroughly cleaned.

3.4.3 After neutralization has been completed, the Installation Supplier shall remove salts and residue with water, wet cloth and frequent rinsing.

3.4.4 Solvents, mineral spirits, commercial detergents, ammonia, or other cleaning compounds or oils, waxes or polishes shall never be applied to the cell jar or lid. When such information is not provided in the job documentation (e.g., cell manufacturer's documentation) only water and baking soda may be used.

3.4.5 The Installation Supplier shall make a visual inspection of 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.

3.4.6 When uncrating cells, the Installation Supplier shall check for stains or discoloration in the packing material to locate damaged or defective cells.

3.4.7 The Installation Supplier shall install explosion proof vents when cells are first unpacked.

3.4.8 In high seismic areas, batteries awaiting installation shall be secured.

3.4.9 Unpacked batteries awaiting installation shall not be covered with a tarp.
3.4.10 Upon installation of a new battery string, the Installation Supplier shall inspect and verify that all voltage-matching stickers are of like color prior to their initial charge. The only exception being round cell technology, which does not supply the stickers. In the event that the entire string does not have like colored voltage-matching stickers the Installation Supplier shall notify the SBC LEC Power Equipment Engineer for direction before proceeding.

3.5. Pressure Testing

3.5.1 The following testing requirements apply only when ordered by the SBC LEC Equipment Engineer, or if any battery leakage is found in any of the cells during unpacking:

a) The Installation Supplier shall pressure test all cells. The cells shall be pressure tested after placement onto the stand to assure that they were not damaged during placement. The Installation Supplier may choose to perform an additional pressure test prior to placing cells on the rack (to avoid placing a leaker). This, however, does not replace the “on the rack” test.

b) Cells, posts and cover seals shall withstand a pressure of 1/2 pound per square inch for one minute without any noticeable loss in pressure. Do not over pressurize the cells.

c) Document the results of the pressure test on the Pressure Test Record (Figure M-1).

3.5.2 Pressure Test Records shall be turned over to the SBC LEC Equipment Engineer at the completion of the job.

3.5.3 The Installation Supplier shall notify the SBC LEC Equipment Engineer, as soon as practical, if a cell does not pass pressure tests.

3.5.4 Cells that do not pass the pressure test shall not be connected until the cell has been fixed and passed a retest, or is replaced.

3.6. Electrolyte Spills

3.6.1 All spills shall be contained and reported to SBC Environmental Management at:

a) Ameritech: 1-877-648-2073
b) Pacific Bell/Nevada Bell: 1-877-823-9833
c) SNET: 1-877-648-2073
d) Southwestern Bell: 1-800-854-5825

3.6.2 Refer to section V, TP 76300MP for additional requirements concerning Electrolyte spills.

3.7. Battery Water

3.7.1 The Installation Supplier shall bring the electrolyte up to the required level using only distilled or de-ionized water.

3.8. Battery Preparation
3.8.1 The Installation Supplier shall notify the SBC LEC Equipment Engineer if the electrolyte is above the upper level line when the cells are received at the job site. Excess electrolyte shall NOT be removed at any time by the Installation Supplier.

3.8.2 A Storage Battery Charge Report (see Figure M-2) shall be maintained on each battery throughout the installing and charging phases of battery installation. A completed copy of the Storage Battery Charge Report shall be provided to the SBC LEC Representative at job completion.

3.8.3 The Installation Supplier shall check the installed batteries for the presence of crystals. If crystals or other defects are detected, notify the SBC LEC Equipment Engineer. The Installation Supplier shall note the presence or absence of crystals on the Storage Battery Charge Report.

4. BATTERY RACKS

4.1. General

4.1.1 Battery racks shall be positioned, assembled, aligned, grounded, designated and installed as specified in the job documentation, TP 76300MP, and the rack manufacturer's documentation.

4.1.2 All non-metallic battery racks shall be equipped with a connection point for an ESD wristband and have a #6 AWG ground lead run from the battery rack to the CO ground system.

4.1.3 The following are minimum clearances, as measured at the floor, between a battery rack and other battery racks, equipment, and non-movable obstructions. The Installation Supplier shall notify the SBC LEC Equipment Engineer if the minimum requirements can not be met.
   a) Adjacent or parallel racks - 30 inches.
   b) Double row rack and a wall - 30 inches.
   c) Equipment or bays - 30 inches.
   d) Walls - 30 inches. This applies to the end of a rack where the length of the rack exceeds 72 inches. A single row rack parallel to a wall should be a minimum of 8 inches from the wall, unless otherwise specified in the detail specification.

4.1.4 On a two-tier, two-row, two-string, battery rack the battery strings shall have cells 1 through 12 on the bottom tier and 13 through 24 on the top tier.

4.1.5 In high seismic zones, cell separators shall be installed between battery cells.

4.1.6 In low seismic zones, cell separators shall be installed between battery cells if provided.

4.1.7 Styrofoam packing material shall not be used as separators.

4.1.8 When tie rods are required for seismic protection on a battery stand installation, it is permissible to double nut the battery stand tie rod on both ends.

4.1.9 In low seismic zones, cells shall not touch each other or adjacent framework.
   a) The spacing between the cells in a row shall be 3/8" to 5/8".
b) The spacing between the rows of cells shall be greater than \(\frac{3}{4}\)".

4.2. Battery Cabling

4.2.1 Size 4/0 flexible type wire (welding cable) is the standard size and type to be used on all cells through 1680 AH. Minimum size 350 kcmil, flexible type power wire is to be used on 3000 to 4000 AH cells.

4.2.2 Cables between the battery posts and battery bus bar shall be installed as shown in Table M-3.

4.2.3 Cable runs, from bus bar drop plates to cell posts shall have sufficient slack to allow 6 inches of movement.

4.2.4 The Installation Supplier shall install the same quantity of inter-tier and inter-shelf conductors.

5. CHARGING STORAGE BATTERIES

5.1. Charging

5.1.1 Before charging is started, the Installation Supplier shall designate the cell with the lowest specific gravity as the Temperature Reference Cell (a.k.a. pilot cell). The Temperature Reference Cell shall be located on the lower shelf of the stand. Do not place the Temperature Reference Cell on the end of a stand, near a window, or near a heating/cooling vent.

5.1.2 When more than one string is charged in parallel, the Installation Supplier shall select a separate temperature reference cell for each string.

5.1.3 The Installation Supplier shall record the temperature reference cell number in the appropriate box on the Storage Battery Charge Report (Figure M-2). Indicate number of strings charged in parallel and voltage regulation employed.

5.1.4 The Installation Supplier shall insert a thermometer in the temperature reference cell so the temperature reading can be taken without touching the thermometer. The temperature reference cell is selected for the purpose of temperature measurement for the hours of charge.

5.1.5 The Installation Supplier shall provide its own portable battery charger with a protective fuse device.

5.1.6 Before installation, batteries shall be charged in accordance with manufacturer’s recommendations.

5.1.7 When using a voltage regulated charger delivering at least 12 amps, the Installation Supplier shall monitor the initial charge.

5.1.8 Just before the start of initial charge, the Installation Supplier shall measure the cell temperature of the TR cell and determine the total length of initial charge requirement by referring to corresponding Cell Temperature column and Time On Open Circuit column of Table M-2. The required time on charge begins at the time that the voltage and current have reached steady state operation.
5.1.9 The Installation Supplier shall ensure that adequate ventilation is present to prevent the hydrogen concentration from reaching the 1 percent level at any time during the charging process. Warning signs shall be placed near the charge area.

5.1.10 Explosion proof vent caps and shipping plugs (for the electrolyte draw off tubes) shall be firmly in place on each cell during cell charging activities.

5.1.11 Unless properly grounded with an ESD strap, the Installation Supplier shall avoid all contact with cells during charge and for 24 hours after completion of charge.

5.2. Charging Records

5.2.1 The Installation Supplier shall complete the Storage Battery Charge Report (Figure M-2) for each battery string. Document the voltage, specific gravity and temperature of each cell at the following intervals.

a) Prior to start of initial charge (indicate in Initial Charge section of Figure M-2)

b) 72 hours after end of initial charge

c) At time of turnover (batteries on float charge only).

5.2.2 The Installation Supplier shall document (on the Pilot Cell Charge Report, Figure M-3) 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 for the first eight hours of charge.

c) Three times a day after the first eight hours of charge.

d) Just before charging is stopped or temporarily discontinued.

e) When charging is restarted (if initial charge is interrupted) and the charge current is stable.

5.2.3 All Storage Battery Charge Reports shall be placed in the central office retained battery records book or separately turned over to the SBC LEC Representative. A copy shall be placed in the yellow wallet.

5.3. Electrolyte Level

5.3.1 While batteries are on initial charge, the electrolyte level may rise above the maximum level line. If it should become necessary to remove electrolyte to prevent overflow, the Installation Supplier shall make note of removals on the battery initial charge records. Retain electrolyte for possible reuse.

5.3.2 Electrolyte not reused shall be disposed of in accordance with Section V, TP 76300MP.

5.3.3 After the initial charge distilled water shall be added to bring the electrolyte midway between the lower and upper level lines. If the electrolyte level exceeds the high mark, the Installation Supplier shall note on the initial battery charge report in the comment section the high level.
5.4. **End Of Initial Charge Crystal Identification**

5.4.1 Before stopping the initial charge, the Installation Supplier shall record the following for each cell on the Storage Battery Charge Report:

a) Voltage  
b) Specific gravity  
c) Electrolyte temperature.

5.4.2 After a satisfactory initial charge, there shall be no crystals or discoloration present on the plates when examined with a flashlight.

5.4.3 Cells that are not free of crystals after the initial charge may contain an internal short. If some cells still have crystals after the initial charge, it is recommended that the battery string be continued on boost charge at 2.5 to 2.55 volts for a total charge time not to exceed 250 hours for both charges. If charging fails to clear the crystals within 250 hours, the cells shall be referred to the SBC LEC Equipment Engineer for investigation and/or replacement.

