QWEST Communications International Inc. Technical Publication

TELECOMMUNICATIONS EQUIPMENT INSTALLATION GUIDELINES

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NOTICE

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1. Introduction

1.1 General (Scope of Document)

This document provides Service Suppliers with the general requirements affecting building facilities and their care, the installation and removal of telecommunications equipment, and related service requirements to be met prior to such activities. The term "Service Supplier" shall include all Qwest installation personnel, contractors or contracted agents, or Tenant organizations working in Qwest facilities.

This document provides material and workmanship requirements for Engineering and Service Suppliers and shall be a basis for audit and evaluation of a job. The workmanship items described in this section are generic and specific in nature and may be applicable to all installation and removal operations. In addition, the Service Supplier shall adhere to the specific installation (new and/or reuse), removal, and operational standards established in applicable equipment specifications as well as all handbooks, technical publications, Standards Configurations, National, State, and Local, requirements that are needed to successfully complete installation/removal of the equipment and associated cabling.

1.2 Quality Policy Statement

To establish long term, mutually beneficial relationships between Qwest and Service Suppliers, focused on a joint process committed to reduce cost and cycle time, improving service and providing continuous quality improvement.

1.3 Reason For Reissue

This publication has been revised to:

- Revise the format to the standard Qwest format.
- Update and reconfigure all chapters.

1.4 Document Organization

This document is organized as follows:

Chapter	Title
1	Introduction
2	General Requirements
3	Assembly and Ironwork
4	Cable Holes, Penetrations, and Fire/Smoke Protection
5	Cabling, Forming, Running, and Securing
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Paragraphs in this publication are numbered as an aid in communicating with Service Suppliers.

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2. General Requirements

2.1 General

2.1.1 It shall be the responsibility of the Service Supplier to have a current copy of this document on site and available for use at all times during the installation/removal activities at Qwest locations.

2.1.2 No work shall start or be performed without a properly signed Method of Procedure (MOP). A copy of the MOP shall be posted in the work area.

This standard shall also apply to Competitive Local Exchange Carrier (CLEC) equipment installed in a “Caged Location” area or a “Cageless Location” space.

2.1.3 All work identified in the Qwest Design Work Package (DWP) and the detailed engineering specification shall be completed per Qwest standards.

2.1.4 Priority of Standards are:

2.1.4.1 Fire, Life Safety Standards, local, state and Federal.

2.1.4.2 Qwest Technical Standards or Standard Configurations in all areas not covered by Technical Publication 77351.

2.1.4.3 Manufacturer’s requirements outside of their network element. Manufacturer’s requirements shall meet or exceed all Qwest requirements.

2.1.5 Service Suppliers doing business with Qwest for a product type shall show a level of expertise in that technology based on past history, training, or related work experience. Service Suppliers shall be required to comply with all suppliers’, manufacturers’, and Qwest Standards and Publications. Lack of documentation or information is not an acceptable reason for noncompliance with this Standard. Service Suppliers shall not deviate from Standards outlined in this Technical Publication without written permission of the Qwest Design Engineer.

2.1.6 The Service Supplier shall be responsible for providing all tools and expendable materials necessary to complete the job.

2.1.7 The Service Supplier shall purchase and pay for electrical permits, licenses, and inspections.

2.1.8 The Service Supplier's work shall meet the requirements of the National Electrical Code (NEC), Qwest Requirements; Qwest Standard Configurations and Technical Publications, local requirements of the municipality, city or state laws that vary from the NEC requirements.

2.1.9 When a Service Supplier becomes aware of a preexisting defective condition, that impacts the work on the job they are installing or removing; the Service Supplier shall contact the Qwest Design Engineer and take corrective action if authorized. This activity shall be documented in the job log.

2.1.10 Any questions not answered by Qwest Technical Publications, the job specification, standard configurations, drawings/records, etc. shall be referred to the "Design Engineer" by routing questions through the Work Management Center (WMC). The WMC shall provide the interface between the Installation Supplier(s) and the Design Engineer(s). Direct contact with the Design Engineer shall be made only after approval from the WMC representative. This requirement applies to all references made in this standard, which instructs the installation supplier to contact the "Design Engineer".

2.1.11 Service suppliers are required to have a competent representative on site at all times. This competent representative can be an employee or contracted agent, as long as the Service Supplier understands that they assume all liability. Any Qwest employee can expel a Service Suppliers and/or contract agent from the facility, if their work operations put the network at risk or fail to comply with appropriate Safety requirements. When the Service Supplier or contract agent is removed from a Qwest facility for any reason, the Qwest Quality Organization shall be notified immediately. Disciplinary action shall be implemented based on Qwest Technical Standard 77369.

2.2 Facility Access and Security

2.2.1 General

The amount of space and its location for administrative purposes shall be a matter of agreement between the Service Supplier and Qwest prior to the start of services. Every attempt shall be made to locate this area outside the room or compartments containing equipment. In those cases where this cannot be accomplished, the area should be set as far away as possible from the equipment locations. Drawings, documentation, and all other flammable materials used in and around equipment and cable racks during the work shift shall be removed at the end of each shift and stored in a fire resistant environment.

The Service Supplier shall be allowed normal use of lunchroom facilities. The Service Supplier shall be allowed access to toilet facilities, if available, in locations where work is in progress. The Service Supplier shall be responsible for providing portable toilet facilities in locations where facilities are not provided.

Temporary trailers/structures shall be provided by the Service Supplier for installation related work or storage room if space is not available at the work location.

2.2.1.1 Service Suppliers and their hired personnel shall wear a valid company picture identification (above the waist, and visible from the front) at all times while at Qwest locations. This identification shall show: the company name, employee name, employee signature, card number, and current photograph of the employee. Contracted labor working for a Service(s) Supplier shall wear their company identification badge plus a tag showing Service Supplier Name (e.g., ABC Communications). See Qwest Technical Standard 77369.

2.2.1.2 The Service Supplier shall be responsible for providing their own telephone service, when calls are not directly associated with a Qwest project. See Paragraph 2.2.2.

2.2.1.3 The Service Supplier shall be in the facility only during authorized scheduled work hours as agreed to and defined in the MOP. Quality personnel associated with a Service Supplier shall notify the “Central Office Operations”, (COO) facility representative before or upon entering a facility to check their installers’ work. This is not required if Service Supplier personnel are on site and the job is in progress.

2.2.1.4 The Service Supplier shall be responsible for the security of all access keys and electronic access cards assigned to them. The duplication of keys and cards is expressly prohibited. Access keys/cards shall be obtained during the initial contact/MOP meeting with the COO representative. These keys/cards shall be returned to the COO representative at the time of the job completion or if the Service Supplier will be away from the job for an extended period due to job interruption. The COO manager can elect for a service supplier to have keys/cards and be responsible for distribution and security. Service Suppliers that have leased office space in a Qwest Central Office(s) shall have access to their leased space, but shall not be allowed in other equipment areas unless covered by an active job and an approved MOP.

2.2.1.5 The Service Supplier shall be responsible for the security of job provided materials and equipment.

2.2.1.6 Whenever the Service Supplier is responsible for work activities in an unattended building, the premises shall be kept secure at all times. The Service Supplier shall guard against and take necessary steps to prevent unauthorized visitors from entering the Qwest facility for which the Service Supplier is responsible.

2.2.1.7 The Service Supplier shall keep doors, windows, and gates closed.

2.2.1.8 The Service Supplier shall be responsible for the security of their personal valuables, tools, materials, and the parking of private and company vehicles.

2.2.1.9 Unauthorized equipment or devices such as cameras, recording equipment, metal ladders, etc. shall not be permitted in Qwest locations without the permission of the Qwest representative.

2.2.1.10 The Service Supplier shall not bring alcohol, drugs, firearms, weapons, or explosives into any Qwest facility.

2.2.2 Service Suppliers doing business with Qwest shall be allowed to use Qwest phone facilities under the following conditions:

2.2.2.1 Use of central office telephones, fax lines and copy machines shall be covered during the Method of Procedure (MOP) process.

2.2.2.2 The central office representative will designate a telephone line and fax machine for use by the central office installation supplier on the "General" MOP.

2.2.2.3 Use of the telephone line, copy and fax machines shall be for Qwest business only. No personal calls, copies or faxes are allowed. Business calls not associated with Qwest are not allowed.

2.2.2.4 All long distance calls shall be charged to the Service Suppliers’ calling credit card.

2.2.2.5 The Installation Supplier shall make use of their pager to minimize incoming calls to the central office. The installer should give out their pager number, not the central office telephone number whenever possible. The intent of this guideline is to minimize the number of times a Central Office Technician will have to answer phone calls directed to the service supplier.

2.2.2.6 No cellular, PCS phones or other Radio Frequency Transmitting devices (including two way pagers) shall be on or used inside the Central Office.

2.2.2.7 Copy machines are to be used for Qwest business only. Business copies not associated with Qwest business or personal copies may not be made at any time.

These guidelines emphasize agreement and management of communications and copy machines between Central Office Operations Personnel and the Service Suppliers.

2.2.3 Special Procedures for Buried Equipment Enclosures

Special Procedures for working at Controlled Environment Vaults (CEV), Controlled Environment Chambers (CEC), Universal Enclosures (UE), or any other partially or fully buried equipment enclosures.

2.2.3.1 Prior to going to a site location, contact the Alarm Center at 1-800-713-3666 to verify if there are any outstanding alarms and to confirm the nature of the alarm(s) or to inform the Alarm Center that you will be working at the site.

2.2.3.2 Upon arrival, verify that the air conditioner and exhaust fans are running by listening for the fan motors. Depending on the climate conditions at the time you arrive at the site, the ventilation system may not be on at that moment. If there is any indication that the air conditioning and/or ventilation are not operational, procure an appropriate type gas meter and test the site before entering.

2.2.3.3 A “red” light on a small box near the entrance indicates a potentially hazardous condition, do not enter. If a red light condition exists, listen and verify that the exhaust fan is operating and if so, the red light should clear within 10-15 minutes at the most. If the red light dose not clear; test, purge, and ventilate the site as described in the Safety Assurance System procedures for utility holes or contact your supervisor or state safety manager for further direction.

2.2.3.4 Upon opening the hatch or door, a “green” light on a small box near the entrance indicates a safe atmospheric condition and you may enter and proceed with your work.

2.2.3.5 If neither the red nor the green bulb is lit after opening the site door, replace the bulbs before taking further action. If either bulb still does not light, do not enter the site without first contacting your supervisor or state safety manager for further direction.

2.2.3.6 After entering the site, visually inspect the battery plant for any evidence of swelling (bulging), leakage, excessive heat (30 degrees or more above room temperature), warping of the batteries, or the smell of “rotten egg gas” (hydrogen sulfide). If any problems are evident, exit immediately and contact the Power Service Assurance Center at 1-800-713-3666 to arrange for a complete evaluation of the power plant.

2.3 Facility Environmental Conditions, Upkeep, Storage, and Handling

Note: QWEST personnel are responsible for temporarily halting a job if environmental concerns are not complied with and for notifying the responsible manager/design engineer should this action be taken.

All building construction or alterations, within the areas requiring service supplier occupancy, shall be completed before the scheduled start of the installation or removal activity. Any exceptions shall be subject to agreement between the Service Supplier and Qwest Design Engineer.

Qwest shall provide suitable openings in buildings to allow material to be placed in position. This includes necessary openings, and ducts for cable and conductors through floors and walls as required.

Qwest shall provide the necessary ceiling inserts, embedded ceiling channel, or appropriate fastening arrangements in areas in which the equipment requires ceiling fastening.

Qwest shall provide floor and wall penetration sleeves when required to facilitate proper fire stopping. (refer to Chapter 4)

Qwest shall provide electric power for all necessary purposes with suitable outlets in rooms in which work is to be performed. Heat and general illumination (permanent or temporary) in rooms in which work is to be performed and material stored shall also be provided by Qwest. Temporary lighting provided by Service Suppliers shall be removed at the end of the job.

2.3.1 The Service Supplier shall not adjust or disable any Heating, Ventilation, Air Conditioning (HVAC) or humidity control, or building alarm system. Any necessary adjustments should be requested through the Qwest building representative.

2.3.2 The Service Supplier shall provide Qwest approved fire retardant protection for floors (typically masonite has been authorized for floor protection), walls, and equipment when necessary to prevent damage. Walls constructed for temporary purposes during and installation or removal shall be constructed with fire retardant materials such as U L Listed lumber meeting FR-S 15P3/AWPA C-20 requirements.

2.3.3 All job related flammable materials, such as waste paper, foam, plastic, cloth bags, packing boxes and crates, and the Service Supplier shall remove similar materials on a daily basis. Solvents and paints shall be properly stored in their original, labeled containers and placed in an approved storage cabinet or a proper storage container when not in use.

2.3.4 The Service Supplier shall not create unauthorized holes and openings in the facility. The design engineer shall be contacted and shall be responsible for making arrangements to place necessary openings. Service Suppliers shall not subcontract the core drilling of floors or walls for the purpose of running cable.

2.3.5 Service Supplier shall be on site to receive and ensure proper storage of all material associated with their jobs. Failure to comply with Qwest “Fire Combustible Policy”, any time during a job shall result in serious disciplinary actions. All equipment and materials shall be unpacked and cleaned outside of the facility or in the facility's authorized unpacking area. Equipment and materials shall be free of contaminates prior to being brought into the work area.

2.3.6 The cutting, filing, drilling, and milling or painting of the Qwest approved auxiliary framing, cable rack, etc. shall be done outside of the equipment area. When drilling of equipment or structures, that can not be removed from a facility, proper protection, and the use of a HEPA vacuum shall be required.

2.3.7 General cleaning of the equipment facility or storage area in which work is being done shall be performed by the Service Supplier during the entire installation or removal process. Care shall be taken to generate a minimal amount of airborne dust.

2.3.8 The Service Supplier shall use only a High Efficiency Particulate Arrestor (HEPA) vacuum, capable of filtering particles larger than .3 microns in size, and equipped with a static dissipative hose in QWEST facilities to capture dust and chips from the drilling of floors, walls, ceiling, ironwork, and equipment during the uncrating process, and while cleaning cable racks and equipment.

2.3.9 The Service Supplier shall be aware of conditions that may result in equipment thermal shock (failure or degraded service brought on by a rapid change in temperature) and take steps to prevent its occurrence.

2.3.10 At the completion of a job, the Service Supplier shall arrange for the disposal of remaining job generated trash, access material, removal of temporary floor, wall, column, and equipment protection placed by the Service Supplier, and removal of the Service Supplier's tools and property. The Service Supplier shall arrange for the turnover of all Qwest owned materials using RG33-0043 and/or any other forms in Chapter 14, associated with this function. All equipment manuals and documentation shall be turned over to the COO representative for proper storage. Combustible material shall not be left in the equipment frames, bays, or cabinets.

2.3.11 The Service Supplier shall establish and maintain documented procedures for the handling, storage, packaging, preservation, and delivery of products.

2.3.12 The Service Supplier shall provide methods of handling products to prevent damage or deterioration.

2.3.13 After the removal of equipment bays or other items anchored to the floor, the installer shall call Real Estate Operations at 1-800-879-3499 and arrange for the floor to be repaired

2.4 Environmental, Safety, and Health

2.4.1 General

Note: Qwest has area safety personnel that have been assigned responsibilities for environmental, safety, and health conditions. When questions arise concerning these topics, the appropriate individual may be reached by calling UNICALL (800-654-2525) and requesting the Environmental or Safety Manager for the state where work is taking place.

2.4.1.1 The Service Supplier shall perform a walk through of the work area, specific to their job, prior to the start of the installation or removal activity to identify any hazardous conditions and to become familiar with the location of emergency equipment. Any hazardous conditions existing in the work area shall be documented, reported to the Design Engineer and recorded in the job log.

2.4.1.2 At the completion of the job, the Service Supplier shall again walk through the area and ensure that all of the Service Supplier's tools, equipment, protective materials, and trash, etc. has been removed and that no hazardous conditions have been created by the service supplier.

2.4.1.3 Any work in a building that requires the use of Radiography or x-ray techniques by Service Suppliers for the purpose of locating building structural members and verifying core drill locations. The following information shall be part of the contractors specifications, and part of their MOP document for the work at hand.

1. Prior to starting work the Service Supplier must visually survey the building and the proposed work area floor by floor and in order to notify personnel about the potential for exposure to radiation and to assure that the exposure area is clear of personnel for the duration of the work.
2. Prior to starting work the Service Supplier must post warning signage on exterior doors or at safe perimeter distances from the exposure area to warn personnel. Example:

- "WARNING - Radiography is in Progress (on Floors 1, 2, 3, etc..)", or
- "WARNING - x-ray equipment is in use (on Floors 1, 2, 3, etc.)"

3. During each radiographic operation the contractor shall maintain continuous direct visual surveillance of the operation to protect against unauthorized entry into a high radiation area. No radiography or x-rays are permitted around the switch equipment.
4. Certain equipment (for example, magnetic tape storage devices, etc.) may be susceptible to the electro-magnetic fields produced by an X-ray machine. In order to ensure that sensitive equipment is protected, the location of the radiography must be cleared by the Qwest Real Estate Building Manager and the Central Office Manager. All radiography shall be done with approval of the Qwest Real Estate department. If a particular location cannot be x-rayed due to the sensitive nature of nearby equipment, other, less-intrusive techniques which don't create potentially harmful electro-magnetic fields must be used; or another location to place penetrations must be found.

2.4.2 Personal Protective Equipment (PPE)

Service Suppliers employee(s) shall assess the workplace to determine if hazards that require the use of personal protective equipment (for example, head, eye, face, hand, or foot protection - includes the removal of jewelry around energized equipment). The Service Supplier shall ensure that their employee’s or contracted labor are trained (recorded on a training record), and instructed on the proper use of safety equipment.

2.4.2.1 Protective goggles or face shields shall be provided and worn where there is any danger of flying particles or corrosive materials.

2.4.2.2 Approved safety glasses shall be worn at all times in equipment areas, when working with tools or in any areas where there is a risk of eye injuries such as punctures, abrasions, contusions or burns could occur.

2.4.2.3 Personnel, who need corrective lenses (glasses or contacts) in working environments having harmful exposures, are required to wear approved safety glasses, or protective goggles.

2.4.2.4 Protective gloves, aprons, shields, or other means shall be provided and required where employees could be cut or where there is reasonably anticipated exposure to corrosive liquids, chemicals, blood, or other potentially infectious materials.

2.4.2.5 Hard hats shall be worn where danger of falling objects exists. Hard hats inspected periodically for damage to the shell and suspension system. Damaged hats shall be replaced.

2.4.2.6 Appropriate foot protection required where there is the risk of foot injuries from hot, corrosive, or poisonous substances, falling objects, crushing or penetrating actions.

2.4.2.7 Approved respirators shall be on site and available in areas where an emergency situation could require their use.

2.4.2.8 All protective equipment shall be maintained in a sanitary condition and ready for use.

2.4.2.9 Eye wash facilities, quick drench shower or Eye wash flush kits shall be located within 12 feet of any work area where employees are exposed to injurious corrosive materials. Special equipment needed for electrical workers shall be also be available. Note: If such facilities are not present the supplier shall notify the Central Office Operation facility manager for the immediate resolution.

2.4.2.10 Food or beverages shall not be consumed on the premises within the area of the telecommunication equipment or in areas where there is exposure to toxic material, or other potentially infectious materials. All food or beverage trash shall be disposed of outside equipment areas.

2.4.2.11 Suppliers shall provide protection against the effects of occupational noise exposure when sound levels exceed the OSHA noise standard.

2.4.2.12 Adequate work procedures, protective clothing and equipment shall be available and on site prior to cleaning up spilled toxic or otherwise hazardous materials or liquids. . Note: If such facilities are not present the supplier shall notify the Central Office Operation facility manager for the immediate resolution.