5.5. **Turnover**

5.5.1 The Installation Supplier shall ensure that the full-charge specific gravity of each cell meets the manufacturer’s documentation and does not vary by more than 0.015 (15 points) per cell.

5.5.2 Cell voltage shall have a measurement between 2.13 and 2.22 volts.

5.5.3 All charged strings shall remain on continuous uninterrupted float voltage of 2.17 volts per cell until put on-line.

5.6. **Valve Regulated Cells**

5.6.1 The manufacturer recommendation and forms shall be utilized for installation of valve regulated cells.

5.6.2 The Installation Supplier shall record individual battery conductance values before battery charge.

5.6.3 Valve regulated cells shall have a float voltage measured at 2.25 volts, plus or minus 0.05 volts.

6. **STRING TRANSITIONS**

6.1. **General**

6.1.1 The Installation Supplier shall ensure that temporary wiring for transition batteries is never less than two 4/0 or one 500 kcmil for 1680 AH and smaller or two 500 kcmil for strings larger than 1680 AH.

6.1.2 The installation supplier shall ensure that the battery string to be transitioned is on a stable float charge, not under discharge, recharge, or subject to recent discharge at the time the string is opened. Only one string should be taken off line at a time. When opening a string,
the installation supplier shall cover cable ends by taping on a heat shrink cap after removing bolt assemblies.

6.1.3 When necessary, the transition string voltage should be raised to adjust voltage differences to 0.05 volts or less. A decision to lower the plant voltage shall be done only with the concurrence of the SBC LEC Representative. The plant voltage shall never be lowered more than 4.0 volts from the normal float voltage for a -48 volt plant and 2.0 volts for a 24 volt plant.

6.1.4 In all cases, the plant voltage shall be kept within the operating limits of the equipment served by the battery plant.

7. **AC POWER**

7.1. **General Purpose Outlets**

7.1.1 While work is being done on AC circuits, fuses shall be removed or switches opened whenever it is practical to do so without causing a service interruption.

7.1.2 When work is being performed that requires removing the electrical potential from an operating circuit, the circuit shall be identified with a "**Warning - Working on Circuit**" tag at the AC source. The tag shall only be removed by the person performing the work.

7.1.3 An Alternating Current Equipment Ground (ACEG) lead shall be provided with each AC circuit. When a conduit contains more than one AC circuit, one ACEG lead may be used if properly sized per the NEC.

7.1.4 The spacing of AC outlets shall be every third bay, not to exceed 10 feet in equipment frames. A single or stand-alone frame should have an outlet provided or placed in the base.

7.1.5 AC outlets shall be mounted flush and equipped with a cover plate.

7.1.6 The Installation Supplier shall ensure that the grounding and polarity of AC outlets are correct, verified and recorded on the test record.

7.1.7 The entire length of the metallic raceway or conduit shall provide a continuous conductive path.

7.1.8 The Installation Supplier shall install bushings, nipples or connectors to protect wiring. Exposed AC conductors shall not be in contact with edges of metal frameworks, boxes or raceways (e.g. running through a knockout).

7.1.9 Isolated ground AC outlets (orange) shall not be provided, except as specified in the detail specification.

7.1.10 Dedicated AC outlets shall be installed in the same bay/frame as the unit the outlet serves.

7.1.11 The Installation Supplier shall install a green ACEG lead for all AC lighting fixtures.

7.1.12 Wire and cable utilized to distribute AC power shall be exclusively copper conductors.

7.1.13 A wire nut shall be used to cover the exposed ends of all AC conductors.

7.2. **Conduit**
7.2.1 Rigid metallic conduit, intermediate metal conduit, EMT or JMC cable etc. shall be utilized for all AC circuits.

7.2.2 PVC type conduit shall not be used as an AC raceway.

7.3. Branch Circuits

7.3.1 When adding new branch circuits, fluorescent lighting or extending existing circuits, the Installation Supplier shall verify that no additional connection is made between the added neutral (white wire) and the required green wire ground (ACEG).
TABLE M-1 – SUMMARY OF CHANGES IN SECTION M

<table>
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<th>Change</th>
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<th>Item in this Issue</th>
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### TABLE M-2--TOTAL HOURS OF CHARGE AT 2.50 - 2.55 VOLTS PER CELL

(NOTE A)

<table>
<thead>
<tr>
<th>Time (T) on Open Circuit (Note C)</th>
<th>Cell Temperature - Measured at Open Circuit Voltage (Note B)</th>
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<tbody>
<tr>
<td></td>
<td>81 Degrees (F) and above</td>
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<tr>
<td></td>
<td>65 - 80 Degrees (F)</td>
</tr>
<tr>
<td></td>
<td>64 Degrees (F) and Less</td>
</tr>
<tr>
<td><strong>T ≤ 4 months</strong></td>
<td>100 hours</td>
</tr>
<tr>
<td></td>
<td>150 hours</td>
</tr>
<tr>
<td></td>
<td>200 hours</td>
</tr>
<tr>
<td><strong>4 months &lt; T ≤ 6 months (lead calcium)</strong></td>
<td>150 hours</td>
</tr>
<tr>
<td></td>
<td>200 hours</td>
</tr>
<tr>
<td></td>
<td>250 hours</td>
</tr>
</tbody>
</table>

**NOTES:**

A. Total charging time should not exceed 250 hours.

B. Cell temperature will be determined by selecting a “Temperature Reference Cell.”

C. Time on open circuit is determined from the “charge by” date on the shipping container. The “Charge By” date is that date when the open circuit time will be 6 months.
### TABLE M-3--CONDUCTORS FOR BUS DROP TO CELL POSTS

<table>
<thead>
<tr>
<th>Cells AMP HR Capacity</th>
<th>8 HR Rate</th>
<th>Conductors</th>
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<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Size</td>
</tr>
<tr>
<td>&lt;420</td>
<td>1</td>
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</tr>
<tr>
<td>&gt;420</td>
<td>2</td>
<td>4/0</td>
</tr>
<tr>
<td>&lt;840</td>
<td>2</td>
<td>4/0</td>
</tr>
<tr>
<td>&gt;840</td>
<td>4</td>
<td>4/0</td>
</tr>
<tr>
<td>1680</td>
<td>4</td>
<td>4/0</td>
</tr>
<tr>
<td>&gt;3500</td>
<td>4</td>
<td>350 kcmil</td>
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FIGURES M-1, M-2 AND M-3

A reproducible copy of a Pressure Test Record (Figure M-1), Storage Battery Charge Report (Figure M-2) and Pilot Cell Charge Report (Figure M-3) are provided on the following pages.
# PRESSURE TEST RECORD

<table>
<thead>
<tr>
<th>Battery Manufacturer:</th>
<th>Model:</th>
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<tbody>
<tr>
<td>Installation Supplier:</td>
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</tbody>
</table>

## 1/2 PSI PRESSURE TEST CHECK LIST

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<tr>
<th>OFFICE</th>
<th>STRING ID</th>
<th>CELL NO.</th>
<th>SERIAL NO.</th>
<th>WHEN RECEIVED</th>
<th>&quot;ON RACK&quot; TEST</th>
<th>SPECIFIC GRAVITY</th>
<th>CELL VOLTAGE</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Prior to initial Charge</td>
<td>Prior to initial Charge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>To Select Pilot Cell</td>
<td>For Records Only</td>
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</table>

To Select Pilot Cell
For Records Only
<table>
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<tr>
<th>OFFICE CLLI</th>
<th>PLANT ID</th>
<th>STRING ID</th>
<th>TELCO JOB NO.</th>
<th>BATTERY MANUFACTURER</th>
<th>Sheet ( ) of ( ) sheets.</th>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>OFFICE ADDRESS</th>
<th>CELL TYPE</th>
<th>MANUFACTURE DATE</th>
<th>INSTALLATION SUPPLIER &amp; DATE INSTALLED</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

**READINGS 72 HOURS AFTER END OF INITIAL CHARGE.**

**DATE:**

**FLOAT READINGS AT TURNOVER DATE:**

**DATE:**

**INITIAL CHARGE**

| CELL NUMBER AND SERIAL NUMBER | Crystals (Round Cells) | Y=Yes  | N=No | Volts In Excess Of 2.000 | S. G. In Excess Of 1.000 Corrected | Temp. In Degrees ºF. | Volts In Excess Of 2.000 | S. G. In Excess Of 1.000 Corrected | Temp. Degrees ºF. | Date | Hour Of Charge | Charge In Amps | Cell Voltage | S. G. corrected | Temp In ºF. | Pilot Cell No. |
|------------------------------|------------------------|--------|------|--------------------------|-----------------------------------|----------------------|--------------------------|-----------------------------------|----------------------|------|---------------|--------------|-------------|----------------|-------------|---------------|-------------|
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |
|                              |                        |        |      |                          |                                   |                      |                          |                                   |                      |      |               |              |             |                |             |               |

<table>
<thead>
<tr>
<th>Average Cell Voltage</th>
<th>Total Hours Of Charge</th>
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**Comments:**

Measurements By:
Use a separate form for multiple strings

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<th>Reading Reqnt.</th>
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<th>Time:</th>
<th>Charge Current</th>
<th>Charge Voltage</th>
<th>Temperature</th>
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<tr>
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<tr>
<td>4</td>
<td>3 hours</td>
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<td>5</td>
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1. GENERAL

1.1. Introduction

1.1.1 This section covers requirements to protect equipment from Electrostatic Discharge (ESD).

1.1.2 Changes in this issue of Section N are summarized in Table N-1.

1.1.3 The term circuit pack is equivalent to terms such as plugs, plug-ins, plug-in units, printed wiring boards, circuit boards, packs, cards, etc.

1.1.4 All equipment containing solid state electronic components is considered ESD-sensitive.

1.2. General Requirements

1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.2.2 The Installation Supplier shall provide the necessary apparatus to prevent Electrostatic Discharge (ESD) damage to sensitive devices.