2.4.2.13 Appropriate procedures shall be in place for disposing of or decontaminating personal protective equipment contaminated with, or reasonably anticipated to be contaminated with, potentially infectious materials.

2.4.3 It is the Service Supplier's responsibility to instruct their employees in the appropriate safety procedures and practices, the operation and safe use of tools and equipment, and to ensure employee adherence to these procedures and practices while on Qwest premises.

2.4.4 Hand And Portable Powered Tools

All tools and equipment (both company and employee owned) used by employees at their workplace shall be in good condition. Note: If tools requiring calibration are on site, these tools shall have the date of calibration attached to that tool. Tools with an expired calibration data shall not be used.

2.4.4.1 Hand tools such as chisels and punches, which develop mushroomed heads during use, shall be reconditioned or replaced as necessary. Broken or fractured handles on hammers, axes and similar equipment shall be replaced promptly. Worn or bent wrenches shall be replaced regularly. Appropriate handles shall be used on files and similar tools.

2.4.4.2 Personnel using tools shall be aware of the hazards caused by faulty or improperly used hand tools. Appropriate safety glasses, face shields, etc. used while using hand tools or equipment which might produce flying materials or be subject to breakage. Tool handles shall be wedged tightly in the head of all tools.

2.4.4.3 Jacks, hoists or other lifting devices shall be checked periodically to ensure they are in good operating condition.

2.4.4.4 Tools cutting edges shall be kept sharp so the tool will move smoothly without binding or skipping.

2.4.5 Portable (Power Operated) Tools and Equipment

Grinders, saws and similar equipment shall be equipped with appropriate safety guards.

2.4.5.1 Power tools shall be used with the correct shield, guard, or attachment, recommended by the manufacturer.

2.4.5.2 Portable circular saws shall be equipped with guards above and below the base shoe. Circular saw guards checked to assure they are not wedged up, thus leaving the lower portion of the blade unguarded.

2.4.5.3 Rotating or moving parts of equipment shall be guarded to prevent physical contact.

2.4.5.4 Cord-connected, electrically operated tools and equipment shall be effectively grounded or be of the approved double insulated type.

2.4.5.5 Effective guards shall be in place over belts, pulleys, chains, and sprockets, on equipment such as concrete mixers, pumps, motor generators, and air compressors.

2.4.5.6 Portable fans shall be provided with full guards or screens having openings 1/2 inch or less.

2.4.5.7 Hoisting equipment available and used for lifting heavy objects shall have hoist ratings and characteristics appropriate for the task.

2.4.5.8 Ground-fault circuit interrupters shall be provided on all temporary electrical 15 and 20-ampere circuits, used during periods of construction.

2.4.5 9 Pneumatic and hydraulic hoses on power operated tools shall be checked regularly for deterioration or damage.

2.4.6 Powder-Actuated Tools

Personnel that operate powder-actuated tools shall be trained in their use and carry a valid operator's card.

2.4.6.1 Powder-actuated tool shall be stored in its own locked container when not being used.

2.4.6.2 A sign at least 7 inches by 10 inches with bold face type reading "POWDER-ACTUATED TOOL IN USE" shall be conspicuously posted when the tool is being used.

2.4.6.3 Powder-actuated tools shall be left unloaded until they are actually ready to be used.

2.4.6.4 Powder-actuated tools shall be inspected for obstructions or defects each day before use.

2.4.6.5 Powder-actuated tool operators shall have and use appropriate personal protective equipment such as hard hats, safety goggles, safety shoes and ear protectors.

2.4.7 Confined Spaces

Confined spaces shall be thoroughly emptied of any corrosive or hazardous substances, such as acids or caustics before work operations begin.

2.4.7.1 All lines to a confined space, containing inert, toxic, flammable, or corrosive materials shall be valved off and blanked or disconnected and separated before work operations begin.

2.4.7.2 Impellers, agitators, or other moving parts and equipment inside confined spaces shall locked-out if they present a hazard.

2.4.7.3 Natural or mechanical ventilation shall be provided prior to confined space entry. Note: Contact the Design Engineer if adequate ventilation is not present.

2.4.7.4 Appropriate atmospheric tests shall be performed to check for oxygen deficiency, toxic substances and explosive concentrations in the confined space before work operations begin.

2.4.7.5 Adequate illumination shall be provided for the work to be performed in a confined space. This may be accomplished by using temporary lighting.

2.4.7.6 Atmosphere inside the confined space shall be frequently tested or continuously monitored during the work operation. There shall be an assigned safety standby employee outside of the confined space, when required, whose sole responsibility is to watch the work in progress, sound an alarm if necessary, and render assistance.

2.4.7.7 The standby employee shall be appropriately trained and equipped to handle an emergency. The standby employee or other employees shall be prohibited from entering the confined space without lifelines and respiratory equipment if there is any question as to the cause of an emergency.

2.4.7.8 Approved respiratory equipment shall be required if the atmosphere inside the confined space cannot be made acceptable.

2.4.7.9 Portable electrical equipment used inside confined spaces shall be either grounded or insulated, and equipped with ground fault protection.

2.4.7.10 Before gas welding or burning is started in a confined space, a HOT WORK PERMIT must be acquired, and all hoses checked for leaks. Compressed gas bottles are forbidden inside of the confined space. Torches may be lit only outside of the confined area, and the confined area tested for an explosive atmosphere each time before a lighted torch is to be taken into the confined space.

2.4.7.11 Employees that will be using oxygen-consuming equipment-such as salamanders, torches, and furnaces, in a confined space, shall ensure that sufficient air provided to assure combustion without reducing the oxygen concentration of the atmosphere below 19.5 percent by volume. Contact OSHA for proper measurement device.

2.4.7.12 Whenever combustion-type equipment is used in a confined space, provisions shall be made to ensure the exhaust gases are vented outside of the enclosure.

2.4.7.13 Each confined space where personnel are expected to work, shall be checked for decaying vegetation or animal matter which may produce methane.

2.4.7.14 Confined spaces shall be checked for possible industrial waste, which could contain toxic properties.

2.4.7.15 Confined space which is below the ground and near areas where motor vehicles will be operating shall be checked with a gas monitor (capable of detecting carbon monoxide) prior to entering the space. (The OSHA 8-hour exposure limit for carbon monoxide is 35 ppm or 100 ppm for 15 minutes.)

2.4.8 Electrical Cautionary notice

All electrical energy, whether AC or DC and independent of voltage, in Qwest facilities constitute an arc hazard and must be treated accordingly. Insulated tools must be used and be in compliance with OSHA. All exposed live parts in the work area shall be protected from physical damage and any unplanned contact. In addition, voltages above 48 volts nominal, whether AC or DC, constitutes a shock hazard. Protection provided will be done to accommodate the voltage. No work shall be performed or allowed to go forward until and unless inspected by an authorized Qwest representative.

2.4.8.1 Electrical work done in Qwest facilities shall be done in compliance with OSHA/NEC, Qwest technical publications and state/municipal codes.

2.4.8.1 Electrical work done in Qwest facilities shall be done in compliance with OSHA/NEC for all contract electrical work.

2.4.8.2 Employees, Service Supplier, and contracted labor are required to report as soon as practicable any obvious hazard to life or property observed in connection with electrical equipment or lines. All electrical work shall adhere to Qwest approved products and Standard Configurations of material, engineering, and installation.

2.4.8.3 Employees, Service Suppliers and contracted labor are instructed to make preliminary inspections and/or appropriate tests to determine what conditions exist before starting work on electrical equipment or lines. Note: All tests and observations shall be documented on RG47-0157, and a copy left in the job package.

2.4.8.4 If electrical equipment or lines are to be serviced, maintained or adjusted, necessary switches opened, proper locked-out and tagged procedures shall be used whenever possible.

2.4.8.5 Portable electrical tools shall be equipment grounded or of the double insulated type.

2.4.8.6 Electrical appliances such as vacuum cleaners, polishers, and vending machines shall be grounded.

2.4.8.7 All extension cords being used shall have a grounding conductor. Multiple plug adapters shall be prohibited. Use of extension cords beyond the installation interval is prohibited in a Central Office environment.

2.4.8.8 Ground-fault circuit interrupters shall be installed on each temporary 15 or 20 ampere, 120 volt AC circuit at locations where construction, demolition, modifications, alterations or excavations are being performed. Extension cords are considered to be temporary wiring and must be ground fault protected.

2.4.8.9 Suitable disconnecting switches or plug connectors at the junction with permanent wiring shall protect all temporary circuits.

2.4.8.10 Electrical installations in hazardous dust or vapor areas shall conform to requirements outlined in the National Electrical Code (NEC) for hazardous locations.

2.4.8.11 Exposed wiring and cords with frayed or deteriorated insulation shall be repaired or replaced promptly. Flexible cords and cables shall be free of splices or taps. Clamps or other securing means provided on flexible cords or cables at plugs, receptacles, tools, equipment, etc. shall be securely held in place. All cord, cable and raceway connections shall be intact and secure.

2.4.8.12 Wet or damp locations, require the use of electrical tools and equipment, which are appropriate for the use or location or otherwise protected.

2.4.8.13 Location of electrical power lines and cables (overhead, underground, underfloor, other side of walls) shall be determined before digging; drilling or similar work is begun. This shall be the responsibility service supplier and/or contracted labor doing the work.

2.4.8.14 Metal measuring tapes, ropes, handlines or similar devices with metallic thread woven into the fabric shall be prohibited where they could come in contact with energized parts of equipment or circuit conductors.

2.4.8.15 Use of metal ladders shall be prohibited in areas where the ladder or the person using the ladder could come in contact with energized parts of equipment, fixtures or circuit conductors.

2.4.8.16 All disconnecting switches and circuit breakers shall be labeled to indicate their use or equipment served. Disconnecting means shall always be opened before fuses are replaced. Documentation of assigned or spare capacity will be provided to the Qwest Design Engineering Representative. If specific assignment is unknown list as “assigned unknown.”

2.4.8.17 Interior wiring systems shall include provisions for grounding metal parts of electrical raceways, equipment and enclosures. Electrical raceways and enclosures shall be securely fastened in place.

2.4.8.18 All energized parts of electrical circuits and equipment guarded against accidental contact by approved cabinets or enclosures. Special enclosures such as power room shall be labeled at all entrances “Authorized Personnel Only”.

2.4.8.19 Sufficient access and working space shall be provided and maintained about all electrical equipment to permit ready and safe operations and maintenance.

2.4.8.20 Unused openings (including conduit knockouts) in electrical enclosures and fittings shall be closed with appropriate covers, plugs or plates. Electrical enclosures such as switches, receptacles, and junction boxes, shall be provided with tightfitting covers or plates.

2.4.8.21 Disconnecting switches for electrical motors in excess of two horsepower shall be capable of opening the circuit when the motor is in a stalled condition, safely. (Switches must be horsepower rated equal to or in excess of the motor hp rating.) Low voltage protection shall be provided in the control device of motors driving machines or equipment which could cause probable injury from inadvertent starting. Each motor disconnecting switch or circuit breaker shall be located within sight of the motor control device.

2.4.8.22 Each motor located within sight of its controller or the controller disconnecting means shall be capable of being locked in the open position or have a separate disconnecting means installed in the circuit within sight of the motor. The controller for each motor in excess of two horsepower, shall be rated in horsepower equal to or in excess of the rating of the motor it serves.

2.4.8.23 Employees who regularly work on or around energized AC electrical equipment or lines shall be annually instructed in the cardiopulmonary resuscitation (CPR) methods.

2.4.8.24 No work shall be performed on LIVE/ENERGIZED AC CIRCUITS by other than a Qualified Electrician.

2.5 Electrostatic Discharge (ESD)

2.5.1 A tested and passing wrist strap shall be worn when removing, inserting, or handling devices and components not in a static dissipative packaging. The wrist strap shall be snug fitting, make contact with the skin and be connected to a jack, terminal or connector with continuity to a properly grounded network element. The jack, terminal or connector must be designated as an "ESD Wrist Strap Connecting Point".

2.5.2 When the Service Supplier is working on ESD sensitive equipment they shall test their wrist strap daily prior to use with either a pass/fail wrist strap test set or by using a volt-ohm meter. The reading shall be 1M $\pm$ 15% ohms., and shall be recorded daily in the job log.

2.5.3 Devices and components shall be stored in their static dissipative packaging prior to insertion in the equipment.

2.5.4 Package and transport all circuit packs, including those presumed defective, in an approved protective static dissipative containers.

2.5.5 The Service Supplier shall maintain a static safe environment for the handling of circuit packs and other electronic equipment. All containers or packing materials used shall be marked with ESD warning labels, and stored in a metal enclosure.

2.5.6 The Service Supplier shall minimize the handling of circuit packs and store packs in anti-static or static dissipative containers.

2.5.7 Circuit packs shall be handled by their front faceplates. If additional support is required, use the outermost top and bottom edge, being careful not to touch any components or conductive paths.

2.5.8 Keep synthetic fibers, plastics, foams, etc., which are not anti-static, out of the environment where circuit packs are being handled.

2.5.9 When removing a circuit pack from service, the pack shall be immediately placed in an anti-static, protective container. The correct size container shall be used to adequately contain and physically protect the individual circuit pack.

2.6 Fire Protection Policy

The first few moments after a fire has started and/or is discovered are of extreme importance. Upon discovery of fire or smoke, first evacuate the building then call the Fire Department. If a Qwest representative is present, that person shall determine whether or not to call the Fire Department. This Qwest policy is intended to minimize the risk and extent of possible fires at QWEST Central Office Equipment locations. This Policy applies equally to contracted labor and Qwest employees.

2.6.1 Central Office Operations (COO)

2.6.1.1 The Central Office Operations shall maintain a zero or near-zero level of combustible materials in the Central Office equipment areas.

2.6.1.2 Combustible materials may be brought into the equipment areas only when necessary to perform work and will be removed from the area when the work is completed. Manuals, papers, computer printouts, drawings, circuit pack boxes, plastic parts bags or any other combustible material must not be stored or left in or around equipment. These items must be stored in metal cabinets, desks or lockers when not in use.

2.6.1.3 Nothing shall be placed on top of a unit of equipment to interfere with the airflow necessary for the cooling of that equipment.

2.6.1.4 All doors in an equipment room shall be kept closed at all times. Fire doors and internal security doors shall not be blocked open or have lock assemblies impeded or disabled.

2.6.1.5 COO personnel shall empty open trash receptacles located in an equipment area daily. Note: If this requirement is not followed by the COO the service supplier shall notify their local quality manager representative. Only closed metal trash receptacles are located in an equipment area.

2.6.1.6 All desks, work areas and computer workstations located in equipment areas shall be kept free of combustible materials. The best solution is to locate work areas outside of equipment rooms or to build a separate room for them. If this is not possible, the combustibles must be controlled. Manuals and other combustibles should be kept in closed metal cabinets.

Circuit packs must be kept in anti-static packaging at all times and stored in closed metal lockers or cabinets.

2.6.2 Installation Activities

2.6.2.1 The Service Supplier shall maintain a near-zero level of combustible material in the Central Office Equipment areas during installation or removal activities. All equipment brought onto Qwest property shall be identified with the job BVAPP number, Supplier name and a contact number for the Supplier.

2.6.2.2 Cardboard boxes and wooden crates containing equipment frames or units, or boxes of cable shall not be stored or staged in equipment areas. These items should be delivered to, stored, staged and uncrated or unpacked in a storage room separate from Central Office equipment areas. Items needed for daily work may be brought into the equipment rooms and shall be removed each day. If no storage room exists in the building, it will be necessary for the Service Supplier, Capacity Provisioning and BRI to provide temporary storage outside of the Central Office building for uncrating and unpacking. No uncrating or unpacking shall be done in equipment areas at any time.

2.6.2.3 If no alternative area exists, uncrated bays or units of equipment (anti-static wrap may be left in place if required), uncrated cables, boxed circuit packs, boxes of numerous small miscellaneous parts or similar items needed for daily operation, may be stored in equipment rooms if all of the following criteria are met:

a. There is absolutely no alternative area or room in the building that can be used.

b. All items shall be placed on fire retardant floor protection (masonite).

c. Combustibles are kept to an absolute minimum and all flammables and trash shall be removed on a daily basis and maintained in this manner for the entire cycle of the job. As boxes are opened, the contents are to be removed, all packaging materials, plastic, bags, paper, etc. must be disposed of daily.

d. Area is not adjacent to heating units, registers or radiators.

e. Area does not create a safety hazard or block access to exits, doors, light switches or any other areas that need to remain accessible to personnel.

f. Area is maintained to the minimum size necessary for daily operation.

g. Small items are stored in boxes, metal or plastic containers, or mobile “parts cart”.

h. All items will be removed from this area when no longer needed.

i. Small quantities of solvents and paints for use on the job shall be properly stored in their original, labeled containers.

j. This storage area is posted with a readable sign identifying the job BVAPP number, Supplier name and a contact number for the Supplier.

k. At no time shall flammable materials be staged or stored in Battery Rooms.

l. The use of fire retardant tarps to cover staged materials is not approved for use in Qwest Equipment Space without written permission of Qwest Risk Management. Note: This will only be granted on a case by case basis.

2.6.2.4 The storage area, the amount and the type of items stored and the duration of storage shall be addressed in the initial "General/Detailed" Method Of Procedure (MOP) for the job and approved at the discretion of the COO. The COO shall consider the risks involved as well as the costs associated with alternatives prior to approval.

2.6.2.5 The administrative area to be used by a Service Supplier shall be agreed upon with the COO and addressed in the "General/Detailed" MOP. This area should be located out of the equipment area if possible, with similar requirements as the equipment storage area. Documentation, drawings and other combustible administrative items needed for daily use must be removed from equipment areas daily or stored in metal containers.

2.6.2.6 This policy applies only to the time that the Service Supplier is actively performing work related to the specific job. If the Service Supplier temporarily closes down work for more than 48 hours while waiting for parts, to perform more critical work on another job or for any other reason, the storage and administrative areas must be cleared of all combustible material until work is restarted. The only exception to this requirement shall be if the supplier has approval from the COO facility manager. The supplier shall then record the agreement period in the job log (date, time etc.) (Also see Chapter 15, Para.15.2.2 for extended work delays of greater than 30 days.).

2.6.2.7 The COO personnel responsible for a Central Office shall report all violations of Qwest combustible policy to their management, and have the responsibility to shut down a job in progress if the Service Supplier does not comply. When the Supplier is again in compliance, the work may be restarted. If for any reason the COO shuts down a job do to this requirement they shall report that situation to the appropriate quality manager for that area.

2.6.2.8 During the acceptance of a job, the COO shall assure that the Service Supplier has left the area free of combustibles and has closed all cable holes. (refer to Chapter 4)

2.6.2.9 Adherence to this policy will allow the Service Supplier to perform work efficiently and maintain cost effectiveness while not placing Qwest at undue risk to the safety hazards, economic and service penalties associated with fires in the Central Office. The lack of adherence to this policy would necessitate a review of the Service Supplier’s contract for Central Office Installation work. It is the Service Suppliers responsibility to adhere to this policy. If such an occurrence was to happen the quality manager for that area shall be notified.

2.6.3 Smoking is not permitted in Qwest facilities, and within 25 feet of any building entrance. Used smoking materials shall not be brought into Qwest facilities.

2.7 Network Alarms

2.7.1 General

All network elements installed by the Service Supplier shall be connected to the appropriate alarm system and tested with the Network Monitoring and Analysis Group (NMA).