1.2.3 Static generating material shall be kept out of work areas where circuit packs are handled.

2. ESD CONTROL HARDWARE - PLACEMENT AND USE

2.1. Wrist Straps

2.1.1 A grounded wrist strap shall be worn at all times when handling a circuit pack that is not inserted in equipment or its protective storage/shipping container. A wrist strap may also be required by an equipment vendor’s documentation when performing installation and/or maintenance operations.
2.1.2 To maintain continuity between the wearer’s skin and the wrist strap ground point, the band of the wrist strap shall be properly adjusted.

2.2. **Wrist Strap Testing and Testers**

2.2.1 At minimum, the wrist strap assembly shall be tested each day it is used to assure proper operation. It must be replaced or repaired when found defective.

2.2.2 The Installation Supplier shall test the integrity of the wrist strap assembly. A Go/No-Go type wrist strap tester using both audible and visual indicators should be used for testing the wrist strap assembly. In the absence of a wrist strap tester, the wrist strap assembly shall be tested with a volt-ohm meter (VOM). The reading shall be greater than 750 kilo-ohms and less than 1.2 meg-ohms.

2.2.3 When a wrist strap assembly is tested, the band shall be properly adjusted to the wrist, then the cord shall be stressed from side to side and subjected to a pulling stress to discover intermittent conditions. This dynamic test helps detect open cords or improperly adjusted or dirty bands.

2.3. **Wrist Strap Grounding Points**

2.3.1 The wrist strap shall be connected to the bay mounted grounding jack, if the bay is so equipped. An alligator clip shall be used to connect a wrist strap to an effective grounding point in equipment not equipped with a grounding jack. Any unpainted screw, nut, bolt, equipment mounting plate, etc., is considered an effectively grounded point. Note: An ESD grounding jack mounted on the manufacturer’s equipment shelf may not offer a viable path to the CO ground and should not be used. A bay or frame mounted jack should be used.

2.4. **Static-safe Work Station and Field Service Kit**

2.4.1 An ESD Field Service Kit provides a portable static-safe workstation well suited for use at all sites and in CEVs and SLC huts not equipped with ESD protective material. An acceptable kit shall include a wrist strap and cord, a grounding cord, and a static dissipative mat that folds out to create a work surface mat. The mat should include pouches that can be used as a temporary means to transport circuit packs while not in their protective shipping/storage containers.

2.4.2 A static-safe workstation shall be created and used at any location where personnel will handle bare circuit packs. At minimum, the workstation shall be equipped with a wrist strap assembly, a wrist strap grounding point, and a static dissipative surface on which a circuit pack can be placed. A circuit pack’s static-safe shipping/storage container meets the requirement for a static dissipative surface.

2.4.3 Items not allowed at static-safe work stations include:

   a) a highly conductive work surface, unless it is covered with a static dissipative material
   b) any static-generating material not absolutely required at the work station
3. CIRCUIT PACK STORAGE AND HANDLING

3.1. Circuit Pack Storage

3.1.1 When a circuit pack is removed from an equipment shelf, bank, module, etc., the circuit pack shall immediately be placed in a static-safe container. A circuit pack shall not be removed from its container except for installation into equipment or for maintenance at a static-safe workstation (setting option switches, etc.).

3.1.2 A circuit pack storage container shall be one of the following:
   a) The circuit pack's original static-safe shipping container
   b) An approved third party static-safe container
   c) An approved static-safe wrapping

Note 1: While static-safe containers are the preferred method of storage, it is acceptable to store bare circuit packs in an existing circuit pack storage frame or cabinet that is a component of an approved equipment system, such as DMS-100F switches.

Note 2: A number of static-safe transport cases for circuit packs have been approved for use in the SBC LECs. The purpose of these cases is to transport circuit packs; they should not be used in place of storage cabinets.

3.1.3 Metal circuit pack storage cabinets shall be grounded. The requirements below are based on the storage cabinets being one or a combination of the following:
   a) Any general purpose type metal storage cabinet (wall locker, etc.) that has been braced per applicable storage unit bracing requirements using a metallic angle secured to the wall and/or floor and the top and/or bottom of the cabinet(s), an enclosure that is a component of an approved for use equipment system, or
   b) A storage cabinet that has been approved as a stand-alone type (floor support only)

3.1.4 A single circuit pack storage cabinet or a group of cabinets shall be grounded using minimum #6 AWG conductor. This connection shall be made to the common bonding network or the isolated bonding network as applicable.

3.1.5 When more than one storage cabinet is used, the cabinet grounds shall be daisy chained or connected per Figure N-1.

3.1.6 With the exceptions that single hole connectors and a daisy chain arrangement are allowed, all other installation and material requirements for grounding of cabinets shall meet the requirements of Section H of TP 76300MP.

3.2. Handling and Transportation Guidelines.

3.2.1 While ESD events can affect working equipment, a circuit pack is most vulnerable while not installed in equipment or in a static-safe shipping/storage container. The following guidelines shall be followed to avoid ESD damage:
a) Wear a properly grounded wrist strap assembly before working on or handling circuit packs.

b) Handle a circuit pack by its edge only; avoid touching contacts of the edge connector.

c) Avoid touching the individual components of a circuit pack.

d) Keep the circuit pack in its original shipping container or static-safe protective container until ready for use.

e) When transporting a circuit pack, place it in static-safe cardboard and/or a static-safe plastic bag or use a protective circuit pack container. The container shall be fire retardant if left in an open area or placed on open shelving to meet local fire codes.

f) Never place static generating material, like documents, inside a static-safe container.

g) Store circuit packs on approved suitable shelving. Avoid storing them in equipment bays not specifically designed as a storage area. Circuit packs stored in non-approved shelving and/or bay should be kept in a static-safe fire retardant container.

h) Unprotected circuit packs shall only be placed on a static-safe work surface in a single layer; circuit packs should not be placed on top of each other.

i) A circuit pack shall be accepted only when it is in an approved ESD protective container.

j) Containers are not to be opened unless wearing appropriate wrist strap assembly.
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FIGURE N-1 – TWO METHODS FOR GROUNDING CIRCUIT PACK STORAGE CABINETS

- #6 AWG to nearest effectively grounded metallic object
- Crimp type C-tap
- Steel angle brace bolted to the cabinets and the wall

[END OF SECTION]
1. GENERAL

1.1. Introduction

1.1.1 This section covers SBC LEC requirements for running and terminating fiber optic cables and jumpers.

1.1.2 Changes in this issue of Section O are summarized in Table O-1.

1.2. Requirements

1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.2.2 The entire length of a polyethylene sheathed fiber optic cable run shall be placed on ladder type cable rack.

1.2.3 The Installation Supplier shall not install innerduct for use with polyethylene sheathed fiber optic cable in the central office environment.

1.2.4 Fiber optic cable troughs shall not be run through floor penetrations.

1.2.5 Additional fiber optic cabling requirements may be found in section J, TP 76300MP.

1.2.6 Refer to section L, TP 76300MP for Fiber Optic Warning Label requirements.

2. RUNNING, SECURING AND FIRESTOPPING FIBER OPTIC CABLE

2.1. Running Fiber Optic Cable

2.1.1 When the fiber optic cable enters the building in conduit, any slack shall be stored in the cable vault or cable entrance facility area, so that the cable can be pulled back and reterminated or spliced.
2.1.2 Whenever the building has no cable vault, any fiber optic cable slack shall be stored at the entrance facility. The stored length shall not exceed 50 feet. If the fiber optic cable has metallic strength members or a metallic shield, no more than fifty (50) feet of cable shall be pulled into the central office.

2.1.3 When the fiber optic cable is direct buried and does not enter the CO in conduit, it can not be pulled back and slack shall not be stored in the cable vault.

2.1.4 Fiber optic cable shall be run on cable rack, or dedicated metallic conduit, from the cable vault and/or cable entrance facility to the fiber optic terminating bay.

2.1.5 Unless directed otherwise by the detail engineer the installation supplier shall run fiber optic cable on or in dedicated fiber optic horizontal cable racks or raceways.

2.1.6 All OSP cable entering a building, for more than 50 feet, that is not riser rated shall transition to an approved riser rated cable or a properly firestopped metallic raceway prior to leaving the CEF. All exposed lengths of non-riser rated OSP cable entering a CEF within an equipment area shall be wrapped with overlapping layers of aluminum duct tape to protect the cables from exposure to an equipment room fire.

2.1.7 The cable shall not be run on dedicated power cable racks.

2.1.8 The cable shall be run straight on the cable rack and shall not hang off the side or run across an open area.

2.1.9 To avoid the premature exhaustion of available cable space, excess cable of individual fiber optic cable runs shall not be stored on or in fiber optic raceways.

2.1.10 Fiber optic cable connectors shall be covered and protected with the manufacturer’s dust caps during installation.

2.1.11 Fiber optic cables/jumpers shall be installed and/or secured in a manner that protects them from damage.

2.2. Fiber Optic Cable

2.2.1 On vertical runs, the cable shall be secured at every strap.

2.2.2 Horizontal runs of cable on cable racks shall be secured as necessary to, maintain a straight run, and flow of the bends. The cable shall be secured at points of breakoff from the cable rack.

2.2.3 Intrafacility cable (IFC) or OSP fiber cables need not be protected due to their protective sheath.

2.2.4 Fiber optic cable shall be secured with two (2) strands of 9 ply polyester twine. A maximum of two cables shall be placed under 1 stitch.

2.2.5 Plastic tie wraps shall not be used to secure fiber optic cable inside the building.

3. FIBER OPTIC PATCHCORDS

3.1. Requirements
3.1.1 Fiber optic patchcord is defined as the fiber link between the network element and the FOT shelf in the FDF or equivalent. Fiber optic jumper is defined as the fiber link or cross-connect within the FDF or equivalent.

3.1.2 Fiber optic patch cords shall not be run on cable racks.

3.1.3 Fiber optic patchcords shall be run in dedicated troughs of fiber protection systems. New fiber raceways will be installed using the approved fiber protection system. The following requirements apply to the installation of fiber protection systems:

   a) Solid-walled raceway shall be used for horizontal runs. The raceway shall be installed with covers where room permits. Covers shall face the ceiling and no side ways mounting of raceway is allowed. Auxiliary framing, conduit, cable racks, etc. shall not obstruct the opening of the raceway covers.

   b) Slotted or solid vertical ducts with covers and appropriate elbow sections shall be used on the framework upright between the fiber trough and the equipment break off points. The vertical ducts shall be mounted with covers facing the aisle.

   c) Split harness protective sheathing or spiral wrap shall be used, if necessary to protect individual fibers and maintain minimum bending radius where the fibers enter or exit the fiber ducts or at other locations where the fibers need protection. The fibers protected by spiral wrap will fit loosely in the spiral wrap. No more than half the capacity of the spiral wrap shall be used.