E-Telemetry (Scan Point), and Switch Trunking Database, X.25 Database and Circuit Provisioning Contacts for: Arizona, Colorado, New Mexico, Utah, Washington, and Wyoming:

NMA – Scan Points	303-896-5837
Switch & Trunking Group	303 896-5850
Etel Circuits	303 896-5861
X.25 Provisioning	303 896-5921
Sonet / X.25 Database	303 896-5939
FAX:	303 896-9386/9391

X.25, E-Telemetry, and Switch Trunking Database and Provisioning Contacts for North & South Dakota, Idaho, Iowa, Minnesota, Montana, Nebraska, and Oregon:

Contact: 763 536 3888 FAX: 763 536-3799

Switch (Scan Point) Database for Power and Environmental Alarms:

Contact: (800) 455-3480 Option # 1 (then NMA Support option)

NMA requires the following information for testing and database work: ETEL number, remote address, and display number (for e-telemetry points); the X.25 circuit ID (for X.25 points); plus the assigned alarm points, and BVAPP number.

2.7.1.1 No network element shall be turned up for service, without power/circuit alarms. Central Office Operations shall accept responsibility for alarm testing, if their software translations or cross connections, are not complete prior to the required service date. Service Supplier shall list all alarms and the reason they can not be tested at job closure in the (Job Log). The Service Supplier shall close job with exceptions listing equipment alarm status on RG 47-0013. The Service Supplier shall still be responsible to correct any problems associated with the installed product alarms. The Service Supplier shall negotiate with the Design Engineer for any additional alarm testing effort required, because of Qwest caused delays or problems. The supplier shall record all test results on RG47-0157 or equivalent and place a copy in the job package.

2.7.1.2 Alarms that are equipped for future use, and require software translations or cross-connections, which are to be made in the future do not require an ETEL number or X.25 circuit ID. Installer shall be required to perform standard continuity and power verifications on these circuits.

2.7.2 After Testing Completion

2.7.2.1 When testing is complete, the NMA group will provide a confirmation log number to the Service Supplier. This log number shall appear in the Job Log and on the Installation Revised Completion Notice (Form RG 47-0002).

2.7.2.2 When alarm testing cannot be completed for reasons of missing circuit packs, alarm systems, or incomplete Central Office Operations responsibilities, the NMA group shall be notified and so documented in the job log. Alarms exceptions status shall be listed on the "Final" - Installation / Revised Completion Notice (RG47-0002).

2.8 Equipment Performance Tests

2.8.1 Performance tests, required by a job, are to be conducted on newly installed and/or modified equipment by the Service Supplier to assure the equipment performance meets manufacturers' and Qwest requirements. Qwest will assure that the tests are performed and that conditions causing unacceptable test results are corrected. To accomplish this Qwest may provide an observer(s) on the job. The test record summary, indicating tests performed and troubles found and cleared, shall be forwarded to the Qwest COO representative prior to acceptance of the job and a copy shall be left in the job package.

2.8.2 Where a functional performance test is not performed, a continuity test shall be made on all conductors run and connected by the installer. The supplier shall record all tests results on RG47-0157 or equivalent and place a copy in the job package.

2.8.3 An authorized Qwest representative shall be present during test and turn up of power equipment (new or reused). Power equipment shall include (but not be limited to) the following;

1) Rectifiers
2) Converters
3) Inverters/UPS's.
4) Ring plant/generators.
5) Standby engines and/or systems.
6) Plant additions (i.e. PBD's, PDSC's, BDFB's, etc.).
7) Monitors and/or alarm units.

2.9 Maintenance Window

2.9.1 A Maintenance Window is a predetermined period of time during each day when specific planned maintenance and infrastructure provisioning work activities should be performed. The purpose of scheduling work during specific times is to minimize the risk of disruption to the Qwest network. Although load and service conditions vary by site, nighttime is generally the time of least traffic in most Qwest sites. Therefore the "Official Maintenance Window" is:

Maintenance Window	
Monday through Friday	10:00 P.M. to 6:00 A.M.
Saturday 10:00 P.M. through	Monday 6:00 A.M.

Note: In high call volume offices or offices with excessive data transfer areas, the Central Office Operations (COO) Manager can adjust maintenance window hours to minimize the risk of disruption to the Qwest network.

2.9.2 Work performed in the “Maintenance Window” generally only applies to “in-service” or "hot" equipment; or the specific times when "dead" equipment is being connected to "live" equipment. Power and Grounding Installation Guidelines are contained in Chapters 9, 10, and 11 of this standard.

2.9.3 Any work on the Ground Window, CO Ground Bars or main Horizontal or Vertical Equalizers while they are "in-service".

2.9.4 Any work on the main power board while it is "hot" (running/live/energized).

2.9.5 Any connection or disconnection of equipment to the DC power plant bus work while it is "hot" (running/live/energized).

2.9.6 Any addition, maintenance (torque of intercell connectors) or removal of a battery cell or string (Single string plant only).

2.9.7 Any connection or disconnection on the main AC power Board (feeder side) or any work on the AC transfer switch.

2.9.8 Any work that could be hazardous to the network (i.e., synchronization / timing) unless specifically approved in writing by the Central Office Operations representative.

2.10 Wood Products and Wood for Use in Equipment Locations

All wood materials used for construction of temporary walls and equipment or terminal mounting boards must be either UL listed fire retardant pressure treated and factory marked with the UL label or be completely coated with a fire retardant paint.

2.11 Letters of Deviation

There are occasional cases where following the standards contained in Qwest Technical Publications are not possible because of specific, identified conditions within the structure. In a few of these cases, it is possible for a letter detailing the condition, and the method used to provide a safe, reliable and well engineered alternative where the standards cannot be met. Letters of deviation are not valid for wholesale or economic concerns. Each instance of deviation shall be documented with an individual letter. These letters are not to be used in continuing non-standard practices that may have been applied in the past, or where new standards have superseded the old, (i.e. Earthquake bracing upgrades caused by seismic zone changes). All letters of deviation shall be discussed with the Common Systems Planner responsible for the structure prior to issue. Only the Qwest design engineer responsible for the long-term management of the central office shall be authorized to issue a letter of deviation. A copy of the Letter of Deviation shall be provided as part of the Document Work Package (DWP) by the installation forces. The original shall be filed in the engineering job folder and stored as part of the permanent record. Jobs that have a letter of deviation shall be required to be kept in the job folder. NOTE: Letters of Deviation shall not be used to remedy installation defects.

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3. Assembly and Ironwork

The Architecture, Models, and Configurations (AMC) of some specific types of equipment and Qwest Drawing Standards may supersede some requirements identified in this chapter.

3.1. General Requirements

3.1.1 The location of auxiliary framing, cable racks, frames, relay racks, bays, cabinets, and other equipment shall conform to the particular plans, drawings/records, and specifications for each installation. Qwest Standard Configuration shall be used wherever possible and supersedes manufacturer documentation. Refer to Qwest Technical Publication 77351 and Standard Configuration documents for engineering guidelines.

3.1.2 All assemblies and ironwork referred to in this section shall be installed to meet Seismic zone requirements for the area in which they are installed. Seismic zones 0, 1, and 2 (defined as “Light”) shall be installed to meet seismic zone 2 requirements. Seismic zones 3 and 4 (defined as “Heavy”) shall be installed to seismic zone 4 requirements. See section 3.18, “Earthquake Zone Map” for specific requirements. Areas identified, as “Heavy” shall comply with supporting requirements for equipment, even if the building structure is substandard for “Heavy” earthquake zones.

3.1.3 Overhead clearance in all aisles and equipment areas must be maintained at a minimum of 7 feet. This includes auxiliary framing, cable rack, cableway systems and lighting. Environment with 9 or 11.5-foot equipment shall maintain clearance’s equivalent with the 9 or 11.5-foot heights.

3.1.4. Unistrut embedded in the concrete ceiling is designed to support telecommunication equipment environments. Other ceiling support shall meet the requirements identified in the 77351.

Framing bars or channels shall be installed in stock lengths (20 ft) wherever possible.

3.1.5. Separate areas of primary and secondary framing, where possible, should be of a consistent design so that when extended to each other and intersected they shall be of a consistent level. Auxiliary framing used exclusively for the support of cable rack shall be consistent with other existing levels of framing where possible.

3.1.6. Where one additional row of frames is to be ultimately installed, the auxiliary framing shall be extended to allow for the ultimate cable rack, ladder track, lighting, etc.

3.1.7. All new areas will be engineered and installed with a 7' Floor Supported System as defined in Qwest Standard Configuration documents.

3.2. Apparatus

All pieces of apparatus shall be installed and secured in accordance with job specifications, drawings/records, and configurations.

3.3. Appliance/Base and Utility Outlets and Permanently Mounted Power Strips

Notes:

1. See 9.1, "AC Circuits," for additional requirements.
2. Appliance/Base outlets are defined as those outlets traditionally located in the base plates and end guards of equipment frames and are to be used exclusively for powering portable test equipment, inspection lamps, and portable temporary computer terminals. These outlets shall never be used to power motorized equipment; i.e., drill motors, vacuum cleaners, buffers, etc. Utility outlets and permanently mounted power strips are defined as those outlets dedicated and intended to power equipment mounted in that frame; i.e., modems, permanently mounted test equipment, computer terminals. These outlets also shall not be used to power motorized equipment. Wall and column mounted outlets may be used for motorized equipment.

3.3.1 All outlets shall be installed and properly positioned per job specifications and documented on Central Office drawings/records.

3.3.2 All outlets shall be of the common National Electrical Manufacturers Association (NEMA) configuration, which connects the grounding terminal common to its frame.

3.3.3 Isolated ground (outlets that do not connect the grounding terminal common to its frame) or "Orange" outlets are not permitted in Qwest locations. All AC outlets shall have their grounding lug referenced to the frame, bay, or cabinet in which they are mounted.

3.3.4 When removals involve AC, as with appliance/base outlets, utility outlets, or permanently mounted power strips, all remaining AC conductors shall be properly terminated.

3.4. Auxiliary Framing

3.4.1 Auxiliary framing bars or channels shall be installed in stock lengths (20 ft) wherever possible. All pairs of auxiliary framing channels or bars shall be of uniform length, aligned per job specification/drawing and closed with end caps or finishing clips when bars or channels extend beyond a clip or support. Finishing clips or end caps may be omitted where ends of bars or channels extend to within three inches of a wall, column, or other vertical surface.

3.4.2 Auxiliary framing shall be located on centers of approximately 5 feet, and in no case shall exceed 6 feet. Distance between last supports and auxiliary framing bar ends shall not exceed 2 ft 6 inches. Auxiliary framing bars shall be flush with the end of support clips at a minimum. Framing bars or channels shall extend approximately 3 inches beyond the last set of clips, to provide for splicing where additional framing would be ultimately installed. Each auxiliary framing section shall have a least one point of support. Junctions and bracing fabrications shall not be considered a point of support.

3.4.3 All splices, junction details, brackets, and hangers shall be secure and installed per QWEST Engineering Standard 77351 and Standard Configurations.

3.4.4 All auxiliary-framing splices in the same aisle of adjacent pairs of auxiliary framing shall be avoided. In no case shall two adjacent pairs of auxiliary framing be spliced in the same aisle.

3.4.5 Captive split nuts and slotted clips may only be used to secure additional layers of auxiliary framing bars that are added above existing auxiliary framing where disassembly of the existing auxiliary framing is not practical. Split nuts are approved for use in earthquake light zones only.

3.4.6 For High Type Auxiliary Framing, the maximum distance between levels of framing or between the ceiling and the first level of framing shall not exceed 5 feet 0 inches.

3.4.7 The height of auxiliary framing is measured from the floor to the bottom of the auxiliary channel.

3.4.8 No pair of bars or channels used for the direct support of vertical loads shall have fewer than two points of support.

3.5. Bolts, Nuts, Screws, and Threaded Rods

3.5.1 All bolts, nuts and screws used to secure any part or unit shall be plated to prevent corrosion (an exception are solid copper and stainless hardware), tight, plumb; free of damage, and meet specific / manufacturer's torque requirements where required.

3.5.2 The threaded part shall be flush at a minimum and may protrude to an extent not to create a safety or service hazard. Maximum allowable protrusion, where exposure may create a safety or service hazard, shall not exceed half the diameter of the threaded unit.

3.5.3 Both ends of bolts, screws or threaded rods shall be free of sharp edges.

3.5.4 Threaded rod splices may be used only under the following conditions:

3.5.4.1 Splicing of threaded rods per Tech. Pub 77351 is not encouraged, unless the rod being spliced is over six feet. No more than one splice is allowed in any threaded rod hanger.

3.5.4.2 The splice has an inspection hole in the center of the splice to permit visual confirmation that the two-rod sections are fully inserted and meet in the center of the splice.

3.6. Cable Racks

3.6.1 All cable racks shall be of the proper size and type, and located, leveled and aligned per job specification and drawing.

3.6.2 All sections of cable rack shall have both stringers supported at a minimum of one point, regardless of length. The ends of both cable rack stringers shall be bolted to the auxiliary framing support and only one bolt is required at intermediate auxiliary framing supports on alternate sides of the rack. Additional intermediate bolts may be required depending on actual support requirements in the office.

3.6.3 Cable rack runs consisting of one piece of rack, which are unsupported at each end, require a minimum of two points of support on each cable rack stringer (a minimum of four points of contact/supports per cable rack).

3.6.4 Horizontal cable racks shall be supported on approximately 5 foot centers, and in no case shall the spacing between supports exceed 6 feet. Cable rack stringer splices do not constitute a support.

3.6.5 Distance between last supports and cable rack ends shall not exceed three feet. Cross-aisle sections of cable rack four feet or less in length may be supported by two corner clips at each end.

3.6.6 Open and protruding ends of ladder type cable rack shall be finished with closing details or protective rubber caps.

3.6.7 All splices, junction details, brackets, and hangers shall be secure and installed per Qwest Engineering Standards 77351 and Standard Configurations.

3.6.8 New switchboard cable rack shall be of the solid bar stringer type or as identified in Standard Configuration and technical documents. Tubular or hollow stringer type is strictly prohibited. Existing channel stringer type cable rack may be extended to its' logical conclusion.

3.6.9 A minimum vertical clearance of 12 inches will be maintained above cable racks.

3.6.10. Minimum of 8 feet to the top of the cable rack stringer shall be required within the confines of a power area.

3.6.11. Power only cable rack shall be only solid stringer for the 15-20 inch rack and solid stringer reinforced for the 25-30 inch rack.

3.6.12. When horizontal cable rack has a change in elevation of more than 9 inches, a connecting cable rack shall be installed between the levels of cable racks. The connecting cable rack shall be installed at an angle no greater than 45 degrees.

3.6.13. The height of cable rack is measured from the floor to the top of the cable rack stringer.

3.6.14. Standard lengths of cable rack and / or auxiliary channel should be installed wherever possible.

3.6.15. Ceiling and auxiliary channel support is required for main aisle cable racking. Cable racking supported in the 7-foot floor supported environment is limited to the initial cable rack level plus one additional level. Where more levels are required, the subsequent levels of cable racking must be supported from the ceiling. Ironwork from a 7 ft environment may attach to a ceiling supported environment on a limited bases were office conditions prevent the continuation of the 7 ft environment and access is required to existing ceiling supported distribution frames and equipment. Where necessary, 7-ft environment cable rack levels may be supported in main aisles.

3.6.16. Cable rack should be placed above the center of the front aisle. Where this is not possible, contact the Qwest Space Planner and Design Engineer. Consideration should be given to heat dissipation, size of the cable rack and installer access whenever placing cable rack in the rear aisle.

3.6.17. Vertical cable racks, offset greater than 9 inches in parallel planes, shall be made using fixed degree edge clamps. Where it is not practical to use fixed degree edge clamps for vertical offsets, adjustable clamps may be utilized. Offsets shall be installed as close to a 45-degree angle as practical.

3.7. Raceways

See Chapter 9.1.5**,** "Raceways" for specific requirements.

3.8. Cotter Pins

The tips of all cotter pins shall be bent back and rest against the rod or bolt to prevent injury by projecting ends.

3.9. Earthquake Considerations

Note: When the Qwest engineers determine that special earthquake or disaster bracing is required, they shall so advise in their job specifications. (Reference - Qwest Communications, Inc. Technical Publication 77351, Module 1, “Qwest Central Office Telecommunications Equipment Engineering Standards.”) Seismic zones 0, 1, and 2 (defined as “Light”) shall be installed for seismic zone 2. Seismic zones 3 and 4 (defined as “Heavy”) shall be installed for zone 4.

3.9.1 In a “Heavy” earthquake zone, auxiliary framing, battery stands, equipment frames, shall be located no closer than 6 inches to exterior or interior walls or columns. Columns shall not be boxed in any earthquake zone.

3.9.2 All auxiliary framing, cable rack and support fabrications shall be equipped with external tooth lock washers in “Heavy” earthquake zone installations.

3.9.3 Splices in the same aisle of adjacent pairs of auxiliary framing shall be avoided. In no case shall two adjacent pairs be spliced in the same aisle. Splices shall be staggered at least one aisle apart. Only drilled-through, bolted splices shall be permitted.

3.9.4 Frame extension supports (bay extenders) are intended to provide support for 7 foot frames installed in 9 foot and 11 foot, 6 inch environments and for 9 foot frames in 11 foot, 6 inch environments. The extension is not intended for the mounting of equipment, if it becomes necessary to mount equipment above the 7 foot level a Letter of Deviation will be required.

3.9.5 Approved Heavy earthquake zone frame extensions (Bay extenders) shall be secured between the frame and extender with a minimum of four bolts. Approved frame extensions (Bay extenders) in Light earthquake zones shall be secured between the frame and extender with a minimum of two bolts.

3.9.6 In earthquake heavy environments, 3/8 inch, or larger, through bolts equipped with flat washer at the bolt head, and external tooth lock washer at the nut end shall be added at the ends of all auxiliary framing bars (per TP 77351). The through bolts are required for auxiliary framing bar overhangs where the end of framing channel is less than 6 inches from bracing details, threaded rods, etc. This bolt is to prevent hanger rods and braces from slipping out during an earthquake. A suitable spacer (½ inch Rigid Metal Conduit or equivalent) shall be placed between the framing channels to prevent bending. Electrical Metallic Tubing (EMT) conduit does not constitute a suitable spacer.

3.9.7 Where extension of auxiliary framing is possible, the ends of the bars shall be drilled for future splices.

3.9.8 In an earthquake heavy environment, stiffening clips shall be added to new auxiliary framing as in TP 77351. These clips shall be on a maximum of 36-inch centers. Where bracing or other attachments occur, these will serve the purpose of the stiffening clips.

3.10. Equipment Removal For Reuse

3.10.1 The Service Supplier shall make a visual inspection of the equipment being removed for reuse to identify and document physical defects or missing parts (broken or bent terminals, broken or warped circuit pack shelves, missing hardware, etc.). The inspection and agreed-to repairs shall be completed prior to the equipment being shipped, documented in the job log, and notification of completion of the repairs sent to the Qwest Design Engineer.

3.10.2 The Service Supplier shall utilize the proper tools and methods and procedures to ensure that the equipment being removed, as well as remaining equipment, is not damaged during the removal process. If the equipment is damaged during the removal activity, the Service Supplier shall notify the Qwest Design Engineer.

3.10.3 Care shall be taken not to damage or remove any shop wiring.

3.10.4 All installers' wiring shall be removed and terminals cleaned unless otherwise instructed by the Qwest Design Engineer.

3.10.5 The Service Supplier shall utilize proper packing assemblies when preparing to ship equipment removed for reuse. All equipment shall be packed and secured per job specification or manufacturer's instructions to safeguard against possible equipment damage during shipment.

3.10.6 System circuit packs and plug-in units shall be secured in place and remain with equipment shelves, unless otherwise noted by the Design Engineer. When it is necessary to protect the structure of the equipment, circuit pack and plug-in units shall be packaged separately in approved ESD containers and identified with the circuit pack or plug-in number on the outside of the container prior to shipment. ESD control measures shall be practiced if circuit pack removal is required. See Chapter 2, “Electrostatic Discharge ESD.”

3.10.7 In areas adjacent to, and within 6 feet of, Isolated Ground Plane Systems the Service Supplier shall ensure that Foreign Object Ground paths are not disturbed. If equipment and ironwork that is Foreign Object Grounded is removed, the Service Supplier shall ensure that ground paths are properly reestablished to remaining equipment and ironwork. See 11.5, "Isolated Ground Systems for Stored Program Control Systems," and Qwest Technical Publication 77355, "Grounding Central Office and Remote Equipment Environments," for additional information.

3.10.8 All equipment identified to be removed shall have all points of termination removed. The associated cabling must be removed to the cable rack at a minimum.

3.11. Fiber Optic Protective/Distribution Systems

3.11.1 Systems installed in equipment locations shall be assembled and aligned per drawings/records, specifications, Technical Publications (77351), Standard Configuration, and technical documents.

3.11.2 All covers and devices used to maintain fiber cable/jumpers within their protective systems shall be in place and secure.

3.11.3 Fiber optic cables and jumpers shall be run on dedicated racks or in dedicated cableways. Maximum length of fiber slack storage in cable racks or fiber management systems shall not exceed 6 feet.

3.11.4 Fiber optic inner duct is not acceptable for Central Office installations.

3.11.5 Fiber optic inner duct may extend a maximum of fifty sheath feet into an equipment facility and shall terminate and be sealed at or in the Cable Entrance Facility (CEF) or cable vault. Fiber optic PVC/PE and inner duct utilized by OSP, shall be terminated in the cable vault and shall not be extended into the equipment facility. Metallic conduit shall be used to route non-OFNR/ONFP type fiber cables that extend more than 50 sheath feet into a Central Office.

3.11.6 A dedicated cable slot/hole/sleeve shall be used for fiber cable entering the equipment facility from the CEF with provisions for approved fire/smoke and gas stopping. Using cable sleeves associated with Distributing Frames for running fiber cable is prohibited.

3.11.7 All sections of fiber trough shall have a minimum of one support, and supports shall be added every 3 feet.

3.12. Frames, Bays, Cabinets, and Stands

Note: See Paragraph 3.9, "Earthquake Considerations," and Paragraph 3.18, "Earthquake Zone Map," for specific Earthquake zone requirements. Seismic zones 0, 1, and 2 (defined as "Light") should be installed for seismic zone 2. Seismic zones 3 and 4 (defined as "Heavy") shall be installed for seismic zone 4. See 3.12 "Frames, Bays, Cabinets, and Stands".

3.12.1 Locate all frames, bays and piece parts per job specification and drawing/record. All frame parts shall be free of defects, secure, and aligned.

3.12.2 All frames, bays, or cabinets shall have two top supports and a minimum of two bottom floor supports in seismic zone “Light” and two top supports and four bottom floor supports in seismic zone “Heavy”. Top supports made with threaded rods or bolts may not exceed 8 inches in length (measured from top of frame to bottom of auxiliary framing bars). All equipment shall be top supported by methods defined in Technical Publication 77351, unless other methods are approved and documented in Qwest Standard Configuration documents. See associated Configuration and TP 77351 figures for use of a frame support pipe as a top support in 9 and 11-foot environments and parallel auxiliary channel as top support in 7-ft environments.

3.12.3 All battery stands shall be floor secured, meet manufacturers' recommendations, and comply with Qwest minimum requirements for the Earthquake Zone in which the stands are installed. Single sided battery stands in seismic zone “Heavy” shall not be located closer than six inches from a wall.

3.12.4 The uprights of all frames or cabinets where the flanges align will be junctioned together. Equipment frames 7 feet high require a minimum of three junction plates. Equipment frames 9 feet or 11 feet 6 inches high require a minimum of four junction plates.

3.12.5 The vertical alignment of all frameworks shall be plumb within the allowable deviations as shown in the “Alignment Tables”, in Paragraph 3.19.

3.12.6. Cabinets on casters or rollers shall have the rolling system disabled or removed and be anchored to the floor.

3.12.7. The distance between the TOP of an approved pipe stanchion and the BOTTOM of the supported ironwork shall not exceed 2 inches.

3.12.8. Frame guardrails, end guards, and spacers shall match and be in alignment, as shown on the floor plan (front of frame guardrails shall be flush). Transition plates or guards shall be installed where this cannot be accomplished, whether the lineup is equipped with rolling ladders or not.

3.12.9. Cabinets on casters or rollers shall have the rolling system disabled or removed and be anchored to the floor in accordance with the earthquake zone requirements in which they are installed.

3.12.10. Frame, Framing and Racking Clearances

Table 3-1: Walls and Columns

	Standard Distance from Wall	Minimum Distance from Wall	Standard Distance from Column	Minimum Distance from Column
Equipment Frames or Cabinets	**note 1**	**note 1**	**1'** **note 2**	**6"** **note 2**
Auxiliary Framing (Perpendicular to)	**1'**	**6"**	**1'**	**6"**
Cable Racking (Perpendicular to)	**1'**	**6"**	**1'**	**6"**

Notes:

1) Front or rear aisle spacing (from Table 3-2) applies unless the aisle is an egress aisle. Any egress aisle, to the front, rear, or side of a bay, shall be a minimum of 4 feet wide.

2) This distance to a column is for the end of a bay to the column. Standard and minimum front or rear aisle spacing will apply to distances from the front or rear of a bay to a column.

Table 3-2: Aisle Spacing – New Applications

Equipment Type	Standard Front (Maintenance) Aisle	Minimum Front (Maintenance) Aisle	Standard Rear (Wiring) Aisle	Minimum Rear (Wiring) Aisle
Toll (up to 1200 Watts)	3’	2’-6”	2’-6”	2’
Data (over 1200 Watts)	Custom Engineering	4’	Custom Engineering	3’
FDF	4’	3’	3’	3'
Switch	3’	2’-6”	2’-6”	2’-6”
Battery Stand (2 Tier /2 Sided)	3’-6”	3’	3’-6”	3’
Battery Stand (Single Sided)	3’	2’-6”	6” from the wall (back side only)	6” from the wall (back side only)
Cosmic Frame	4’	4’	4’	4’
CDF, MDF	4’	4’	4’	4’
DSX	4’	3’	4’	3’
Main Aisle, Egress	4’	4’	4'	4'

Toll Equipment is defined as traditional telecommunications equipment with a total heat release of less than 1200 Watts per bay or cabinet.

Data Equipment is defined as technologically advanced and concentrated telecommunications equipment with a total heat release greater than 1200 Watts.

Main Aisle in a Central Office environment provides space for placement of feeder cable racks, conduit, equipment lineup designation numbering and identification, and breaks at the ends of the 50-foot equipment lineups. The main aisle may also be considered the main egress, see below.

Egress is defined by OSHA as "Means of egress." A means of egress is a continuous and unobstructed way of exit travel from any point in a building or structure to a public way. For our purposes a public way is defined as an exit that leads out of the building.

AISLE MEASUREMENTS

- Equipment frame aisles will be measured from the outer most edge of the frame guard rail or guard rail extension to the outer most edge of the opposite frame guard rail or guard rail extension.
- Main aisles are measured from the outer most point of the end guard attached to the first frame in one lineup to the outer most point of the end guard attached to the first frame in the lineup directly across the new main aisle.

LINEUP REQUIREMENTS

- Frameworks of the same depth shall be used in QWEST Central Office (CO) frame line-ups.
- A maximum difference of 3 inches in depth is allowable for framework or cabinets within a single Central Office lineup.
- Equipment frame line-ups shall not exceed 50 feet in length.

3.13. Framework and Ironwork Components

3.13.1 All piece parts (i.e., ironwork, framework, threaded rod, miscellaneous details, etc.) shall be installed per equipment drawings/records and shall be secure, aligned, plumb, and free from defects, sharp burrs, points, etc.

3.13.2 All splices on cable racks, auxiliary framing bars or junction bars shall be butted together or butted against junctioning hardware. Gaps shall not exceed 1/8”.

3.13.3 All surfaces of equipment and ironwork parts shall be free of rust, dirt and contaminants. If rust is apparent on equipment or parts, they shall be cleaned and painted.

3.13.4 All cut ends of cable rack auxiliary framing, threaded rods, and other unprotected metal parts shall be plated or painted.

3.13.5 End guards shall be provided for end of equipment lineups, and shields provided when frame duct / uprights (wiring and cables) are exposed within an equipment lineup.

3.13.6. Approved pipe stanchions shall be secured in the light earthquake zones with 2 floor anchors of the correct size and 4 floor anchors of the correct size in the heavy earthquake zones.

3.14. Lighting Fixtures

Note: **See 9.1, "AC Circuits."**
All approved lighting fixtures shall be installed in accordance with job specifications, standard configurations, Technical Publication 77351, and drawings/records.

3.15. Rolling Ladders and Tracks

Note: See 9.1, "AC Circuits."
3.15.1 Hanger rods or bolts used for direct support of ladder track shall be provided with a cotter pin or self-locking nut.

3.15.2 Ladder stop bolts and bushings shall be installed on all ladder track ends and equipped with cotter pin or lock nut.

3.15.3 Ladder track stop bolts shall be placed or relocated to ensure accessibility of equipment from rolling ladder.

3.15.4 Non-creep bolts shall be installed, burred, and staked on all ladder track ends.

3.15.5 Ladder track splice screws shall be equipped with washers and burred, staked or secured with self-locking nut.

3.15.6 Rubber plugs shall be installed at both ends of the ladder track to prevent hazard to personnel. Ladder track ends shall be no closer than 6 inches from a wall.

3.15.7 Fenders and wheel guards shall be provided on all ladders where specified.

3.15.8 All ladder brakes shall be adjusted per Qwest standards or manufacturers' standards, as applicable, to ensure proper operation of brake assembly.

3.15.9 All brake rope ends shall be trimmed and clamped to remove risk of personal injury.

3.15.10 All ladders shall run free and clear of equipment.

3.15.11 Distributing frame or single sided lineup ladders shall have their handrails located on the side of the ladder farthest from the equipment it serves.

3.16. Units of Equipment

Note: When mounting positions are identified in inches or in fractions of inches, these measurements are from the top of the frame base to the bottom of the unit *of equipment.*

3.16.1 All units of equipment shall be installed, aligned and secured in accordance with Standard Configurations, job specifications and drawings.

3.16.2 All installer mounted units shall be secured with a minimum of four screws in the upper and lower most available mounting holes on each side of the unit. Units exceeding 8 inches in height require 1 additional mounting screw on both sides for each additional 8-inch interval. Additional screws may be required for heavier units or as required by manufacturers' specifications.

3.16.3 All units of equipment (including cabling, connectors, etc.) shall not extend beyond the front or rear edges of the base or guardrail of the frame.

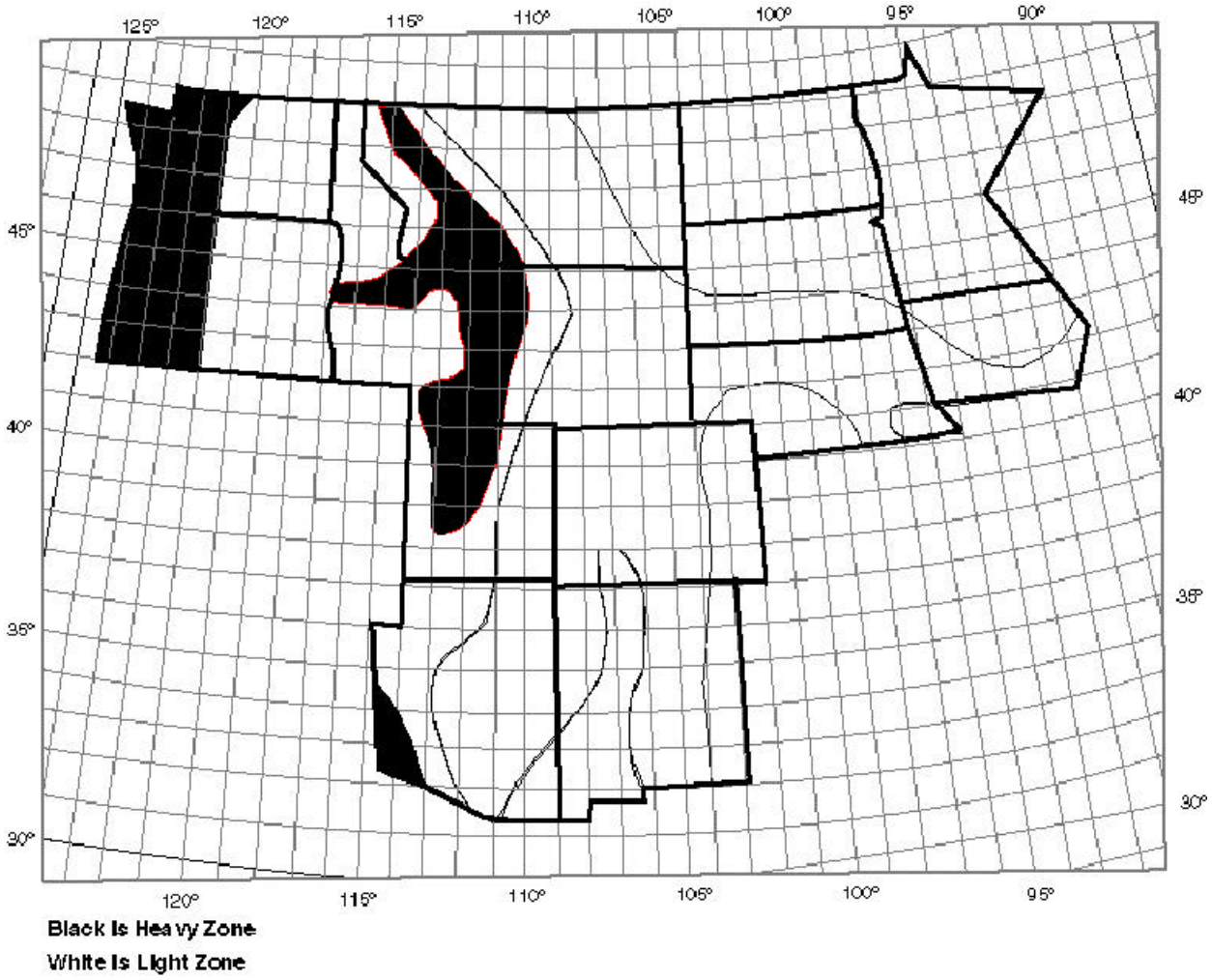
3.16.4 Frames shall not be equipped above the 7 foot level. Rolling ladders are the traditional approved method of access, and shall be installed front and rear of equipment for 9 foot or 11-foot 5-inch environments.

3.16.5 Mounting space adapters shall be used where hole spacing is incorrect for the equipment being mounted in the frame, bay, or cabinet. The frame, bay or cabinet shall not be drilled under any circumstance to accommodate equipment mounting.

3.17. Antenna and associated Transmission Lines

3.17.1 Antenna and associated Transmission Lines shall be installed and supported as specified in accordance with job drawings / records, specifications, Technical Publications (77355 and 77360), and Standard Configuration documents and, manufacturers’ instructions.

3.18. Earthquake Zone Map



3.19. Alignment Tables

VERTICAL ALIGNMENT
Maximum Allowable Deviation From Plumb

Height	Maximum Allowable Deviation
4'6" or Less	**1/16"**
Over 4'6" and less than 7'	**1/8"**
7' to 9' inclusive	**3/16"**
Over 9'	**1/4"**

HORIZONTAL ALIGNMENT
Shall Be Level

3.20. Building Envelope Drilling Procedures

All drilling of the equipment building envelope, consisting of floors, walls, ceiling, or any wall/separation therein, shall be accomplished in a safe and environmentally sound manner, which captures and contains any debris using proper HEPA vacuum and protective materials.

All floor tiles shall be considered and treated as asbestos, unless identified as asbestos free.

These procedures shall be followed whenever the Service Supplier is performing an installation that involves drilling through floor tiles that contain asbestos or if the Service Supplier is unsure of the asbestos content of the floor tiles. See Chapter 12, "Hazardous Material Handling," for additional information.

3.20.1 Dry Drill Procedures

- Assemble tools and equipment: drill motor, drill bit, eye protection, petroleum jelly, spray detergent, paper wipes/towels, plastic locking seal bags, container (box) labeled with a Class 9 DOT label.
- Mark the floor tile where drilling is intended.
- Spread petroleum jelly in a five-inch diameter circle, 1/4" thick, surrounding the drilling point.
- Place the drill bit at the starting point and drill at the slowest practical speed. The early debris is the material from the tile. The later gray material is concrete dust formed into petroleum jelly slurry.

- Remove the drill bit and wipe the floor and drill bit with paper wipes/towels. Clean the resulting oily surfaces of the drill bit and floor with spray detergent.
- Place all used paper wipes/towels and filter from vacuum in a large plastic locking seal bag, place this bag into a second plastic locking seal bag, and place the bag in a properly-labeled asbestos container for disposal.
- Properly fill out a Straight Bill of Lading RG 33-0017, addressed to the BRI-MRC, and contact the MRC for pick up. Insert the following information in the Hazardous Materials section of RG 33-0017:
    - Number and Units - number of containers
    - Hazardous Materials - RQ, Asbestos, 9, NA2212, PG III
    - Hazard Class - 9
    - NA No. - NA2212
    - Weight - estimated total weight of container

3.20.2 Wet Core Drilling Procedures

- 1. Assemble tools and equipment: drill stand, drill motor, core bit, water tank, vacuum pump, water collection kit, damp and dry paper wipes/towels, plastic locking seal bags, container (box) labeled with Class 9 DOT label.
- 2. Mark floor tile where drilling is intended.
- 3. Follow the manufacturer's drilling procedures for setup, drilling, and wastewater collection.
- 4. When drilling is complete, vacuum any remaining water and clean up equipment with paper wipes/towels.
- 5. Follow procedures in 3.20.1, "Dry Drill Procedures," steps 6 and 7.

3.21. Floor Anchors and Installation Instructions

There is one anchor bolt assembly approved for use within all Qwest telecommunications facilities. The only exception is the approved power equipment anchor for battery stands and other power room equipment, see 3.21.1. These anchors are available in kit form containing two anchors and two 2" X 2" hold-down plates under Hilti® item #002307122, Qwest PID #2285841. The anchor has a 2 1/2 (60 mm) inch embedment depth and the head of the torque indicating anchor will break off when installed correctly. For anchor bolt quantity and positioning information refer to the Qwest Technical Publication 77351. If floor depth problems are encountered, the Service Supplier shall contact the Qwest Space Planner who will coordinate a resolution with the Qwest Real Estate Representative responsible for that office. Floor anchor holes shall not exceed the imbedded depth of the anchor bolt assembly. The Installation service supplier shall document any applicable resolution in the Job Log

3.21.1 All battery stands and power room specific frameworks (i.e. power plants, rectifiers, etc.) placed in any Qwest telecommunications power area will use the approved power equipment anchor. The specific power equipment to anchor with this anchor is defined in the Qwest Standard Configuration documents. The only approved power equipment anchor is available in kit form from Hilti. Each kit contains two anchors and two 2"x2" hold down plates under Hilti item # 97413007. Two anchor bolts are required on 3.21.2 Drill the proper diameter and depth hole following the instructions in 3.20, "Building Envelope Drilling Procedures," as appropriate.