3.1.4 At the FDF the fiber protection system (trough) shall be mounted above, beside or below, but not on, the cable rack in the front of the bay. If possible, the fiber protection system shall be mounted at or near to the 7' level. At the network element the fiber protection system shall be on the front of the bay.

3.1.5 When placing or extending FPS, the Installation Supplier shall place numerical markers on the entire horizontal run at 5’ increments beginning at the FDF (i.e. 5, 10, 15, 20 etc.). This will aid in determining the proper length of the patchcords. On all new installation projects that require a patchcord be placed in an existing FDF the 5’ increment markers shall be placed at this time.

3.1.6 Fiber optic patchcords shall not exceed the total required length by more than (10’) ten feet. Store excess patchcord slack at the network element end only, while maintaining the minimum bending radius.

3.1.7 Protective caps shall be placed on the ends of a fiber optic jumpers and patchcords during installation, and on the ends of an unterminated fiber optic jumpers or patchcords. The protective caps are used to prevent scratching the end of the jumper, which would increase loss and/or cause errors and accidental exposure to laser light.

3.1.8 Vertical portions of the fiber protection system on frame upright shall have support brackets at the top and bottom and every 18 inches between the top and bottom.

3.2. Fiber Optic Warning Labels

3.2.1 Fiber Optic Warning Labels shall be installed per Section L, TP 76300MP.
### TABLE O-1 – SUMMARY OF CHANGES IN SECTION O

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[END OF SECTION]
SECTION P -- CABLE VAULT AND CABLE ENTRANCE FACILITY

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1. GENERAL ................................................................. P-1
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   1.2. General Requirements .................................. P-1
   1.3. Cable Vault .................................................. P-1
   1.4. Cable Entrance Facility (CEF) ...................... P-2

1. GENERAL

1.1. Introduction

1.1.1 This section covers the grounding requirements in the cable vault and Cable Entrance Facility (CEF).

1.1.2 Changes in this issue of Section P are summarized in Table P-1.

1.2. General Requirements

1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.3. Cable Vault

1.3.1 Each lineup of cable rack in the cable vault shall be equipped with an insulated ground bar near each cable entrance facility (CEF). Refer to Figure P-1.

1.3.2 The insulated ground bar shall normally be mounted above the top horizontal support arms between verticals 2 and 3. As an alternate location, in cable vaults with a single line-up, the insulated ground bar may be mounted on the wall.

1.3.3 All of the ground bars located in the cable vault shall be bonded to each other with a minimum 1/0 AWG conductor to form a grounding system.

1.3.4 The bonding conductor shall be run on the top horizontal and secured every 18 inches with cord.

1.3.5 A 1/0 AWG grounding conductor shall be installed from the central office ground system to the associated cable vault grounding system.

1.3.6 Each lineup of cable rack in the cable vault shall be bonded to the cable vault ground bar with a #6 AWG bonding conductor. Use a two (2) hole crimp type connector, drill the upright, remove the paint and coat contact surface with a thin coat of NO-OX-ID "A".

1.3.7 Each ST 21 Peth (polyethylene) sheath entrance cable shall be bonded to the ground bar nearest its CEF (maximum 18 cables per bar). The bonding conductor shall be a #6 AWG
conductor equipped with a single hole crimp type lug for connection to the cable splicing case. Lockwashers are required to ensure a secure connection.

1.3.8 Each new or rearranged cable with lead sheath shall be bonded to the ground bar nearest its CEF. The #6 AWG bonding conductor shall be attached to the lead sheath using a B or D bond clip. The bonding clip is normally located between the 2nd and 4th verticals. Connecting a grounding conductor to a lead sheath by soldering on existing cable is not acceptable.

1.3.9 The metallic shield of all cables, including fiber optic, entering a structure shall be bonded to the structure's ground system. In central office cable vaults, this bond is usually made at the point designated as the protection bay.

1.3.10 Foil-lined air pipes shall also be bonded to the nearest CEF ground bar. Airpipe fittings are available for this purpose. #6 AWG bonding conductors shall be used. Several air pipes may be connected together.

1.3.11 Connections to the cable vault ground bar shall be made using two (2) hole crimp type connectors.

1.3.12 All #6 AWG and 1/0 AWG bonding conductors shall be tinned, stranded and insulated.

1.4. Cable Entrance Facility (CEF)

1.4.1 The CEF is considered as the immediate area where the cables enter the building.

1.4.2 The metallic shield of a cable entering a structure shall be bonded to the structure's ground system.

1.4.3 In a CO, remote hut, CEV or customer premise location without a cable vault, an insulated ground bar shall be mounted near the CEF.

1.4.4 A 1/0 AWG conductor shall be installed from the central office ground system to the CEF ground bar.

1.4.5 Bond all cables to the CEF ground bar.

1.4.6 Multiple CEFs may be provided in a single building. When this condition occurs, a #1/0 AWG conductor shall be installed to bond all bars together.
TABLE P-1 – SUMMARY OF CHANGES IN SECTION P

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FIGURE P-1 – CABLE VAULT GROUNDING

Sketch A
Connections Between CO GRD and the Cable Entrance Facility

Sketch B
10-Position Ground Bar
(one bar required per 18 entrance cables)

Sketch C
Side View - Bus Bar Mounting and Bonding

[END OF SECTION]
SECTION Q -- EQUIPMENT REMOVAL AND CABLE MINING

1. GENERAL

1.1. Introduction

1.1.1 This section covers the requirements for equipment removal activities.

1.1.2 Changes in this issue of Section Q are summarized in Table Q-1.

1.2. General Requirements

1.2.1 The Installation Supplier shall not remove equipment from service unless authorized by the SBC LEC Representative.

1.2.2 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.2.3 Removal work shall include an analysis of the central office ground paths. Connectivity to central office ground shall be maintained for frames and bays not being removed. It is the responsibility of the Installation Supplier to maintain the integrity of the central office ground system.
1.2.4 Before removing frames or bays from a lineup, the central office ground shall be temporarily bridged to insure the ground path is not interrupted. The minimum size used for the bridge shall be a #6 AWG stranded conductor.

1.2.5 When the MGB is removed, the Installation Supplier shall maintain ground reference continuity between the battery return of the power plant and Central Office Ground (CO GRD).

1.2.6 Frame and aisle lighting, switches and appliance outlet circuits that are modified or removed will have the AC power removed and the circuit breaker or fuse tagged with an installer created “Warning Tag”, before work begins.

1.2.7 After removing fluorescent lighting or outlet circuits, verify that the remaining circuits have the correct polarity and the ACEG is continuous.

1.2.8 Ensure that all junction box holes produced by the removal of conduit etc. are plugged. All remaining, open-ended conduit shall be capped. All junction box cover plates shall be in place.

1.2.9 All holes in walls and floors created by removal activities shall be filled with approved fire stoppage products as listed in BSP 800-005-200MP.

1.2.10 All record books and designations shall be updated to reflect any revised circuit and fuse assignments, per requirements in Section L.

1.2.11 All designations on equipment remaining in an office associated with removed equipment shall be removed. This includes, but is not limited to, distributing frames, end guards, fuse and power board assignments, and DSX panels.

1.2.12 The Installation Supplier shall coordinate with the trucking, hauling or scrap company, specified in job documentation, or, as instructed by the SBC LEC Equipment Engineer, to ensure that all scrap materials are properly removed from the job site.

1.2.13 The Installation Supplier shall have at the job site a cable splicing kit capable of splicing 25 pairs of #22, #24 or #26 gauge conductors at one time.

1.2.14 The Installation Supplier shall have personnel experienced in cable tracing and splicing on the job site at all times during cable cutting operations in the vicinity of working equipment.

1.2.15 The Installation Supplier shall have an acid spill kit on site for all battery removal activities.

1.2.16 The Installation Supplier shall ensure that all battery vents and filling tubes are plugged with a shipping plug prior to shipment of batteries containing acid. Also, terminals shall be protected from short circuit with tape, caps, or protective packaging.

1.2.17 The Installation Supplier shall verify (with a clamp-on ammeter) the absence of current for each power lead to be removed. When multiple leads are being removed, the Installation Supplier shall verify the absence of current immediately before removing each lead.

1.2.18 Before the fuse at the power source end of the cable is removed, a clamp-on ammeter shall be utilized to verify the absence of current.
1.3. **Alarm Circuits**

1.3.1 Verification of all visual and audible central office and building alarms shall be conducted by the SBC LEC Representative and the Installation Supplier before job start.

1.3.2 Alarm circuits should be kept operational at all times.

1.3.3 Any alarms disconnected shall be restored and verified for visual and audible accuracy at the completion of each work shift and when removal operations are completed. Alarm verification shall be confirmed for both central office and building alarms by the remote monitoring location.

1.4. **Disconnecting Live Circuits From Service**

1.4.1 The Installation Supplier shall verify that the SBC LEC Representative has made the equipment busy and removed all associated fuses, patch cords, cross-connections, etc., before any removal operation is started.

1.5. **Clearing Trouble**

1.5.1 If trouble is encountered during removal activity, the Installation Supplier shall notify the SBC LEC Representative immediately.

1.5.2 It is the joint responsibility of the Installation Supplier and the SBC LEC Representative to promptly locate and clear service interruptions and circuit troubles.

1.6. **Protection Of Working Equipment**

1.6.1 The Installation Supplier shall protect working equipment during removal operations.

1.6.2 All materials used for protection shall be anti-static, fire retardant and approved by the SBC LEC representative.

1.6.3 When extensive equipment removal activities are required, an anti-static, fire retardant sheeting or canvas partition wall shall be constructed and placed between working central office equipment and the equipment removal area to protect working central office equipment from airborne contaminants resulting from removal activity.