3.21.3 Clean loose debris from the hole. Make sure all drilling debris is removed from the hole.

3.21.4 Make sure the nut and washer are threaded onto the rod with the washer in contact with the top of the sleeve. Any isolation bushings or hold down plates should not be on the anchor at this time.

3.21.5 Insert the anchor into the hole and tap the anchor down with a hammer until the washer contacts the concrete.

3.21.6 Pre-torque the anchor to approximately one half of its installation torque (30 foot pounds).

3.21.7 Loosen the nut several turns and then remove the rod, nut, and washer. The rod assembly may be backed out by using the screwdriver slot.

3.21.8 Position the frame, bay, or cabinet over the holes. Be careful not to let debris fall into the holes.

3.21.9 Place the rod through the hole in the base of the frame, bay, or cabinet and thread it into the anchor body until it is fully engaged in the threads in the bottom cone.

3.21.10 Add all components such as bushings, washers, and hold down plates.

3.21.11 Tighten the torque nut to the point where the top flange of the nut snaps off (approximately 60 foot pounds). Use a box end or a flare nut wrench or socket to tighten the torque nut. Do not use an open-end wrench, which may distort the torque nut and affect the setting torque.

3.22. Floor Tile Punch Procedure:

Tools needed:

- Floor Punch R5567 (Comcode 200207256):
- A one-inch diameter punch.
- Heat Gun
    - If available, use an approved heating device (i.e., heat gun) to heat the tile. Use heating device in accordance with manufacturer's instruction.
    - Place floor tile punch on the area to be punched.

- Strike punch with a mallet while trying not to move the punch (if a heat gun is not available, 1 to 3 forceful strikes with a sharp punch will be needed to get through the floor tile. Additional strikes may cause splintering of the tile.)
- Remove the tile plug.
- If additional debris remains after punching, use spray detergent or HEPA vacuum (approved for use with asbestos) to clean up. If a HEPA vacuum is used for cleanup, the pre-labeled asbestos disposal container must be treated as asbestos waste and must not be emptied for re-use. Emptying the container could cause asbestos fiber release.
- Double bag plug and any asbestos debris that may remain. Ensure that the outer bag is properly labeled for asbestos disposal. Seal the bag and place in a storage area previously identified for asbestos waste. After several bags or containers (i.e., 4 or more) have been accumulated at the location, contact your local EHS or Environmental Manager for pickup and disposal according to local regulations (please call (UNICALL 800) 654-2525 for the area Manager).

Please note that the floor tile punch can also be used to fill in a plug of tile that has been removed previously:

- Chose the same size punch as the one that was used to remove the piece of tile.
- If there is a hole in the concrete underneath the tile layer, make sure that you have filled the hole with a stable material to prevent the plug from falling into the hole.
- Using the punch on an extra floor tile that may be available, follow the procedure listed above to create a plug.
- Apply an appropriate glue or mastic to the underlying material to hold the plug in place. Place the plug in the hole and tap gently into place with the mallet.
- Double bag, the asbestos debris and plug. Ensure that the outer bag is properly labeled for asbestos disposal. Seal the bag and place in a storage area previously identified for asbestos waste. After several bags (i.e., 4 small bags or more) have been accumulated at the location contact your local EHS or Environmental Manager for pickup and disposal according to local regulations (please call (UNICALL 800) 654-2525 for the area Manager).

3.23. Floor Tile Drilling With HEPA Vacuum Attachment”

Floor tile drills with HEPA vacuum attachments, approved for use with asbestos, can be used if the collection container is pre-labeled for asbestos debris. The drill should be operated at the lowest speed practical to maximize the debris collected in the vacuum.

Additional Considerations:

- To ensure that fiber release is minimized, ensure that the drill and attachment are working properly and are not clogged. If the vacuum attachment gets clogged, the

obstructions must be cleared to maximize suction. Water should be sprayed onto the debris to minimize fiber release while the vacuum is being cleared.

- If the HEPA vacuum is not working properly, the procedure for use of a drill with petroleum jelly, “lubricant cable wire interduct” (PID# 2228122) must be used to reduce fiber exposures.

The pre-labeled asbestos disposal container must be treated as asbestos waste and must not be emptied for reuse. Emptying the container could cause unnecessary asbestos fiber release.

- Double bag any remaining asbestos debris. Ensure that the outer bag is properly labeled for asbestos disposal. Seal the bag and place in a storage area previously identified for asbestos waste. After several bags or containers (i.e. 4 or mom) have been accumulated at the location, contact your local EHS or Environmental Manager for pickup and disposal according to local regulations (please call **(UNICALL 800) 654-2525** for the area Manager).

3.24. Floor Tile Drilling With Separate HEPA Vacuum That Is Not Attached To Tile Drill:

This method can be used when two technicians are available to perform the work. One employee would perform the drilling while the other holds the vacuum (equipped with a disposable container for asbestos wastes). The additional employee must operate the vacuum at the point to catch as much of the released debris as possible. If the vacuum becomes clogged, the obstructions must be cleared to maximize suction. Water should be sprayed onto the debris if there is a potential for fiber release while the vacuum is being cleared. If you cannot get the HEPA vacuum to work properly, follow the procedures for drilling through floor tile utilizing petroleum jelly to contain asbestos fibers.

The pre-labeled asbestos disposal container must be treated as asbestos waste and must not be emptied for re-use. Emptying the container could cause asbestos fiber release. Double bag any remaining asbestos debris or items used for cleanup. Ensure that the outer bag is properly labeled for asbestos disposal. Seal the bag and place in a storage area previously identified for asbestos waste. After several bags or containers (i.e. 4 or more) have been accumulated at the location, contact your local EHS or Environmental Manager for pickup and disposal according to local regulations (please call **(UNICALL 800) 654-2525** for the area Manager).

3.25. Raised Floors

When mounting frames, bays, or cabinets on raised floor environments, the floor manufacturer's requirements shall be followed. Where raised floors refer to ED4A306-70 for methods of support use Group 4 for light earthquake applications and Group 16 for heavy earthquake applications.

3.26. Waterproof Floor

3.26.1 Before drilling into any basement floor or basement wall, it shall be the installer's responsibility to determine from the Qwest Building Engineer whether or not waterproofing has been provided. Usually this is covered on job drawings or in job specifications.

3.26.2 When waterproofing is used, Qwest shall decide the method for securing the frames.

3.26.3 Drilling in waterproofed floors, where authorized, is limited to depths not exceeding three inches.

3.26.4 If the waterproofing cannot be temporarily broken to accept anchors, the “poured concrete block” method should be considered; however, some frames cannot be secured in this manner. See Qwest Communications Inc. Technical Publication 77351, “Qwest Central Office Telecommunications Equipment Engineering Standards.”

3.26.5 Frames equipped with pull out units, where an appreciable amount of the weight may be shifted outward, shall not be fastened with the “poured concrete block” method.

3.27. Battery Containment

3.27.1 Before drilling floors for new battery stands the installer shall determine if there are any containment requirements. This may include the entire room. After a floor containment system has been compromised the Real Estate department shall be notified to reestablish the containment.

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Figures

4. Cable Holes, Penetrations, and Fire/Smoke Protection

Note: All cable holes and penetrations shall be closed with the appropriate intumescent method

The recommended method of fire / smoke stopping is accomplished with approved intumescent and endothermic materials and high temperature caulking compound.

Cable holes shall not be filled beyond ¾ capacity to allow for firestop to operate effectively.

Cable holes nearing or surpassing capacity will be brought to the attention of the Qwest representative responsible for Space Planning immediately.

All Service Suppliers are required to have 3M trained and certified personnel when working on fire stopping.

The AMC Standard Configuration of some specific types of equipment and Qwest Drawing Standards can supersede some requirements identified in this chapter.

4.1 General Requirements

4.1.1 All cable holes, slots through floors and walls of interior spaces opened for installation purposes, occupied or not, shall be temporarily closed at the end of each working day and/or shift or whenever it is anticipated that no additional cable will be run that same day. Cables holes shall be permanently closed, using an approved method, when no further cable will be run on that specific job. **(In "no case" should this exceed 5 days of inactivity before permanently sealing penetrations).**

4.1.2 Job installation/removal work requires optimum fire protection to be maintained at all times.

4.1.3 The Service Supplier shall utilize Qwest approved fire/smoke stopping systems, which shall be properly installed to conform with their respective Underwriters Laboratory (UL) Listings.

4.1.4 Only one fire/smoke stopping system shall be used to close any individual penetration.

4.1.5 Intumescent and non-intumescent systems and putties shall not be mixed. Intumescent stopped holes shall use intumescent putty only. Putty shall be installed per manufacturers' instructions.

4.1.6 The installer shall refer to intumescent material manufacturer's "Application and Specification Guide" for specific requirements and instructions.

4.1.7 All cable holes and slots that utilize mineral wool bags shall have steel cover plates installed on both sides of the enclosure. Putty shall also be installed on both sides of the enclosure.

4.1.8 All penetrations shall be fire/smoke stopped using the approved intumescent method. Occupied cable holes utilizing wool bag type firestop materials shall be upgraded to preferred materials when opened for a cabling addition or as soon as practical.

4.1.9 All wood material used for construction of temporary walls and equipment or terminal mounting boards must be either UL listed fire retardant pressure treated and factory marked with the UL label or be completely coated with a fire retardant paint. Mounting boards should be kept to the minimum size required to mount equipment and allow for reasonable growth.

4.1.10 Cable temperature shall not exceed 115° Fahrenheit in any horizontal cable rack, vertical cable rack or vertical duct within the bay. In addition, there shall be no instance where an equipment surface temperature exceeds 115° Fahrenheit without a highly visible warning label.

4.1.11 For any work in a building that requires the use of Radiography or x-ray techniques by contractors or vendors for the purpose of locating building structural members and verifying core drill locations, following shall be part of the contractors specifications, and part of their MOP document for the work at hand.

- Prior to starting work Contractor must visually survey the building and the proposed work area for personnel exposure floor by floor and notify personnel about the potential for exposure to radiation and to assure that the exposure area is clear of personnel for the duration of the work.
- Prior to starting work Contractor must post warning signage on exterior doors or at safe perimeter distances from the exposure area to warn personnel. Example:
    - "WARNING - Radiography is in Progress (on Floors 1, 2, 3, etc..)", or
    - "WARNING - x-ray equipment is in use (on Floors 1, 2, 3, etc.)"
        1. During each radiographic operation the contractor shall maintain continuous direct visual surveillance of the operation to protect against unauthorized entry into a high radiation area.

4.2 Closure Labels

Note: A template for labels is included with the cable hole application figures and may be reproduced on pressure sensitive paper for use. See Section 4.5.

4.2.1 A green temporary closure tag shall be placed on or near any hole opened during the installation process. This tag shall be removed when the cable hole is permanently closed. It shall be permissible to use a reusable placard (magnetic or etched plastic) to satisfy this requirement. Temporary closures shall be made at the end of each working day or when no additional cable is to be run that same day. The bottom cover is not required for “temporary closures.”

4.2.1.1 Temporary closure requires that the top cover be secured with a minimum of five bolts (corners and center front) and that putty is installed around cables.

4.2.1.2 Temporary closures, associated with cable removals, require that an additional composite sheet be placed over the old sheet. This sheet shall be used to cover the void caused by the removal of cables. The additional sheet shall be bolted with a minimum of two bolts, and keep the gaps between the cables and the composite sheet one-half inch or less. Installer shall putty the void between the composite sheets and the cables.

4.2.1.3 The edge of the composite sheet against cables shall be taped with aluminum tape (1-2 mils thick), or plastic finger edging approved by the composite sheet manufacture. Protection is required to shield the cables from the composite sheet metal edges.

4.2.2 A red permanent closure tag shall be placed across the edge of a cable hole cover at the end of the installation process to assure that the label is destroyed if the cover is subsequently removed.

4.2.3 Closure labels shall have the following information: U S WEST order number, supplier/organization name, telephone contact number, and date of closure. See Section 4.5 for labels.

4.3 Horizontal, Miscellaneous, and Vertical Penetrations

4.3.1 All cable slots, cable sleeves and openings through fire rated walls and floors including conduit runs, fiber optic distribution systems, and other openings require fire/smoke stopping.

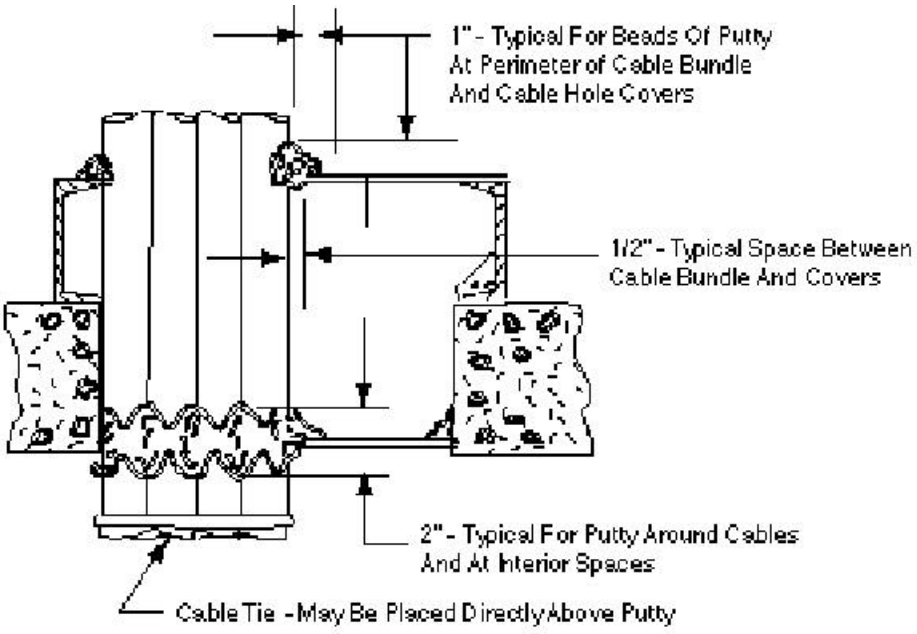
4.3.2 All floor cable holes require a top cover of .112" thick steel sheet (.112 is an American Standard Preferred Thickness approximately related to AWG size 10). If the traditional bag method is used, a bottom steel plate is also required. When the Intumescent Method is used, the CS195 composite sheet is sufficient for the bottom cover, and requires putty on the top side against the cable bundle. Bottom covers are to be secured by the recommended method of the UL process used to Fire/Smoke seal penetration. The 10 AWG top cover steel plate can be straight cut one inch from the cable bundle, when the CS195 composite sheet is used. Note: Qwest requires the use of CS195 sheet on the bottom of all Vertical Penetrations when the Intumescent Method is used.""

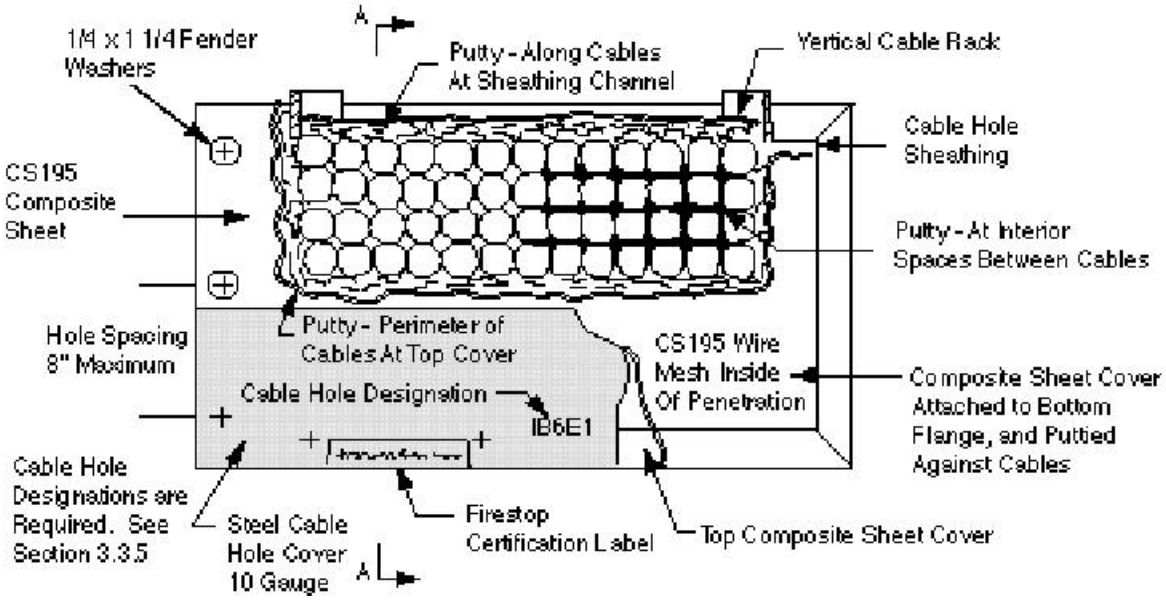
4.3.3 All cable holes through fire rated walls require steel cover plates on each side of the penetration when the traditional method is used.

4.3.4 Temporary protection such as cones, posts, rails shall be provided for personnel and equipment where there is a danger of personnel or material falling through the cable hole.

4.3.5 Upon creating a floor or wall penetration, the location shall be identified as shown on the Floor Plan Drawing and shall be designated on both sides and will be fire stopped appropriately before end of shift. The method shall be consistent with the TP 77353 Central Office Drawing Standards.

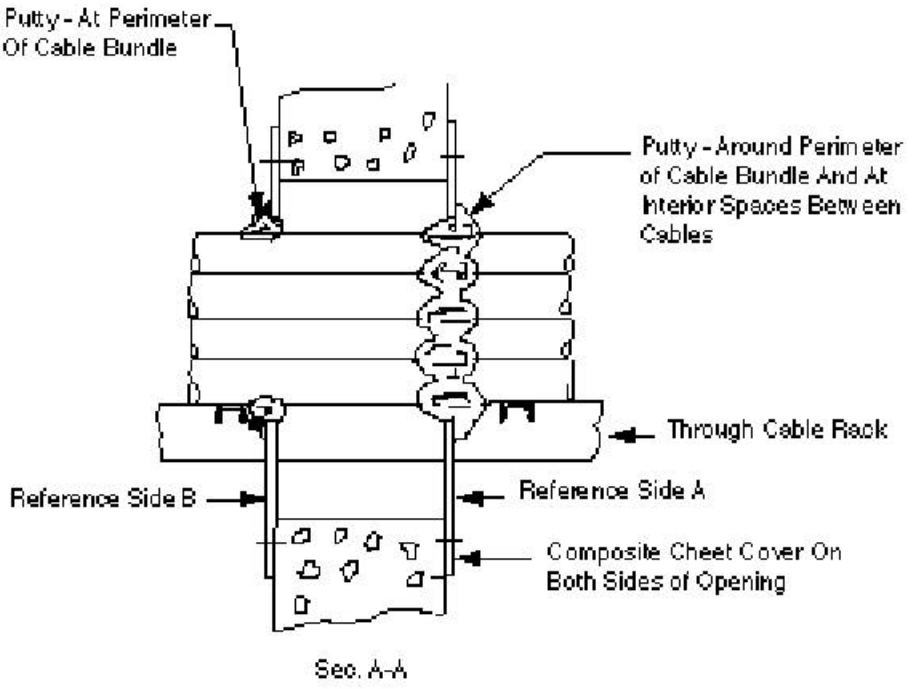
4.3.6 Intumescent Firestopping - Floor Penetrations



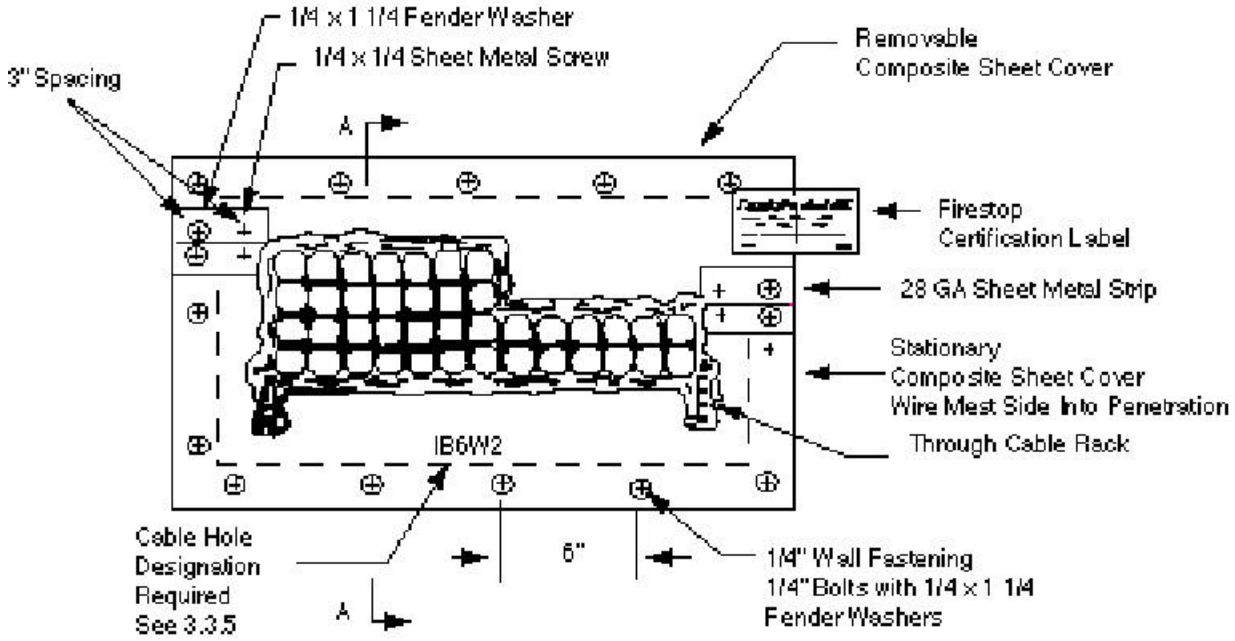


Note: Bottom composite Sheet may be Secured directly to bottom of cable hole. Bottom steel plate is not reinstalled

4.3.7 Intumescent Firestopping - Through Wall Penetrations



U S WEST Requires That All Wall Penetrations Be Provided With A Metal Flange



4.4 Approved Materials

All 3M UL listed Fire Protection Products approved for use in Telecommunication Buildings.

4.5 Approved Label Template

RG 47-0132

CABLE HOLE OPEN

This cable hole is to be temporarily closed. Temporary closures shall be made at the end of each working day, when no additional cable is to be run that same day, or when period does not exceed 48 hours and shall conform to Qwest Communications, Inc. Technical Publication 77350.

U S WEST ORDER NO.:_____
SUPPLIER/ORGANIZATION:_____
CONTACT TELEPHONE:_____
DATE:_____

(GREEN)

RG 47-0133

FIRESTOPPED CABLE HOLE

This cable hole has been firestopped in accordance with Qwest Communications, Inc. Technical Publication 77350.

U S WEST ORDER NO.:_____
SUPPLIER/ORGANIZATION:_____
CONTACT TELEPHONE:_____
DATE:_____

(RED)

Supplier may duplicate these labels on adhesive backed paper, color the edges the proper color, and use these approved labels.

4.6 Application Exhibits

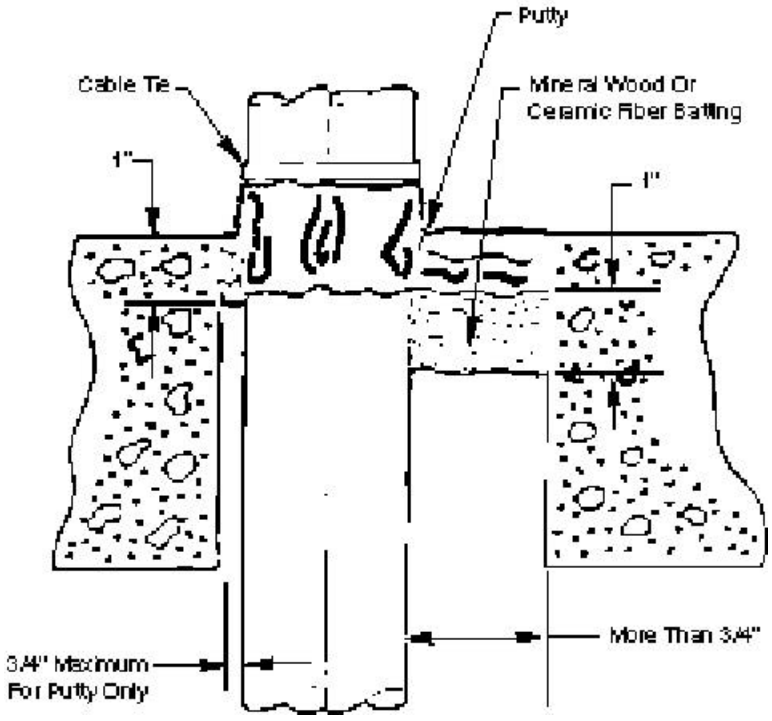


Figure 4-1 Intumescent Firestopping - Circular Opening With More Than One Penetrating Item

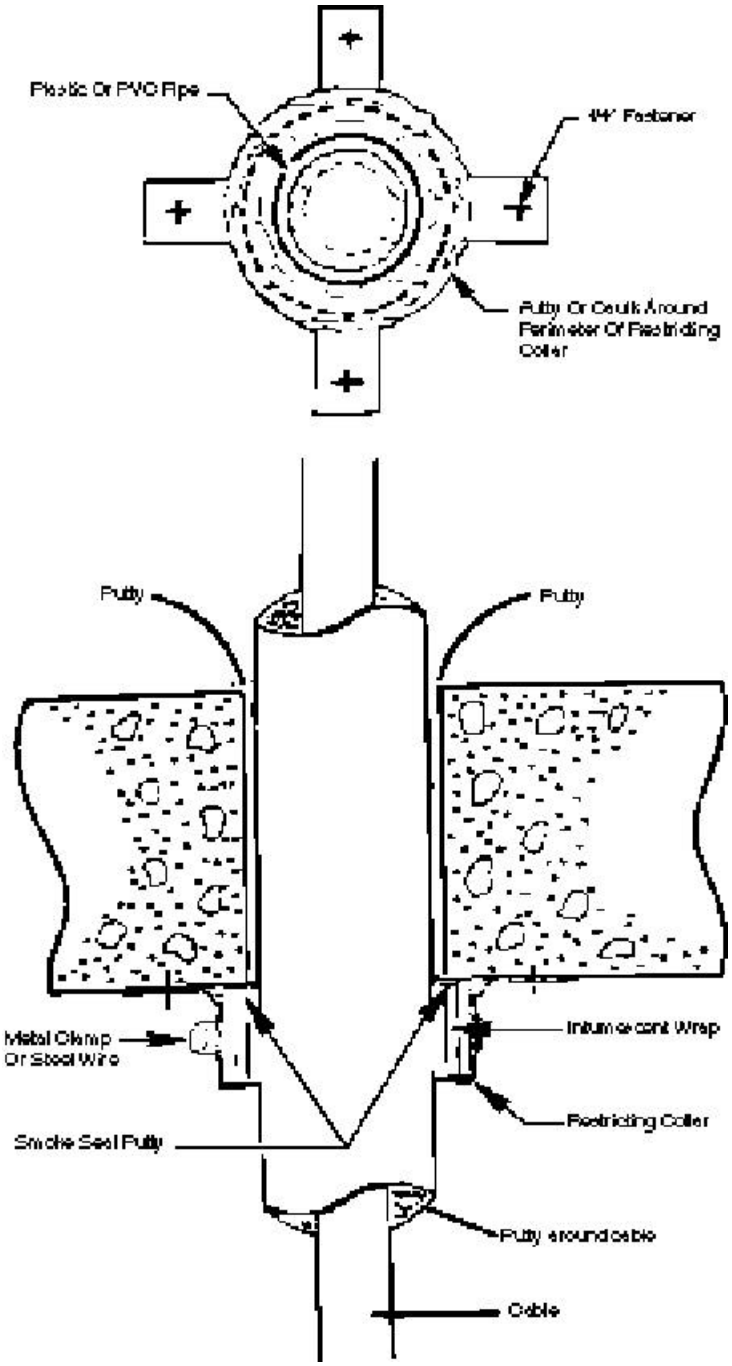


Figure 4-2 Intumescent Firestopping - Plastic or PVC Pipe in a Close Fitting Opening

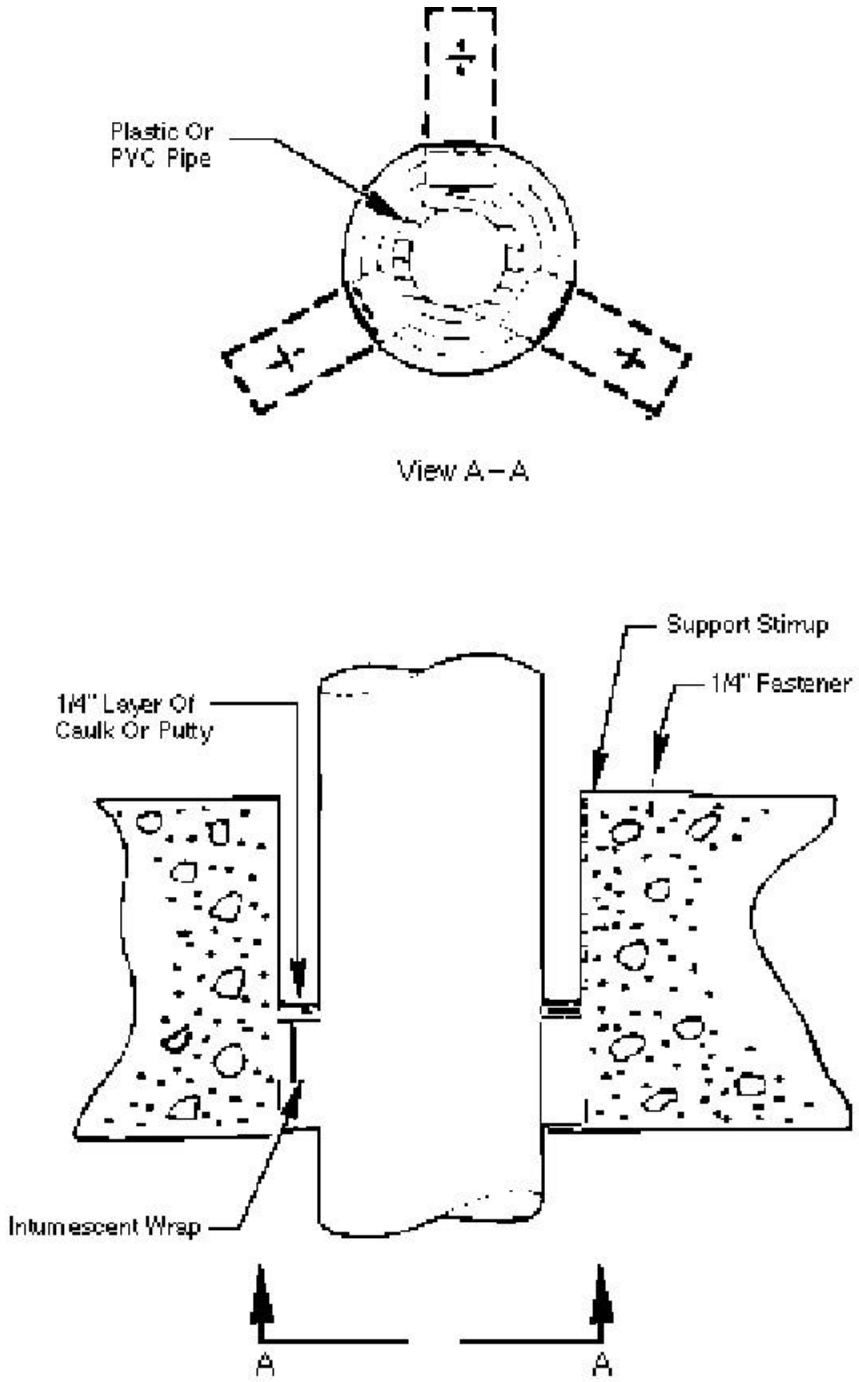


Figure 4-3 Intumescent Firestopping - Plastic or PVC Pipe in a Large Area Opening

CONTENTS

Chapter and Section **Page**

5. Cabling, Forming, Running, and Securing

Note: Additional requirements for power cabling are found in Chapter 9.

5.1 General Requirements

The requirement for cable routing and segregation shall be per job specification and records/drawings, specified in Qwest Standard Configuration documents or technical publications.

Cables shall be run directly from point to point with only a maintenance loop of slack (not to exceed 6 feet) stored on the cable rack.

5.1.1. All cables shall be run within the confines of the cable rack stringers and shall not be ran so as to block access to entrance to a bay. Do not run cables on existing cable racks where cable pileup exceeds cable pileup limits or the top of cable horns. Cable horns are limited to a maximum usable length of twelve inches. If the Design Engineer gives the supplier a waiver on running of their cable in offices that have excessive build up then that supplier shall document and place a copy of that waiver in the job package.

5.1.2 Remove all cable running tags and binder grouping material after the completion of testing. Exception: When requested by the Central Office Operations (COO) personnel and the Qwest Design Engineer concurs with a letter of deviation, on a per job basis, the tags may be left in place if those tags are made of a fire resistant material. A copy of that waiver shall be placed in the job package.

5.1.3 Cable and cable management systems shall be a distance sufficient to maintain a maximum cable/enclosure temperature of 115° F. At a minimum, the distance shall be no less than 6 inches clearance from engine exhaust pipes, steam pipes, or other environmental hazards.

5.1.4 Cable spanning horizontal planes shall not exceed 9 inches without additional support.

5.1.5 Where cables transition off a cable rack, they shall be routed over the side stringers or off the end of a cable rack that will not be extended at some future date. Cables shall not be routed through the cable rack.

5.2 Cable Mining

5.2.1 Cable mining conducted above working equipment shall only be done after precautions are taken to protect the equipment below. A protective barrier shall be constructed between the cable rack and the equipment. Before any cables are removed, the cable racks shall be vacuumed with a High Efficiency Particulate Arrester (HEPA) vacuum.

5.2.2 Ring or loop type cutters, which require the free end of the cable to be inserted through a ring or loop, shall be required for the removal of cable. Removal of cables shall have an authorized "Detailed" MOP written before any cable is removed.

5.2.3 A current probe or clamp on ammeter capable of reading both AC and DC currents shall be used to check for a zero current condition prior to the cutting of power/grounding cables. The installer shall be required to designate the far-end termination on both sides of the power / grounding cable prior to the initial cut. This shall be documented in the "Detailed" MOP and a copy placed in the job package.

5.2.4 All cables shall be mined / removed to a minimum of the top of the cable rack. The ends of all cables shall be individually taped.

5.3 Bending and Forming

Note: Sharp bends in cables shall be avoided to prevent damage to insulation and conductors.

Minimum Bending Radius for Cable and Wire Table

Cable Type	Bending Radius
Switchboard / ABAM	3 Times Cable Diameter
Shielded / Coaxial, Twin Conductor	10 Times Cable Diameter
Power Cable	12 Times Cable Diameter
Armored Cable (BX), Flexible Steel	5 Times Cable Diameter
Grounding Conductor	1 Foot Minimum (12 inches)

Fiber Optic	Bending Radius
Single Fiber	1-1/2 inches
Dual Fiber	2-3/4 inches
Quad Fiber	3-5/16 inches

Note: *General Bending Rule*, bending radius equals 10 times the diameter.

5.3.1 Earthquake Considerations

Cabling between equipment elements that are secured to different earthquake planes (i.e. floor and ceiling) shall require additional slack between the cable break off and the equipment frame. Typically an additional 9 inch slack loop shall be provided.

5.4 Protection and Storage

Protect all cables and wires against damage at all locations where they come in contact with sharp edges or threaded rod, using fiber sheet, plastic edge guard, and/or protective tubing as appropriate.

5.4.1 All cables stored for future use shall be identified at both ends with the far end location. All cables shall be stored in a manner that allows for future access.

5.4.2 Cables run (extended), but not yet connected, shall be coiled, banded, and stored in a manner that shall not damage equipment or cause a safety hazard. Under no circumstances shall unconnected cables be stored in the cable rack system.

5.4.3 Plastic electrical tape or heat shrinkable tubing shall be used to wrap/protect the butt location of ABAM and shielded cables.

5.4.4 All cables shall have their exposed ends covered (taped) during the running process to protect existing equipment. The tape shall be left on until the cables are terminated. All cable running activities that have been determined to have the potential of damaging equipment or causing a safety hazard to personnel shall have an "Detailed" MOP written and authorized describing the hazards of how the supplier will handle the emergency situation.

5.4.5 Specific Locations Requiring Protection

All types of cable rack that have threaded rod(s) within 3 inches of the cable rack shall have the threaded rod(s) protected with protective tubing. All tubing shall be installed prior to the start of cable running operations.

5.4.5.1 Provide protection using fiber sheathing on inverted ladder-type cable rack in a horizontal or vertical plane where the wire and cable is in contact with the flange side of the cross straps.

5.4.5.2 Power wires fastened to the underside of channel type cable rack straps shall be protected.

5.4.5.3 Cables on distributing frames that are butted at the transverse arm require fiber protection or fanning rings.

5.4.5.4 Fanning rings shall be required when wires are fanned under transverse arms (i.e. when wires from one cable are terminated on multiple blocks).

5.4.6 Specific Cabling Requiring Protection

All soft rubber insulated cables require protection when secured with 9-cord, or equivalent, or nylon tie. Cable insulation that will not cold flow is exempt from this requirement. Cold flow is a condition where insulation thins or flows away from an impingement point.

5.4.6.1 All exposed ends of power/ground cables shall be protected with rubber insulating tape and plastic electrical tape or heat shrinkable end caps. The added insulating and protective covering shall be equivalent to the insulation and protective cover of the involved cable. This requirement applies specifically to common feeders serving multiple bays or cables that have been dead-ended.

5.5 Securing and Supporting

5.5.1 All switchboard cables and wires not in screened or panned and bracketed (with cable horns) cable basket rack are to be sewn with No. 9 cord (twine, waxed polyester, 9 ply) or equivalent. Horizontal runs are to be sewn every sixth strap and when necessary to keep cable in the cable rack or from sagging through the cable rack. Vertical runs and all waterfall type cable racks are to be sewn on alternate straps. To the extent possible and prudent, cables shall be sewn in complete layers the approximate width of the cable rack before starting additional layers. Installer may leave securing cord provided that ending stitch is made and cord is properly stored (secured back so that it doesn't provide a safety hazard for equipment or personnel) for future use. No excess securing cord slack shall be allowed in equipment frames. No more than two square inches of cable shall be secured under a single stitch. Band between cable rack break-off and first frame support is exempt from the two square inch requirement.

5.5.2 All cables shall be tied with 9 cord, or equivalent, at cable rack break-off points, banded or tied between the cable rack and first support (where this distance exceeds eighteen inches), and tied at the first support on a frame, bay, or cabinet. At the point of break-off the cable rack stringer (side of the cable rack) shall be protected with cable rack stringer fiber or equivalent. When cable rack pileup prevents the installer from securing cables at the cable rack break-off, they shall be secured to the existing cables.