1.7. **Disposition Of Removed Equipment**

1.7.1 All removed equipment shall be disposed of at the direction of the SBC LEC Equipment Engineer.

1.7.2 The Installation Supplier shall contact the SBC LEC Equipment Engineer to obtain shipping containers if containers are not specified in the detail specification.

1.8. **Use Of Cable Markers**

1.8.1 The Installation Supplier shall place a green cable marker on each cable being removed from a bay, unless all the cables associated with the bay are being removed.
2. HAZARDOUS MATERIAL

2.1. General Requirements

2.1.1 Before the removal or shipment of any equipment, the Installation Supplier shall contact the SBC LEC Equipment Engineer for instructions for the identification and handling of hazardous material.

3. RETIRED IN PLACE

3.1. Requirements

3.1.1 Hazardous material shall not be removed.

3.1.2 Equipment retired in place shall be identified by attaching a “RIP” tag or label. Place the labels on the equipment so they do not cover the identifying designations. Use stencils or other permanent methods for marking the following information on the label or tag:

   a) TEO number.

   b) Date retired in place.

3.1.3 The Installation Supplier shall not remove power supply fuses unless authorized by the SBC LEC Representative in the MOP. The Installation Supplier shall disconnect and remove all cables associated with the removed fuses.

3.1.4 The Installation Supplier shall install dummy fuses in each vacated fuse position.

3.1.5 Switchboard cable and wire terminating on the frame, bay, unit or position shall not be disconnected.

3.1.6 Switchboard cable and wire associated with the far end (i.e., distributing frame, fuse boards, other frames, bays, units or positions, etc.) shall be disconnected.

3.1.7 Vacated terminal strips shall be removed at the distributing frame.

3.1.8 Designations associated with retired equipment shall be removed from partially vacated terminal strips, end guards and DSX panels.

4. REMOVALS

4.1. Removing Frame, Bays And Units

4.1.1 The Installation Supplier shall not remove power supply fuses unless authorized by the SBC LEC Representative in the MOP. The Installation Supplier shall disconnect and remove all cables associated with the removed fuses.

4.1.2 The Installation Supplier shall install dummy fuses in each vacated fuse position.

4.1.3 When frames or bays are removed from under auxiliary framing, the auxiliary framing must be permanently supported at approximately 5'0” intervals, not to exceed 6'0". Support shall be provided using 5/8” threaded rods from the ceiling inserts or from the floor using 2” pipe...
stanchions if ceiling inserts are not available. The auxiliary framing shall be level and at the height specified on the SBC LEC cable rack drawing.

4.1.4 The Installation Supplier shall remove all far end wiring terminations associated with equipment being removed.

4.1.5 Opened alarm multiples shall be reconnected.

4.1.6 When distributing frame terminal strips are partially cleared, all wiring and designations associated with the removed circuits shall be removed.

4.1.7 When a frame or bay is removed, the floor fastener (e.g., Loxin, Hilti, etc.) shall not extend above the floor lines. If the floor fastener extends above the floor line, it shall be removed.

4.1.8 If the floor fastener is removed, the hole shall be filled.

4.1.9 The Installation Supplier shall remove the switchboard cable and wire back to the cable rack. If the cable rack is open ladder type, re-secure the cable with cord; if the cable rack is pan type, place the cable on the cable rack. Protecting the ends of dead switchboard cable is not required if the cable is on the cable rack. If the cable ends cannot be stored on the cable rack, the ends shall be covered with heat shrink.

4.1.10 If equipment is to be reused, the Installation Supplier shall:

a) Remove solder wire wrapped connections and excessive solder from rectangular terminals. Remove wire ends, clear wire holes and remove excessive solder from flat terminals.

b) Remove the unit and protect the equipment in a shipping container as specified by the SBC LEC Equipment Engineer.

c) **Not** remove the hazardous material from the frame or bay.

d) Remove the frame or bay and protect the equipment in a shipping container as specified by the SBC LEC Equipment Engineer.

5. CABLE MINING

5.1. Introduction

5.1.1 Cable mining is defined as the removal of non-working cable (power, switchboard, armored, etc.) from cable racks (vertical or horizontal) that may be mixed with working cables on the same rack.

5.1.2 Cable mining is an operation with a potentially high risk of service problems, equipment damage, personnel injury and fire hazards.

5.1.3 A bulk cable mining operation involves the removal of a significant number of dead cables from a cable route. A bulk cable mining operation does not imply that all the cables on a cable rack are dead and will be removed.

5.1.4 A dead cable is a cable that has been disconnected at both ends and cut back to a point on the cable rack, as a result of equipment removals, relocations, modifications, etc.
5.2. Requirements

5.2.1 The Installation Supplier shall immediately stop work and notify the SBC LEC Representative if any of the following job conditions are observed.
   a) Sparks, ashes, or other signs of arcing
   b) Cables that are warm to the touch
   c) Worn, frayed, or damaged insulation on working cables
   d) Armored cable.

5.2.2 The Installation Supplier shall exercise care when mining cable not to disturb H-tap covers. If an H-tap cover is opened, it shall be secured at each end with waxed cord.

5.2.3 Cable mining on vertical cable racks between floors where large cables or large amounts of cables are being removed shall be unsecured and removed no more than one floor at a time to prevent excessive unsecured cable hanging weight.

5.2.4 The Installation Supplier shall ensure that remaining cables are placed and secured in accordance with Section J of TP 76300MP.

5.2.5 The ends of dead power cables remaining after mining shall be protected with heat shrink caps.

5.2.6 If required, only a nonmetallic cable mining wedge shall be used to separate cables. The wedge shall not be driven between cables; it shall be inserted by hand.

5.2.7 Protection shall be provided for live equipment in the vicinity of cable mining and cutting operations.

5.2.8 Switchboard-type cable shall be cut initially as close to the termination of the cable at the equipment or frame as possible and mined toward its source.

5.2.9 Power cable shall be removed initially between the source protection device and the cable rack before power cable mining starts.

5.2.10 After the initial cut, the Installation Supplier shall cut cable as follows:
   a) Pull the dead cable off the cable rack until the cut end is in hand (do not, under any circumstances, cut cable loops).
   b) Pass the end of the dead cable through a cable ring cutter and cut. The cable shall be cut approximately 15 inches from the cable rack, with the hanging loose end visible.
   c) Make sure the cable does not fall into live equipment.

5.2.11 After the mining operation, all remaining cables shall be restored in accordance with the Section J of TP 76300MP.
TABLE Q-1 – SUMMARY OF CHANGES IN SECTION Q

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[END OF SECTION]
SECTION R -- PRODUCT CHANGE NOTICES AND MISCELLANEOUS INSTALLATIONS

1. GENERAL

1.1. Introduction

1.1.1 This section covers the requirements for installation suppliers performing Product Change Notice (PCN) and miscellaneous work operations not covered by a specific Telephone Equipment Order (TEO).

1.1.2 Changes in this issue of Section R are summarized in Table R-1.

2. CLASS A/AC PRODUCT CHANGE NOTICES (PCNs)

2.1. Requirements

2.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the product change documentation.

2.1.2 All applicable sections of TP 76300MP shall be observed when applying PCNs, except that use of the Job Start Agreement and MOP shall be negotiated locally.

2.1.3 The Installation Supplier shall coordinate all hardwired class A/AC PCNs that are to be applied to SBC LEC equipment with the SBC LEC Representative, to provide the necessary coverage for removing affected equipment from service, testing and restoral of equipment to service. All spare plug-ins shall be modified.

2.1.4 The Installation Supplier shall be responsible for applying any apparatus to the plug-in. After the modification has been completed the Installation Supplier shall apply the new HECI/CLEI barcode label.

2.1.5 The Job Completion Report is not required to report PCN activity only. Instead, the Installation Supplier shall provide the location and quantity of all CLEI changes (old and new), using the Report of PCN Activity form in Figure R-1, to the address provided at the bottom of the form.
3. MISCELLANEOUS WORK OPERATIONS

3.1. Introduction

3.1.1 Miscellaneous work operations include any supplier installation activity performed at an SBC LEC location that is not covered by a Telephone Equipment Order (TEO) or Product Change Notice (PCN). An example of such work would be when an Installation Supplier had to return to a job site to correct errors discovered during an audit and the TEO had already been closed.

3.2. Requirements

3.2.1 Miscellaneous work operations (e.g., warranty work, engineering complaint orders, defects correction) shall be performed according to all applicable sections of the TP 76300MP.
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FIGURE R-1 -- REPORT OF PCN ACTIVITY FORM

A reproducible copy of the Report of PCN Activity form is provided on the next page.
The following report is furnished to allow correction of SBC LEC records associated with the Product Change Notice (PCN) activity identified below:

**REPORT OF PCN ACTIVITY**

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THIS CONCLUDES THIS REPORT

Forward the completed report to:

Gwen Schumaker (gs5695@sbc.com)
2200 N. Greenville, Room 3E
Richardson, TX
[END OF SECTION]
1. **Introduction**

1.1.1 This section covers the requirements for correcting and updating central office drawings.

1.1.2 Changes in this issue of Section S are summarized in Table S-1.

1.1.3 Additional information on updating central office drawings may be found in Section 4 of TP 76400MP.

1.2. **Requirements**

1.2.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

1.2.2 All installations, removals or assignment changes shall be marked on office base drawings, if applicable, and by electronic application (i.e., ACORN, TAB/db, power database, etc.).

1.2.3 The Installation Supplier shall compare the drawings with the equipment layout and make corrections as necessary so the "final" drawings reflect the actual office layout.

1.2.4 When a drawing is marked or corrected, there is normally one (1) or more associated drawings that also require changes. The Installation Supplier shall correct the affected drawing and ALL associated drawings.

1.2.5 When corrections are required to the drawings, the changes shall be legible and marked in color. Changes to the drawings shall be made as detailed below:

   a) **Red** - Additions shall be marked or highlighted in red.

   b) **Yellow** - Removals shall be marked or highlighted in yellow.

   c) **Green** - New information concerning existing equipment shall be marked or highlighted in green. This indicates a "Record Only" change.