5.5.3 All non-fiber cables and wires shall be secured at intervals not to exceed three sheath feet in protected ducts or eighteen inches in open ducts and at all turns or junctions within the frame, bay, or cabinet.

5.5.4 Secure all cables at turns, before and after all turns and junctions of horizontal runs in other than pan, basket, and horned racks.

5.5.5 Cable shall not be unsupported for a distance greater than three sheath feet, measured from the last support on the cable rack or waterfall to the first support on the frame or bay except where otherwise specified in specifications or drawings.

5.5.6 Distributing frame cabling requires the securing of all cables on first and every alternate transverse arm, at break-off points, turns, and at the terminal strip location. Cables secured to horizontal transverse arm shall be secured according to the following table. Transverse arms on the horizontal side of the distribution frame shall have their cabling equally distributed across the served area. Cable Ties shall not be used to secure cables on Distributing Frames. Cables shall be secured using the standard waxed nine cord or equivalent.

5.5.7. All cables shall be secured in a manner that affords access to the equipment.

Distribution Frames Cable and Wire Securing

How You Identify Need	Securing Guidelines
On transverse arms 5” or less	Secure cable sheath within one-half inch of butt.
On transverse arms 5” to 12” in length	Secure cable sheaths within one-half inch of butt.
On transverse arms greater than 12”	1. Secure at cable turn 2. Secure at cable butt location 3. Secure midway between butt and turn
Frame vertical side	Sew cables at alternate transverse arms
Unsupported drop at bottom or top of frame	Maximum cable distance 3 sheath feet
Distribution of fanning rings	No additional support required
Wires that cross under a transverse arm at cable butt	Requires a fanning ring instead of butt fiber

5.6. POWER CABLES

The use of segregated cable racks for power and switchboard cable is the first choice of installation in central offices. Where segregation is not possible the following may apply with the approval of the Design Engineer.

Power cables protected with 70 amp or less fuses / breakers may be run on cable racks utilized for switchboard cabling if they are sized at 4/0 or smaller. All power cables larger than 4/0 regardless of fuse / breaker size shall be run on dedicated FUSED POWER CABLE ONLY cable racks (TP 77385). The placement of any type of cable used for anything other than power on FUSED POWER CABLE ONLY racks is strictly prohibited. The issuance of Letters of Deviation waving any of these requirements shall be considered invalid.

5.6.1 Dedicated FUSED POWER CABLE ONLY cables racks shall not be equipped with screens, pans or cable horns. T-intersections and / or 90 degree turns in the racks require corner brackets in order to maintain the minimum-bending radius of larger size cables. All cabling on these racks shall be secured per table 5.12.

5.6.2 Power cables (Battery and Battery Return) on unsecured cable racks shall be closely coupled/paired and secured together at 24-inch intervals.

5.6.3 Cables from the rectifiers to the battery, charge/discharge bus, between the battery stands and from the batteries to the distribution panels shall be on a separate cable rack from all other cables. These cables shall be referred to as UNFUSED POWER CABLES.

5.6.4 Vertical runs of power cable, which extend more than three floors, shall be provided with twenty feet of horizontal cable run out every third floor to alleviate weight buildup.

5.6.5 Power (Battery and Battery Return) cables shall be supported within 24 inches from a point of termination.

5.7 GROUNDING CONDUCTORS

5.7.1 Grounding conductors 1/0 and smaller may be secured directly to the side of cable racks with cord or ties. See 5.11, “Use of Nylon and Plastic Cable Ties ”.

5.7.2 Grounding conductors larger than 1/0 shall be suspended on and secured to cable hangers. Cable hangers shall be placed at eighteen-inch intervals.

5.7.3 Grounding cables shall be supported within 24 inches from the point of termination.

5.8 Cable Pile-up

Switchboard/ABAM Cable
Horizontal Cable Rack

Width of Cable Rack	Supports on 5’1” Centers	Supports on 6’0” Centers
15” to 25”	12”	10”
30”	10”	7”

5.8.1 The maximum pile-up of switchboard, coax, ABAM, etc. allowed on cable rack 12 inches wide or less shall be no greater than the width of the cable rack.

Vertical Cable Rack

5.8.2 Vertical runs of Switchboard/ABAM type cables are is limited to 12 inches.

Power Cable

5.8.3 The maximum pile-up on combined vertical and horizontal cable rack shall not exceed 7 inches.

Power Cable Pile-up (Horizontal and Vertical)

Width of Ladder Cable Rack	Maximum Depth of Cable Allowed (Supports on 5'1" Centers	Maximum Depth of Cable Allowed (Supports on 6' Centers
12-20 Inches (Solid Stringer Only)	7 Inches	7 Inches
25-30 Inches (Reinforced Only)	7 Inches	7 Inches

5.8.4 The maximum width of horizontal and vertical dedicated power cable rack shall not exceed 20 inches before converting to a reinforced cable rack. Any dedicated power cable rack 25 inches in width or larger shall be a reinforced cable rack. All power cable rack shall be solid stringer type only.

5.8.5 The maximum pile-up on cable hangers or "T" bars shall be limited to 2 1/2 inches. One-inch cable minimum clearance shall be maintained between hanger and supporting cable rack stringer. The maximum pile-up on cable brackets or hangers shall not exceed the manufacturers recommended weight restriction or the width of the bracket which ever is more stringent.

5.8.6 Fiber Optic Riser Type Cable Pile-up (Horizontal and Vertical)

Width of Ladder Fiber Cable Rack	Maximum Depth of Cable Allowed (Supports on 5'1" Centers)	Maximum Depth of Cable Allowed (Supports on 6' Centers)
5 Inches	5 Inches	5 Inches
12-20 Inches	7 Inches	7 Inches

5.9 Coaxial Cables

5.9.1 Coaxial cables may be run with other types of cable.

5.9.2 Care shall be taken, when sewing or banding, not to indent or collapse cables.

5.10 Fiber Optic Cable

5.10.1 Fiber Optic Intra-office Riser cables and jumpers shall not be pulled or twisted during installation. Manufacturers' guidelines regarding bend radius shall be followed at all times where requirements are more stringent than those listed in this chapter.

5.10.2 Slack on fiber optic cable shall be stored in the cable vault or in a designated storage cabinet. Fiber jumper slack shall be stored on reels or trays, specifically designed for that purpose. Slack stored in the trough system or on the Fiber Only Cable rack shall not exceed the maintenance loop (4 foot) maximum length.

5.10.3 Cable ties shall not be used for banding or securing fiber optic cables/jumpers.

5.10.4 Fiber optic jumpers and cables shall be protected from metal work and lacing twine by wrapping with 1 layer of sheet fiber.

5.10.5 Metallic type fiber optic cables shall be grounded. Components include: protective cable covering, cable sheath and/or any metallic inner strength members.

5.10.6 Fiber optic cable bend radius shall not be less than:

- Simplex cable 1 1/2 inch radius
- Duplex cable 2 3/4 inch radius
- Quad 3 5/16 inch radius
- General rule: bending radius = 10 times the diameter of the cable/lead.

5.10.7 New cable racks installed to support fiber optic cables meeting the criteria defined in paragraph 5.9.8 must be dedicated for that purpose. Placing intra-office fiber optic cables with copper cables on the same cable rack is strictly prohibited unless specifically stated in Qwest Standard configuration documents. All new fiber cable racks will be orange ladder type (solid stringer only) equipped with orange plastic kydex pan and cable horns. Vertical fiber cable rack will be installed using the orange ladder cable rack without the plastic pan and brackets. The vertical fiber cable itself must be manually wrapped with fiber sheeting and securely tied with cord to every cable rack cross strap to secure the cable on vertical runs. Fiber optic inter-office "MIC" type cable will be laid in the orange cable rack unsecured. Existing gray fiber cable rack will not be removed to add the new standard fiber orange cable rack. Adding orange pan to other colors of fiber cable rack is not acceptable. New fiber cables placed on existing gray fiber cable rack will continue to be wrapped with fiber sheeting and secured to every fourth cross strap. Orange panned and bracketed fiber cable rack will be used for all new additions. Gray cable rack is not acceptable for new fiber cable rack installations, only for extending existing systems.

5.10.8 Fiber optic cable, which qualifies for support by ladder type cable rack, must meet several design specifications. All dielectric construction shall provide ElectroMagnetic Interference (EMI) immunity. For the detailed specifications on fiber optic cable approved for use within Qwest central offices and buildings, contact the Qwest representative for fiber cable standards or technology selection. The fiber optic cables (fiber patch cords or jumpers) not equipped with a heavy protective sheathing leaving the FDF shall be continuously protected within an approved FPS until they are terminated on the fiber equipment bays. This totally enclosed protection system shall be equipped and installed with covers on all fittings and straight sections, both horizontal and vertical. FPS systems shall maintain a minimum 12" clearance when located above cable rack. End caps are required on the end of all horizontal or vertical sections. Running fiber optic cables or patch cords with any other type of cable is strictly prohibited unless specified in Qwest Standard Configurations documents.

5.10.9 Fiber jumpers and cables will be run in either an approved fiber protection system or on dedicated, segregated cable rack per the following guidelines.

	Can be run in a Fiber Protection System	Can be run on Fiber Cable Rack
Non OFNR / OFNP type Fiber Jumpers	Yes	No
OFNR / OFNP Type Fiber Cable: 1 to 12 fibers	Yes (*)	Yes
OFNR / OFNP Type Fiber Cable: over 12 fibers	No	Yes

*** Restrictions apply. Small quantities of fiber cables only or existing office conditions prevent the installation of a new cable rack system.** ***It is not recommended to run fiber patch cords/jumpers together with*** **OFNR / OFNP** ***type cables. Due to the size and often the quantity of*** **OFNR / OFNP** ***or riser fiber cables, the ability to access or add fiber patch cords/jumpers is often compromised.***

5.10.10. Other than Optical Fiber Nonconductive Plenum (OFNP) or Optical Fiber Nonconductive Riser (OFNR) type fiber cables the length shall not exceed 50 feet from the cable entrance facility.

5.11 Ribbon Cable

Some Fiber Optic Ribbon type cables can be run on dedicated fiber cable rack. For detailed specifications on fiber optic cable approved for use within central offices and buildings, contact the Qwest representative for fiber cable standards or technology selection. All other fiber ribbon cables shall be placed in dedicated cableways and labeled for fiber optic ribbon cables only.

5.12 Repair of Damaged Cables

5.12.1 Damaged outer jackets of Polyvinyl Chloride (PVC) covered cables shall be repaired with electrical tape. The tape shall be applied in two half-lapped layers with the final two wraps applied without tension and overlapping. The tape shall extend a minimum of two inches past the damaged section.

5.12.2 Seriously damaged sections of outer jackets of PVC covered cables 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, extending two inches either side of the repaired section, to secure it in place.

5.12.3 Damaged outer jackets of power cable shall be repaired with an insulation equivalent to that of the original insulation or with an insulating device identified for the purpose.

5.12.4 A run of cable shall be replaced if the number of damaged conductors exceeds five percent of total conductors.

5.13 Spliced Cables, Splicing Systems, and Mated Connectorized Cables

5.13.1 Multiconductor cable shall be rerun if the number of spliced conductors exceeds five percent of the conductors in the cable. Under certain conditions, this requirement may be deviated from with permission of the Qwest Design Engineer or the use of an approved cable splicing system. A letter of variance shall be required and the reason for not rerunning the cable shall be documented in the job log.

5.13.2 Splicing of any type of cables shall be kept to a minimum and, if required, shall be done in the vertical duct of frames, bays or cabinets. All splices shall be protected. Splices shall not appear on the cabling surface of cable racks.

5.13.3 Mating of connectorized cables shall be kept to a minimum and if required shall be done in the vertical duct on the splice shelf of frames, bays, or cabinets, or on dedicated rack. Connectors shall not appear on the cabling surface of a cable rack.

5.13.4 Mated connectorized cables shall be mated and secured by using twine, tie wraps, hook and loop systems, screws, spring clips, clear heat shrink etc.

5.13.5 Spliced or mated cables shall be protected, designated (location, type, functionality), and be accessible for maintenance. Splices or mated cables that are stored in cableways, or dispersed throughout the equipment facility shall require a “Master Location List” (RG47-0156). The “Master Location List”, shall show all splice number, splice locations, splice type, and functionality of the spliced circuit. The “Master Location List” shall reside at the same facility and be available to those with a need for the information. Splice locations shall also be designated to show exact location of the splice. Designations shall be visible from the floor, and are require a minimum designation of a Master Location List reference number. Splice connections shall have sufficient slack at the splice point for maintenance.

5.13.6 Protective covers or caps shall be installed on unused connectors to protect contacts from mechanical or ESD damage.

5.14 Use of Nylon and Plastic Cable Ties

5.14.1 Cable ties are not approved for securing or banding of cables in cable racks or securing fiber optic cables and jumpers.

5.14.2 Cable ties used for banding and securing of cable, PVC protection etc. shall be of an adequate size, type, strength, etc. for the particular application.

5.14.3 Cable ties shall be trimmed at the locking head with a flush cutting device that provides automatic tensioning.

5.14.4 Under no circumstances shall cable ties have sharp or jagged cut ends protruding from the locking head. A cable tie is considered to have sharp or jagged ends when it is sharp to the touch.

5.14.5 The locking head of reusable cable ties shall be positioned so as not to interfere with the installation or removal of apparatus or equipment

5.14.6 Reusable cable tie tails shall be positioned so as not to present a personnel hazard.

5.14.7 When superimposing additional cable or wire to forms, existing cable ties shall be removed where the heads of tie wraps interfere with additional cable or wires.

5.14.8 Where cable or wire forms are secured to cable securing brackets, the locking head of the cable tie shall be positioned on the side of the bracket opposite the side on which the cables or wires are run.

5.14.9 Nylon ties shall not be used at any location on the MDF, CDF SDDF, COSMIC or any other type of Distribution Frame.

5.14.11 Approved Cable Tie Applications

5.14.11.1 Banding together of cables after the cables break off the cable rack or other similar banding operations.

5.14.11.2 Banding together of cables or power wire including flexible cordage and soft rubber cables with the use of protection.

5.14.12.3 For power cable strain relief ties.

5.14.13.4 For banding together armored cables.

5.14.14.5 The securing of power, ground, and armored cable to cable brackets and other similar-type wire supporting details in power equipment bays.

5.14.15.6 The securing of ground cable to the stringers of cable rack and auxiliary framing bars.

5.15 Securing Tables

Sewing Horizontal Resting Runs On Dedicated Power And Switchboard Cable Racks

Size of Wire	Sew at Strap	Number of Twine Strands	Ultimate Number of Layers	Cables per Stitch
400 kcmil or Larger	Every 4th	4	*Any Number* Note 1	2
250-350 kcmil	Every 4th	2	Any Number Note 1	2
4/0 and Smaller	Every 4th	2	Any Number Note 1	4
Switchboard Cable	Every 6th	2	*Any Number* Note 1	6 **Note 2**
Fiber Cable	Every 4th	2	*Any Number* Note 1	1

Sewing Vertical Or Inverted Horizontal Runs
On Dedicated Power and Switchboard Cable Racks

Size of Wire	Sew at Strap	Number of Twine Strands	Ultimate Number of Layers	Cables per Stitch
250 kcmil or Larger	Every Strap	4	Note 1	1
4/0 - #4	Every Strap	2	Note 1	2
#6 and Smaller	Every Strap	2	Note 1	*Note 2*
Switchboard Cable	Alternate Strap	2	Note 1	4 **Note 2**
Fiber Cable	Every Strap	2	Note 1	1

Sewing on Horizontal Runs of Cable Hangers
Cable Hangers Spaced at 18" Intervals

Size of Wire	Sew at Strap	Number of Twine Strands	Ultimate Number of Layers	Cables per Stitch
250 kcmil or larger	Every Hanger	2	Note 1	1
4/0 and smaller	Every Hanger	2	*Note 1*	2 **Note 2**

Notes:

1. Limited by 5.6, "Cable Pile-up," requirements.
2. Cables under a single stitch shall not exceed two square inches.

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6. Wiring

6.1 General Requirements

6.1.1 All equipment installed shall have the all-wiring run and terminated using the type, color, and gauge specified in the drawings/records and/or manufacturer's specifications and instructions.

6.1.2 Wire shall be dressed in such a manner as to avoid congestion, to ensure accessibility, and to maintain clearance between terminals.

6.1.3 All spare and unused wire shall be placed in fiber/protective tubing or secured to the existing form or equipment. Individual bare wire ends shall be insulated. This requirement shall also apply to spares within a frame distribution block enclosure.

6.1.4 Where a functional performance test is not performed, a continuity test shall be made on all conductors run and connected by the Installer, this test shall be made with appropriate test equipment (Manufacturers continuity test card - I.E. streaker). Functional performance and continuity testing shall be recorded on RG47-0157 “Test Record (COE)”; Copy of test records shall be left in Job Packet.

6.1.5 Wires connected in distribution frame blocks shall be dressed to allow visual inspection of terminal connections.

6.1.6 Wire dress shall be sufficient to provide for one only additional skinner length without splicing the conductor.

6.1.7 Wire shall be both listed and rated for the application.

6.2 Fanned and Unsewed Forms

6.2.1 Fanning rings shall be placed as provided in job specifications prior to wiring operations.

6.2.2 Provide fiber protection at butt locations on transverse arms of distributing frames where fanning rings are not used. When cables fan under the transverse arm, fanning rings are required.

6.2.3 Loose wires not held in place by rings or other similar retaining devices shall be banded at each point of breakout.

6.3 Sewed Forms

6.3.1 Shall be secured in a manner that affords access to the equipment.

6.3.2 All wiring added to existing forms shall be properly secured.

6.3.3 All ending stitches shall be trimmed of excess twine.

6.3.4 Forms designed for hinged equipment shall be capable of accomplishing movement without twisting or damage to the form.

6.4 Protection

All wiring shall be protected from hazardous conditions such as sharp edges, excessive strain, etc.

6.5 Cable Tags

All shop wiring and verification tags shall be removed prior to turnover. Exception to this standard is when the COO has requested the tags to be left on. This will require a waiver and concurrence from the Design Engineer, and must be a documented change in the job log.

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Figures

7. Connecting

Note: AC, power, and grounding connecting requirements are specified in Chapter 9.

7.1 General Requirements

7.1.1 All connections made over solder or on terminals with soldered connections shall be soldered.

7.1.2 Connections made with untinned wire do not require soldering, simply because they are untinned or not plated.

7.1.3 All DC wire connections terminated under screw heads shall be made with an approved connector. (Example - ring or fork connectors). Exception: Threaded compression connections specifically designed for bare wire insertion.

7.1.4 All single hole and two hole terminations for power and bonding/grounding shall require the use of a lock washer, except where double or locking nuts are standard. Use shake proof (star) lock washers under mounting screws and split ring lock washers with bolts and nuts. Lock washers shall not be placed between the connecting terminal and the contact surface.

7.1.5 All terminals, lugs, and connection points shall be free of contamination and previous connecting materials; i.e., corrosion, paint, grease, dirt, etc.

7.1.6 Plated surfaces, such as silver or lead-plated copper, etc., are plated to prevent oxidation and reduce contact resistance and, therefore, shall not be sanded or abraded. If cleaning is required, wipe with a dry cloth.

7.1.7 All types of connections shall be secure (tight) and shall conform to manufacturer’s torque requirements where specified.

7.1.8 The type of coaxial connector installed shall be of the type specified in the job or installation instructions, or manufacture’s documented requirements.

7.1.9 All cables/wires shall be connected as identified in installation specifications or manufacture’s requirements.

7.2 Coaxial Connections

Correct crimping practices and components shall be used as specified by the manufacturers' of the connector components and crimping tools. All Coax connections shall be made using manufacture’s approved tools and procedures. Field testing of all new coax connections shall be accomplished per manufactures recommendations. For DS3/STS-1 connectors the following process shall be used.