1.2.6 The Installation Supplier shall place one copy of each marked print in the yellow wallet and list on the separate MDR as specified in Section E.

1.2.7 When changes to the drawings are required, the affected area shall be outlined in the appropriate color. It is not necessary to color the entire area. For example, an area outlined in red indicates that everything in that area has been added. However, everything possible shall be done to clarify the correction. Small areas (e.g., units mounted in a relay rack, added fuse, etc.) may be completely shaded; bay or circuit numbers may be colored over.
1.2.8 When a small area is outlined, it requires straight lines that define the affected area of equipment; a loose circle that covers part of the adjacent equipment shall not be used. However, large isolated areas may be circled, for example, if a complete bay or frame is being removed from a front equipment drawing, a circle may be used. The whole idea is to mark the drawing so the draftsperson can accurately update the drawings.

1.3. Parameters for Drawing Changes - Additions

1.3.1 Where there is enough space to legibly enter the information, the Installation Supplier shall:

a) Outline the exact area in red.

b) Enter the information.
   1. Include locating dimensions.
   2. Use symbols to indicate bay sizes.

1.3.2 Where there is not enough space on the drawing to legibly enter the information, the Installation Supplier shall:

a) Select a nearby vacant area.

b) Draw an enlarged outline of the area. Circle the outlined area and draw a line to the intended location on the drawing.

c) Enter the new information in the outlined area.

d) Position the information exactly.

1.3.3 Additions (red) and information (green) shall not be drawn on top of removals or changes (yellow).

1.4. Parameters for Drawing Changes - Removals

1.4.1 When equipment is removed, the affected area shall be outlined or highlighted in yellow.

1.5. Parameters for Drawing Changes - Changes

1.5.1 When equipment is to be replaced, the removal location shall be outlined or highlighted in yellow.

1.5.2 The Installation Supplier shall add the changes (new information and additions) using the rules detailed above for additions. Do not add the new equipment (red) over the removed (yellow) area.

2. Relay Rack Front Equipment Drawing

2.1.1 The Installation Supplier shall show the following information:

a) Bay sketch with reference to the height and width of the bay, size of mounting plates and supplier (Lucent, Newton, Hendry, etc.)

b) Supplier equipment name or designation

c) Bay number
d) Circuit, shelf, panel, etc. number

e) Name of circuit or unit
Table S-1 – summary of changes in section S

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1. **GENERAL**

1.1. **Introduction**

1.1.1 This section covers the requirements for wiring in a manner to ensure compliance with the SBC LEC synchronization rules and policies.

1.1.2 Changes in this issue of Section T are summarized in Table T-1.

2. **REQUIREMENTS**

2.1. **General**

2.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

2.1.2 The Installation Supplier shall attach a sync assignment record book to the bay upright at or near the BITS clock.

2.1.3 Refer to section J, TP 76300MP for cabling requirements.

2.1.4 Refer to section L, TP 76300MP for labeling requirements.

2.2. **Building Integrated Timing Supply (BITS)**

2.2.1 Building Integrated Timing Supply (BITS) concept is the method of providing intraoffice synchronization. The BITS plan specifies that each office shall have one master clock called the BITS. Under the BITS concept, every timing capable network element in the office should derive its timing directly from that single source within the office. A timing capable
Network Element is defined as any digital equipment that is able to conform to the BITS concept by accepting timing from an external source. A Network Element is still timing capable even if it is not currently configured or equipped to accept external timing, as long as the option exists to allow it to be so equipped.

2.3. Synchronization Requirements

2.3.1 The installation supplier shall wire every timing capable network element within a building directly from the BITS. This timing shall not be wired through any intervening devices, other than BITS equipment.

2.3.2 Any Network Primary Reference Source (PRS) shelf shall be mounted in the same with or an adjacent bay to the master shelf. The installation supplier shall contact the SBC LEC Equipment Engineer, if the detailed engineering specifications contain instructions for mounting this equipment in any other manner.

2.3.3 The SBC LEC Equipment Engineer shall be contacted in the event of BITS DS1 output or composite clock exhaustion.

2.4. Diversity And Redundancy

2.4.1 All primary and secondary reference inputs to the clock, all power feeds to the clock, all power feeds to a dedicated BITS fuse panel and all output leads from the clock going to network elements with redundant inputs, shall be routed as described below, in order of preference.

a) Two separate and distinct cable routes between the BITS and the network element, via existing cables racks. No new racks shall be added just to provide diversity.

b) A common cable route with timing leads run on opposite sides of the cable rack. For ladder type cable racks, the synchronization cables shall be secured every third strap. When panned cable racks are provided, the cable shall be loosely tied to the inside of the cable rack stringer every six feet.

NOTE: Output leads from the clock going to network elements with non-redundant or single inputs do not require diverse routing:

2.4.2 Diverse leads run vertically within a bay shall be run down opposite sides of the bay.

2.4.3 Diverse leads, to the same network element, shall not cross at any point if physically possible.

2.5. Output Cabling Requirements

2.5.1 The timing leads from a BITS clock OUTPUT port to a network element shall be run using an approved shielded cable (currently type 1175A cable).

2.5.2 The Installation Supplier shall connect (DC/hard grounded) the shield wire at the clock end only (unless specified by the equipment vendor as electrically part of the circuit). NOTE: The shield wire shall not be connected via a DC/hard grounded at the network element. Unless otherwise specified on a SBC Standard Drawing, connection of the shield wire at the network element shall be in accordance with the manufacturer’s instructions. This may include
leaving the lead unterminated or AC connected through an appropriately sized capacitor. When the network element manufactured cables do not meet this condition, the detail engineer shall be contacted for further instructions.

2.5.3 The Installation Supplier shall not run the timing leads from the BITS clock OUTPUT to the network element input through DSX jacks unless specifically instructed to do so in the detailed specification.

2.5.4 When instructed by the detailed specification to wire the BITS OUTPUT through a DSX jack and cross connect to the network element DSX jack, the Installation Supplier should select the network element jack to be as close as possible to the modified sync jack. The T1 output of the BITS should be connected to the OUT jack, hardwired side of the DSX jack. The (IN) jack should be terminated with a 100 ohm resistor. (See Figure T-5)

2.5.5 At the network element or DSX jack appearance, the sleeve ground wire of the approved cable shall be insulated with spaghetti sleeving.

2.5.6 Where the Installation Supplier is instructed to select the BITS termination point, all critical network element timing lead termination points shall terminate only on the BITS office master shelf or one of its three expansion shelves. Critical network elements are defined as:

a) All CCS7 related equipment (STP’s, LPP’s, FLIS, IDST, Secure 7, and D4 bays serving SS7 Links).

b) Slave/Remote clock shelves.

c) Any other equipment specified by the SBC LEC Equipment Engineer or detail engineer as being “critical.”

2.5.7 The Installation Supplier shall wire all redundant timing leads to BITS in mated pairs, odd and even assignments within a shelf. Outputs shall be equally assigned between each matched set of card so that both cards will be exhausted at the same time period.

2.5.8 Redundant output timing feeds from existing cards should be routed in accordance with the existing office pattern. Redundant output timing feeds from new or vacant card slots shall be routed from alternate sides of the BITS shelf, thereby splitting the total shelf output complement in half, as viewed from the rear of the BITS shelf.

2.5.9 Redundant output timing feeds from new or vacant card slots shall be wired to associated pairs of output card slots utilizing the following or similar pair scheme, thereby reinforcing diversity of output assignments and terminations.

2.5.10 At the rear of the BITS shelf, the Installation Supplier shall butt and strip the cable sheathing in such a manner as to not allow cable sheathing to be placed on the fanning strip or within the rear protective cover of this strip.

2.5.11 All composite clock output leads to CCS7 and remote BITS equipment shall be placed in flexible plenum-rated innerduct and shall be diversely routed. This innerduct shall stop at the top of the BITS bay and the top of the network element bay.

2.5.12 All alarm and alarm return leads shall be run as a pair as specified by the job documentation.
2.5.13 Alarms shall be wired and tested as specified in the detailed specification and other sections of TP76300MP.

2.6. Input Cabling Requirements

2.6.1 The Installation Supplier shall wire all input timing references to the BITS through modified DSX sync jacks. If the BITS clock is not within DSX-1 line-up, the cabling shall be diversely routed.

2.6.2 All sync jacks shall be equipped with appropriate markers indicating SYNC. These markers should include the modified DSX jack, the originating facility jack and the terminating network element jack.

2.6.3 The appropriate sync DSX jack schematic (see figures) shall be used. The schematic within the manufacturer's BITS clock documentation shall be marked as void and shall be replaced with the actual schematic utilized.

2.6.4 For reference, the timing references, provided by the SBC LEC Equipment Engineer, are shown in Figures T-1 through T-4.

2.7. Power Requirements

2.7.1 A dedicated BITS fuse panel shall serve only BITS equipment in the same or its adjacent bay.

2.7.2 If a Timing Bridging Office Repeater (TBOR) is utilized, it shall be powered from a dedicated bits fuse panel.

2.7.3 Battery and battery return leads from the fuse panel to the BITS shall be routed down opposite sides of the equipment bay and cabled with a minimum of 16 gauge cable. A and B battery outputs of the fuse panel shall be wired in a manner to correspond to the A and B battery input of the BITS equipment. This may require the mounting of two wire support brackets, one above and one below the fuse panel.

2.7.4 Both A and B battery and battery return leads from the BDFB to the added BITS and/or BITS fuse panel shall have diverse routing.

2.7.5 All battery and battery return connections from the fuse panel to the BITS equipment shall be made with ring terminals at both ends.

2.7.6 Battery and battery returns to the BITS and/or BITS dedicated fuse panel shall originate from separate BDFBs where multiple BDFBs are currently provided on the same floor, or from diverse load supplies on single floor BDFBs.

2.7.7 Battery and battery returns to the BITS and/or BITS dedicated fuse panel that originate directly at the Power Plant shall be fused on different rows.

2.7.8 The Installation Supplier shall ensure that fuses specified by the detail engineer are provided and installed.

2.8. Grounding Requirements
2.8.1 All clock shelf chassis (frame) DC-ground leads shall be individually run and terminated. These grounds shall be cabled with a minimum of 16 gauge black wire and terminated with ring terminals or soldered to the existing ground buss within the same bay.

2.8.2 All terminations at the network element shall be dressed with heat shrink insulation or two wraps of insulated electrical tape.

2.8.3 The drain wire from the approved signal cable shall be insulated with spaghetti type sleeving.

2.8.4 If the timing lead from a network element within an isolated ground plane has a DSX appearance, the shield shall be grounded at the network element and at the BITS clock, but left unterminated at the DSX. If the lead does not have a DSX appearance, the shield shall be grounded at the network element end only.

2.8.5 Where a shield ground connection is required, verify that the ground termination pin is DC-grounded and not capacitively-coupled or grounded through a capacitor.

2.9. Cabling Requirements For SONET

2.9.1 Each SONET terminal/ADM shall be individually timed from the office BITS, with primary and secondary DS1 reference from T1 (DS1) output cards, with odd-even card slot assignments. The Installation Supplier shall not daisy chain these timing lead to enable cascading of synchronization to all terminals within a bay framework. Arrangements shall be made with the SBC LEC Equipment Engineer to install additional BITS outputs.

2.9.2 Each SONET terminal/ADM shall have the “CLOCK IN” connections (PRIMARY and SECONDARY) cabled via the approved 22 AWG single pair shielded cable, type1175A, (or approved equivalent) to the BITS. Shield lead conductors of all SONET sync input cables shall be DC-grounded at the BITS shelf only and left unterminated at the SONET terminal/ADM connector.

2.9.3 The BITS “CLOCK OUT” shall be cabled to the SONET network element “CLOCK IN” connection.

2.9.4 The network element “CLOCK OUT” connections (PRIMARY and SECONDARY) shall not be cabled if these connections are in a separate connector or are available on separate wirewrap pins from the “CLOCK IN” connectors terminating on the network element, except when required for office BITS reference.

2.9.5 The External Clock Wire Wrap (ECWW) adapter kit is the preferred method to terminate timing leads to a DB9 connector.

2.10. Removals

2.10.1 The Installation Supplier shall remove terminations at the BITS associated with removed and/or displaced network elements.

2.10.2 The Installation Supplier shall verify timing leads before they are disconnected as follows:

   a) First, verify the presence of far end ground on the unterminated shield drain wire at the network element.
b) Second, identify the cable at the BITS clock end and remove the shield drain wire.

c) Third, verify loss of ground on the shield drain wire at the network element being removed. If ground is lost, the cable shall be disconnected at the BITS clock and the network element, in that order.

d) If ground remains after the shield drain wire is removed at the BITS clock, an incorrect cable has been identified and the shield lead should be reconnected. To identify the correct leads, the Installation Supplier must trace the timing leads from the network element to the BITS clock.
TABLE T-1 – SUMMARY OF CHANGES IN SECTION T

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FIGURE T-1--SCHEMATIC OF SYNCHRONIZATION JACKS USING SECURE 7 REFERENCED SIGNAL

INPUT LEVELS INTO THE DCD SHELF MUST BE LESS THAN .3V FOR BRIDGED INPUT OR MORE THAN 1V FOR TERMINATED INPUT.

VOLTAGES MUST BE MEASURED WITH AN OSCILLOSCOPE

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.
FIGURE T-2--SCHEMATIC OF SYNCHRONIZATION JACKS USING SONET REFERENCED SIGNAL

INPUT LEVELS INTO THE DCD SHELF MUST BE LESS THAN .3V FOR BRIDGED INPUT OR MORE THAN 1V FOR TERMINATED INPUT.

VOLTAGES MUST BE MEASURED WITH AN OSCILLOSCOPE.

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.
FIGURE T-3--SCHEMATIC OF SYNCHRONIZATION JACKS USING CCS7 REFERENCED SIGNAL OR TRAFFIC BEARING T1 SPAN

* For locations where the DSX line-up is less than 5 bays and the Sync Jack is located in the middle bay. If this condition is not met, these resistors should be replaced with a strap.

** When the DSX line-up is more than 6 bays or the length of these leads exceed 15 feet, the resistors should be connected between the hardwired side IN jack of the D4 bank jack and the OUT jack of the modified Sync. jack.

INPUT LEVELS INTO THE DCD SHELF MUST BE LESS THAN .3V FOR BRIDGED INPUT OR MORE THAN 1V FOR TERMINATED INPUT.

VOLTAGES MUST BE MEASURED WITH AN OSCILLOSCOPE

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.
INPUT LEVELS INTO THE DCD SHELF MUST BE \textit{LESS THAN} \( .3 \text{V} \) FOR BRIDGED INPUT OR \textit{MORE THAN} \( 1 \text{V} \) FOR TERMINATED INPUT.

VOLTAGES MUST BE MEASURED WITH AN OSCILLOSCOPE

SHIELD TERMINATION FROM DSX TO THE BITS ARE REQUIRED. DCD-523 REFER TO NOTE 55 IN INTERCONNECT DRAWING FOR TERMINATION. DCD-ST2 AND DCD-400 SHELVES REQUIRE AN EXTERNAL GROUND SOURCE.

\textbf{INSTALLER MUST CABLE ORIGINATING OFFICE TIMING LEAD FROM THE BITS CLOCK TO THE FACILITY MUX. LOCAL TECHNICIANS WILL TERMINATE ON THE MUX AND TURN UP THE SPAN.}
FIGURE T-5--SCHEMATIC OF SYNCHRONIZATION JACK
(INPUT TO NETWORK ELEMENT)

The sleeve leads should be grounded at the BITS end only.
1. GENERAL

1.1. Introduction

1.1.1 This section covers the general requirements for the installation of stand-by engine/alternator sets.

1.1.2 Changes in this issue of Section U are summarized in Table U-1.

2. REQUIREMENTS

2.1. General

2.1.1 The Installation Supplier shall ensure, as part of the evaluation of the installation, that all work has been done in accordance with the detail specifications or approved changes to the detail specifications.

2.2. Exhaust Requirements

2.2.1 Exhaust piping and duct connection joints shall not be insulated until full load testing has been completed and the bolts have been re-tightened.

2.2.2 Exhaust piping shall have a flexible section installed within 12” of the engine/alternator set manifold. All flexible metallic conduit shall have a #6 AWG continuity bond across the flex section.
2.3.1 The Installation Supplier shall extend and terminate all specified alarm leads as designated by the SBC LEC Equipment Engineer. The terminal blocks shall be stenciled per Section L.

2.4. **Grounding**

2.4.1 The standby engine/alternator set control cabinet shall be grounded to the alternator frame with a flexible braided strap in accordance with BSP 790-100-658MP, *Standard Specification and Performance Requirements for Engine/Alternator Sets*.

2.4.2 The standby engine/alternator set control cabinet shall have an #6 AWG ground lead terminated with a two-hole crimped lug and be tagged.

2.4.3 When multiple parallel conduits are used a full sized grounding conductor shall be run in each conduit.

2.4.4 Equipment grounding conductors shall terminate within the engine/alternator cabinet provided for termination of phase conductors. Termination shall be made directly to a non-insulated ACEG bus bar.

2.4.5 To provide grounding continuity between the entire engine/alternator set and the equipment grounding conductors, the engine/alternator cabinet shall be electrically connected to the set frame in one of the following manners:
   a) By attachment hardware
   b) By a bonding strap of cross-sectional area equal to that of the grounding conductor specified.

2.5. **Connections**

2.5.1 All field wire and cable connections #10 and larger shall be made using compression type copper connectors manufactured by T&B or Burndy. The finished crimp shall be circumferential. The crimping tool or dies shall emboss the crimped connection in such a way that it may be easily identified for correct tool embossment.

2.5.2 The installation vendor shall provide means to prevent field installed connectors from tuning at termination points.

2.5.3 The standby engine/alternator set output leads (either single or three phase) shall be connected to the transfer switch, Building AC or within a junction box termination point in the following manner.
   a) The correct compression type splice connector shall be utilized when the conductors between the alternator and AC transfer switch are spliced or directly joined together.
   b) Two-hole compression terminals may be utilized with a bus bar arrangement in the junction box or AC transfer switch when this arrangement is specified.
   c) The split bolt type connectors, sometimes called kearnies, shall NOT be used.
   d) The splice or junction box shall not be mounted on the emergency, engine/alternator set mounting assembly due to vibration.
2.6. **Fuel System**

2.6.1 Engine/alternator set fuel lines that are located outside the central office and exposed shall be protected from being crushed.

2.6.2 Both the fuel and return lines shall have flexible sections connected to the engine/alternator set.

2.6.3 All field installed fuel hoses shall be of proper length without any looping, sharp bends or excessive slack.

2.6.4 All engine/alternator set fuel piping shall meet the following criteria:
   a) All fuel piping from the engine/alternator to the day tank shall be that stipulated within the Engine/Alternator Data Sheet.
   b) Pipe sealant such as Gasiola red, shall be used on all fittings.

2.6.5 Day tanks shall be equipped with spill containment dams of adequate capacity to contain the contents of the day tank.

2.6.6 Day tanks of metallic construction shall have a #6 AWG stranded and tinned grounding conductor terminated with one 2-hole compression connector and extended to the CO grounding system.

2.6.7 Any time the fuel system (i.e., Piping, day tank, fuel storage tank, etc.) from the standby engine/alternator set to any fuel tank supporting the engine/alternator set requires work, the Installation Supplier shall contact the Environmental Management Control Center (EMCC) before beginning work. The EMCC can be contacted at:
   a) Ameritech: 1-877-648-2073
   b) Pacific Bell/Nevada Bell: 1-800-757-6575
   c) SNET: 1-800-854-5825, 1-877-648-2073
   d) Southwestern Bell: 1-800-854-5825

2.7. **Guards, Labels and Nameplates**

2.7.1 All phase leads between the engine/alternator set and the control board shall be marked showing the phase rotation.

2.7.2 All piping shall be directionally labeled and isolation valves shall be position labeled.

2.7.3 All exposed surfaces with temperatures greater than 45° C / 113° F shall be marked with warning labels. Surfaces with temperatures greater that 60° C / 140° F shall be guarded as well as marked with warning labels. Non-asbestos insulation and/or ventilation guards shall be provided to protect the operator from accidental contact with the engine/alternator set exhaust system parts and piping or any other components with surface temperatures higher than 60° C / 140° F.
2.7.4 Suitable guards that meet OSHA requirements shall be provided to protect any operator from being harmed by fans, blowers, rotating parts of alternators and any other moving parts associated with the engine/alternator set to which the working personnel may be exposed.

2.7.5 All setscrews, bolts, keys or keyways shall have no projecting or sharp edges or be suitably guarded. All in-running gears and sprockets shall be completely enclosed or provided with band guards around the face of the fear or sprocket. Working personnel shall not be able to touch any rotating part.

2.7.6 The engine/alternator set AC panel shall have the power source labeled clearly.

2.8. Testing and Acceptance

2.8.1 The Installation Supplier shall verify the availability of lubricating oil and permanent antifreeze required for standby engine/alternator sets.

2.8.2 The Installation Supplier shall verify that the engine/alternator contains lubrication oils before the initial test run.

2.8.3 Installation Supplier personnel working in the vicinity of operating engine/alternator sets shall wear ear protection.

2.8.4 The engine/alternator set shall not be started until a manufacturer’s representative has performed the initial start-up.

2.8.5 The Installation Supplier shall provide resistive type load bank(s) and connection cables capable of absorbing 110 % of the engine/alternator’s rated output in kilowatts during the on site load testing.

2.8.6 The Installation Supplier shall provide a representative to assist the SBC LEC personnel in acceptance testing.

2.9. Batteries

2.9.1 Anti-corrosion coating such as No Ox ID A shall be applied to all battery terminals and connections.

2.9.2 All battery cables shall be secured to prevent chaffing.

2.9.3 The engine/alternator set start and control batteries shall be located so the cells are not exposed to excessive heat.

2.10. Radiator

2.10.1 Any radiator not located on the engine/alternator skid shall comply with all ‘remote’ radiator requirements.

2.10.2 Radiator piping and AC conduit shall not be supported by the radiator stand.

2.10.3 All radiator piping shall be painted with a high temperature outside paint.
### TABLE U-1 – SUMMARY OF CHANGES IN SECTION U

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[END OF SECTION]
INSTALLATION REQUIREMENTS
SBC Local Exchange Carriers
Section V, TP 76300MP
October 1, 2001

SECTION V – HAZARDOUS MATERIALS AND WASTE MANAGEMENT

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1.0 GENERAL

1.1 INTRODUCTION

1.1.1 This section covers general requirements for hazardous materials and waste management in SBC central offices.

1.1.2 The information in this section is not intended to be an all-inclusive guide. It is intended to provide an awareness of the types of hazardous materials that may be present in SBC central offices.

1.1.3 Proper handling and management of hazardous materials and waste is necessary to:

   a) Protect SBC employee and installation supplier’s health

   b) Protect public welfare,

   c) Maintain SBC’s corporate objective to conduct, manage and maintain its operation in compliance with environmental laws and regulations with full regard to their potential impact on the environment and the community.

1.1.4 Compliance with environmental laws and regulations is the responsibility of every person working in an SBC facility.

1.1.5 For guidance regarding hazardous materials and wastes management the SBC LEC Representative can refer to the Environmental Management web site, http://em.sbc.com, or contact the appropriate regional Environmental Management office as provided below:
1.1.6  Changes to this issue of Section V are summarized in Table V-1.

2.0 DEFINITIONS

2.1  Hazardous Materials are useable materials that exhibit one or more hazardous characteristics – corrosivity, ignitability, reactivity or toxicity (e.g. acid and alkaline batteries, fuel, engine fluids, central office switch components containing mercury and/or PCBs).

2.2  Hazardous Wastes are materials that exhibit hazardous characteristics described above and are no longer useful or valuable to its owner (e.g. spent batteries, leaking batteries, mercury and/or PCB central office switch components that are to be disposed).

3.0 REQUIREMENTS

3.1  GENERAL

3.1.1  The Installation Supplier shall adhere to all federal, state and local regulations regarding hazardous material/waste in addition to SBC LEC installation requirements.
3.1.2 The Installation Supplier shall be responsible for compliance with federal, state and local environmental regulations.

3.1.3 The Installation Supplier shall employ environmentally safe practices in the performance of their duties.

3.1.4 The Installation Supplier shall obtain the necessary environmental permits (e.g. standby engine permits), notifications (e.g. notification of regulating agency and Environmental Management) and training (e.g. Floor Drilling training) prior to the initiation of work activities.

3.1.5 The SBC LEC Representative shall direct the Installation Supplier regarding hazardous materials and waste management prior to, during and after completion of work activities.

3.1.6 The SBC LEC Representative shall adhere to guidelines and procedures established by SBC Environmental Management, available on the Environmental Management website at http://em.sbc.com, or through the regional Environmental Management office.

3.1.7 The Installation Supplier shall coordinate with the SBC LEC Representative before starting any activity related to hazardous material/waste.

3.1.8 Only vendors approved by SBC’s Environmental Management organization shall handle, remove, package, purge, transport or dispose of hazardous waste.

3.1.9 In the event of any of the following occurrences, the Installation Supplier shall immediately contact the SBC LEC representative who will contact the appropriate SBC organization:

<table>
<thead>
<tr>
<th>Type of Occurrence</th>
<th>SBC LEC will contact…</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Regulatory agency inspector visit to site</td>
<td>Environmental Management</td>
</tr>
<tr>
<td>• Accidental release/spill of hazardous material or waste</td>
<td>(In Connecticut, Indiana, Illinois, Michigan, Ohio, and Wisconsin call 1-877-648-2073; In Arkansas, Kansas, Missouri, Oklahoma and Texas call 1-800-854-5825; In California and Nevada call 1-877-823-9833)</td>
</tr>
<tr>
<td>• Accidental exposure to workers</td>
<td>SBC Corporate Safety : 1-866-SBC-SAFE</td>
</tr>
</tbody>
</table>

3.2 HAZARDOUS MATERIALS AND WASTES

3.2.1 Installation Suppliers often handle hazardous materials in the course of their work activities. Handling of hazardous wastes requires specialized training and knowledge. Therefore hazardous wastes are managed only by Environmental Management approved vendors.

3.2.2 The following hazardous materials, not to be considered inclusive, may be encountered in SBC facilities:

<table>
<thead>
<tr>
<th>Hazardous Material</th>
<th>Typical Environment Encountered</th>
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<tbody>
<tr>
<td>Material</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Asbestos</td>
<td>Floor tile, cable holes and covers, cable sheath, ceramic resistor washers,</td>
</tr>
<tr>
<td></td>
<td>asbestos textiles, asbestos sheets, generator and boiler insulation</td>
</tr>
<tr>
<td>Arsenic Trioxide</td>
<td>Cable Sheath around older cables</td>
</tr>
<tr>
<td>Electrolyte (battery acid/alkali)</td>
<td>Wet-cell, gel cell, Ni-Cd batteries</td>
</tr>
<tr>
<td>Lead</td>
<td>Lead Sheath and solder</td>
</tr>
<tr>
<td>Mercury</td>
<td>Switches, relays, tubes and interrupters. These may be frame mounted,</td>
</tr>
<tr>
<td></td>
<td>plug-in units or mounted on plug-in circuit boards, fluorescent light tubes</td>
</tr>
<tr>
<td>Petroleum Products</td>
<td>Fuel for emergency power generating equipment and in lubricating fluids and</td>
</tr>
<tr>
<td></td>
<td>solvents</td>
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<tr>
<td>Polychlorinated Biphenyls (PCBs)</td>
<td>Capacitors, power supplies, frequency generators, motor driven interrupters,</td>
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<td>fluorescent light ballasts and oil filled transformers</td>
</tr>
<tr>
<td>Radioactive Materials</td>
<td>Cold cathode tubes, fire detectors, emergency exit signs, vacuum tubes</td>
</tr>
<tr>
<td>Compressed Gases</td>
<td>Gases like nitrogen may be found in cable vaults</td>
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3.2.3 Installation Supplier shall issue appropriate warnings to, inform and educate its employees, agents, subcontractors, other invitees, and the employees of any of them, entering SBC facilities of the above information in accordance with applicable laws and regulations.

3.2.4 When central office equipment containing hazardous material (e.g. 1-AESS switches, transformers, rectifiers, relays, etc) is moved between SBC facilities, the Installation Supplier shall notify Environmental Management through the SBC LEC Engineer prior to transportation to ensure compliance with environmental regulations.

3.2.5 Central Office equipment containing hazardous material that is removed during routine maintenance and repair shall be segregated and stored in appropriate and properly labeled containers and Environmental Management contacted to assist with proper disposal using an SBC Environmental Management approved-vendor.

3.2.6 Hazardous material in Central Office equipment determined to be of no additional use is considered hazardous waste. The Installation Supplier shall not remove hazardous components unless the supplier is an SBC Environmental Management approved-vendor.

3.2.7 An Installation Supplier shall not transport or dispose of hazardous materials or waste unless the supplier is an SBC Environmental Management approved-vendor.
4.0 DOCUMENTATION

4.1 General

4.1.1 The Installation Supplier shall use documents identified by the Regional Environmental Management organizations to manage hazardous materials/wastes. These may include:

   a) Hazardous Waste Manifests
   b) Bills of Lading
   c) Material Disposition Record Forms

4.1.2 The SBC LEC Engineer shall forward to the Regional Environmental Management Office the original documentation as described in Section 1.1.5 and place a copy in the yellow wallet.

5. QUESTIONS

5.1 General

5.1.1 Further questions or clarifications regarding the proper management of hazardous materials or wastes may be directed to the regional Environmental Management organization.
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