7.2.1 Coax Connector Testing Procedure

In an effort to minimize faults, the following steps will be required on all new installations as part of installation acceptance procedure on all DS3 and STS-1 coax cable connectors.

Add additional DS3 / STS-1 to existing network elements / DSX. Turnover test requirements. Tests similar to 323-1201-222.

STEP	Action
1)	New DS3/STS cards may auto provision in some Network Elements, others will need to be provisioned. * see note 1
2)	Place new facilities OUT OF SERVICE.
3)	Operate FACILITY/LINE loopback on each new DS3/STS interface being wired ONE AT A TIME.
4)	Using a DS3/STS test set send a test pattern. Perform a slight (45) degree bend at each coax connector crimp, within one inch of connector. No errors should be recorded or detected at the test set. If errors are detected the crimp is defective, and must be redone.
5)	Daisy Chain new DS3's/STSs and run from DSX or DCS.

DS3 TEST SET PARAMETERS:

Receiver	**Transmitter**
DS3 framed	DS3 framed
PRBS (pseudo-random binary sequence)	PRBS
untimed	error free
DSX level	DSX level
total bit errors ZERO	

STS-1 TEST SET PARAMETERS:

Receiver	**Transmitter**
Receive signal : STS-1	Transmit signal: STS1
STS-1 SPE under test: 1	STS-1 SPE under test: 1
Payload : DS3	Payload : DS3
Framing: M13	Framing: M13
Pattern: 2	

*Note 1
If network element is not equipped, use a coax barrel connector to provide loop back to the test set. Refer to network element documentation to verify transmit and receive termination's and proceed to Step 4.

The results of all tests shall be recorded on RG47-0152. Copy of test records shall be left in the job packet.

7.2.2 A Qwest approved or manufacturers' specified crimping tool shall be used.

7.2.3 Center conductors shall be secured in the method specified by the manufacturer for the component being used. The component shall either be soldered or crimped, but not both.

7.2.4 Components shall be crimped once only, multiple crimps shall not be allowed.

7.3 Connectorized Cables

Connectors shall be properly mated and secured with an approved method; i.e., clips, screws, tie wraps, hook and loop systems, etc

7.4 Crimp Compression Connectors, Splices, and Taps

7.4.1 Aluminum connectors/lugs are not authorized for use in Qwest locations. Copper/tinned copper connectors/lugs shall be used.

7.4.2 All crimp compression connections using the various types of approved commercial connectors shall be properly made with the number of crimps being determined by the manufacturers' requirements pertaining to the wire gauge, type of wire, type of lug, and the crimp compression tool used.

7.4.3 The lug specified or used shall determine the crimp compression tool and die set combination required. Wires shall be inserted to full depth of lug. The wire shall be inserted to within 1/8 inch of the inspection hole for wire sizes #2 AWG and smaller and within 1/4 inch for wire sizes 1/0 AWG and larger

7.4.4 Space between wire insulation and body of solderless connectors and power lugs shall be kept to a maximum of one eighth of an inch

7.4.5 All connections shall be accessible for inspection. Power conductor H taps shall be taped with plastic electrical tape, have covers applied, and the covers secured with 9 cord.

7.4.6 All connections shall be free of sharp edges, fins, or burrs caused by the crimping process.

- Crimps shall not extend onto the tang area.
- Individual crimps may not be recrimped after initial application.
- Only one wire shall be crimped in a connector barrel.

7.4.7 Compression crimps shall be permitted on solid wire, 18 gauge and smaller, and on solid #2 AWG tinned copper conductors used specifically for internal connections to the ring ground system. Connectors used on solid #2 AWG shall be specifically intended for use on solid wire.

7.4.8 Parallel connector covers for battery and battery return cables shall be secured with cord or plastic tape. Parallel connectors shall not be located on cable rack stringers or any other metallic object which will cause pressure to be exerted on its protective cover.

7.4.9 Parallel connectors that have a different voltage potential than frame ground shall be plastic taped to prevent accidental closure to ground.

7.5 Quick Clip/Slotted Beam Connections

7.5.1 Quick clip terminations shall be made with the correct tool, properly inserting the wire into the working portion of the terminal, and shall be secure.

7.5.2 Only one wire of the proper size and type shall be engaged in each terminal slot, wire ends from previous connections shall be removed.

7.5.3 Textile (cloth) insulated wire shall not be terminated in slotted beam terminals.

7.5.4 Conductors shall not be placed on deformed terminals.

7.5.5 Previously terminated wire ends shall not be reterminated; use new wire ends.

7.5.6 Wire ends shall clear metallic parts by one thirty-second of an inch, minimum.

7.5.7 Wire ends shall protrude one sixteenth of an inch beyond edge of clipped terminal.

7.6 Soldered Connections

7.6.1 Connections shall be soldered so as to provide a secure metallic connection between the parts. Solder used shall be 60/40 rosin-core solder.

7.6.2 A minimum of one and one quarter turns shall be made on all soldered, wrapped connections.

7.6.3 Pig tail components shall be soldered, unless the component is specified by the manufacturer for wire wrap installation, or is modified to add leads suitable for wire wrap connection. Wire wrapped components shall have a minimum of five conforming turns. See 7.8, "Solderless/Wire Wrapped Exhibits."

7.6.4 Solder shall flow and encompass the entire exposed length of the terminal connections.

7.6.5 Sufficient heat shall be applied to connections to prevent cold solder joints. The installer shall consider heat sinks if adjacent components or connections could be damaged by excessive heat.

Solder connections may only be made where approved. Terminals that are not tinned or capable of being tinned, shall not be soldered.

7.6.7 Minimum Clearances for Soldered Connections
A minimum clearance of 1/32 of an inch shall be maintained between adjacent soldered connections or soldered connections and metal work.

7.7 Solderless Wire Wrapped Connections

"Solderless/Wire Wrapped Exhibits," are established standards, and compliance to these standards are recommended. Exemptions listed in Section 7.8, "Solderless/Wire Wrapped Connections," are intended to be for 20-26 gauge wires only.

7.7.1 Solderless wire-wrapped connections shall be secure and shall conform to the consecutive turns/wraps requirements shown in Figure 7-2 "Minimum Wraps".

7.7.2 All connections not meeting the minimum requirement shall be reterminated using the solderless wrapped technique. This may require:

- Complete reskinning of the existing lead.
- Running a new lead.

Soldering only when the above conditions cannot be met and are not specifically prohibited by other requirements.

7.7.3 Clearances for Solderless Wrapped Connections

Examples of deficiencies: Overlaps, excessive separations, excessive shiner (+1/8 inch), excessive tail (+1/8 inch), or lead that has been previously terminated. Solderless Wrapped Connections shall be located at the base of the terminal or adjacent to previous connection(s).

7.7.4 A minimum clearance of 1/32 of an inch shall be maintained between adjacent connections or connections and metal work.

7.7.5 Separations between adjacent wraps shall not exceed .005 of an inch for 20, 22, 24, and 26 gauge wire; .003 of an inch for 28 and 30 gauge wire.

7.7.6 Wire end projections shall not jeopardize minimum clearances and shall be less than 1/8 inch in length.

7.7.7 Insulation shall be within one eighth of an inch of terminal. Exception: 28 and 30 gauge wire shall have one full wrap of insulation before wire wrapping begins. This requires the use of a bit designed to provide a "modified" wrap. The turn of insulated wire shall not count as 1 of the 7 minimum consecutive conforming turns.

7.8 Solderless Wire Wrapped Exhibits

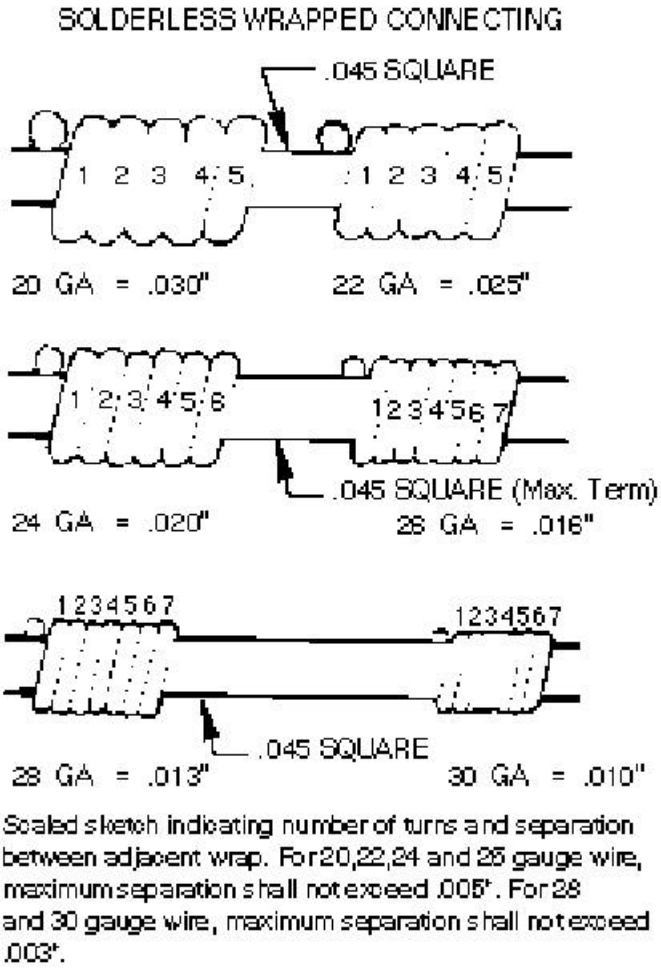

Figure 7-1 Solderless Wrapped Connecting

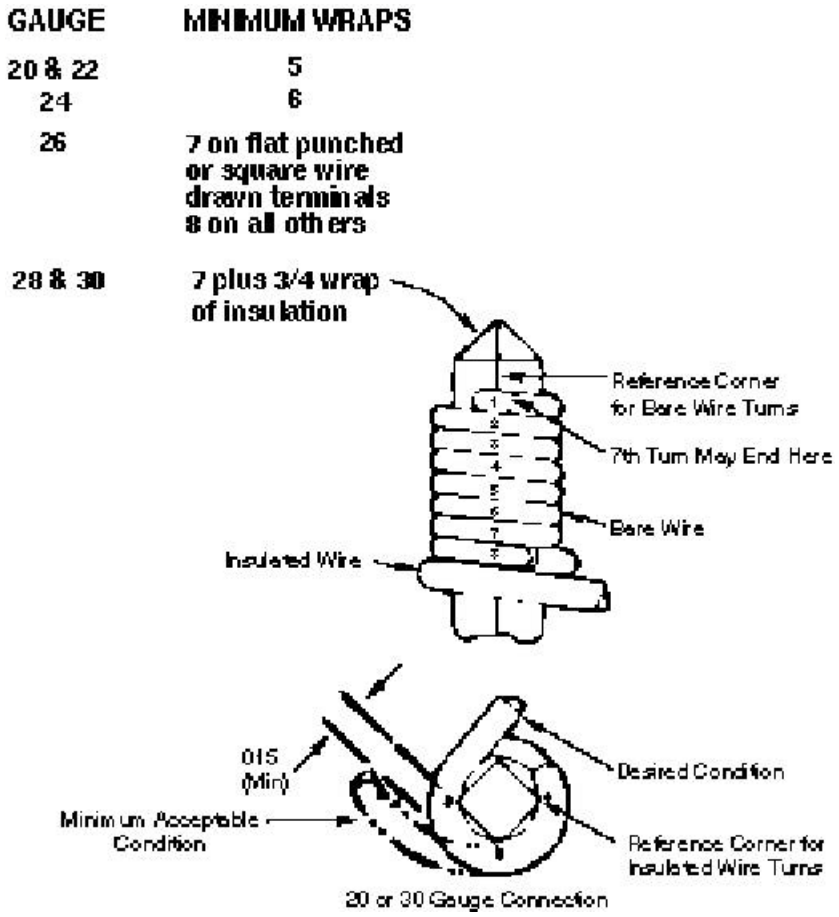

Figure 7-2 Minimum Wraps

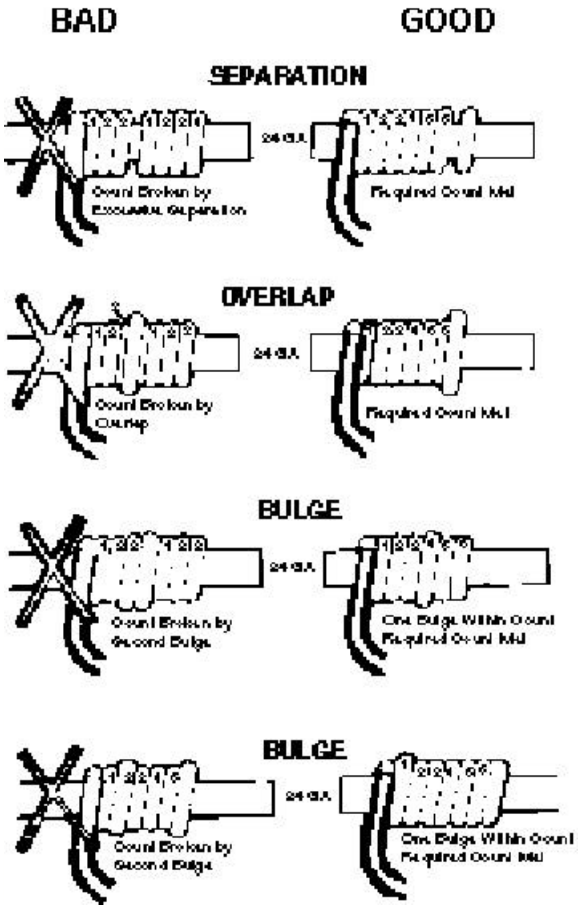

Figure 7-3 Example of Good and Bad Wire Wrap

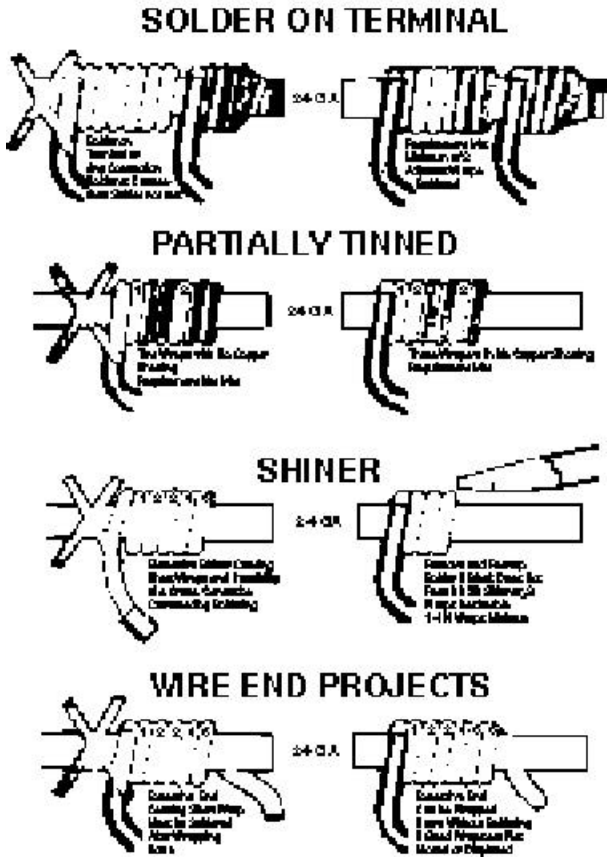

Figure 7-4 Solder on Terminal

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8. Equipment Designations

8.1 General Requirements

All designations shall be accurate, permanent, legible, visible, aligned, secure, the proper color, at the prescribed location, complete, and conform to the existing equipment designation pattern. The Qwest Bay Equipment (RG 47-0130, -0131) Label in Paragraph 8.21 shall be used for the purpose of identifying power, alarms, timing, DSX, etc. including circuit numbering where necessary, on all units of equipment in the transport and miscellaneous (MIS, MISC, M, etc.) switch frame environments. Miscellaneous equipment, mounted in a frame, bay, or cabinet, shall be designated with either label or a portion thereof, as appropriate. If the frame, bay, or cabinet is fully equipped with like equipment (subscriber / digital carrier, D-4, etc.), then a single label for the entire bay may be used. Labels shall be located on the part of the frame, bay, or cabinet that is not normally removable by maintenance personnel and which shall remain fully visible. See 8.11 and 8.18, "Conductors, Leads, Bonding/Grounding Points" and "Stenciling and Font Size Tables." (The intent of the Bay Label is to identify the far end location and termination point of cables. This label does not apply to cables that do not leave the bay.)

8.1.1 Stamping or approved labeling is required on painted or plated surfaces. The use of labeling machines is acceptable with black lettering on white background.

8.1.2 Designation tags, cable sheaths connectors and approved designating labels may be designated by printing, using a fine point, permanent, black ink marker.

8.1.3 Equipment removed or installed on a temporary basis, shall be marked with a "Temporary Removal and Installation Tag." Temporary removal or installation is defined as equipment that will be replaced within 180 days of removal or installation. "Temporary Removal and Installation Tag" will need to reference the Qwest Design Engineer and phone number, job number (that has authorized the installation, removal or transfer of equipment), date removed, replacement date, service supplier (doing the work), and service supplier contact. This type of job shall comply with all Qwest technical standards (Job Packet, MOP, etc.). Cabling needs to be properly spared, fuses removed, equipment designations do not have to be removed. All network elements locations associated with installed or removed equipment will be labeled with the Temporary Removal and Installation Tag. Recommended color is red background and black lettering. See 8.21, "Equipment Designation Labels Exhibit."

8.2 Color of Characters for Stamping and Labels

Use black ink on light surfaces and use white ink on dark surfaces. Vermilion (red) is to be used on caution notices.

8.3 Designation Conventions

8.3.1 Designate all frames, bays, shelves and cabinets, with frame type (BDFB, RR, etc.) and number on the front and rear.

- The recommended locations are: first choice - frame base, second choice -mid-frame to eye level left frame upright, or as the existing office convention dictates.
- The designations shall be readily visible.

8.3.2 Designate each shelf, unit, or position on front and rear. or as instructed in the detailed installation specification and drawings/records. When a shelf/unit of equipment is designated by "Equipment Location" EQL such as plate number the lowest occupied plate number for the shelf/unit shall be referenced. General rule for designating units: they must have an electrical connection (power, fiber, ring or tone, synchronization timing, alarm, etc.). Cooling fans shall be identified and shown as such at the equipment and the fuse record sheet (FAN 01, FAN 02, etc.). Frame filler plates, and cableways should not be given a shelf number.

8.3.3 The recommended convention for numbering of shelves, units, and positions in the same frame is: lowest to highest, bottom to top, left to right as viewed from the front or as the existing office convention dictates.

8.3.4 Shelf/panel/plate/bank numbers shall consist of a two-digit, unique number, starting with 01. Fuse panels shall be identified with a consecutive numbering scheme (FS/PNL 99, FS/PNL 98,etc.). Heat baffles, writing shelves, filler plates, cableways are not considered network elements, and shall not be designated. (See Qwest Technical Standard 77351 Module 1 Chapter 2 "Equipment Layout"). This requirement is for all equipment (Exception Switch environments) regardless of what the manufacturers label, equipment drawings and Design Work Package (DWP) states. Switch environments such as: IAESS, 2BESS, 5ESS, DMS, AXE, ATM, etc. shall label all miscellaneous equipment units / shelves that are not documented in office drawings, to show all assignment locations (Distribution frame, Power, Timing, DSX, etc.). This can be accomplished with designation tags, or a shelf label.

8.3.5 All circuit numbers associated with shelves, units, blocks, terminal strips, or panels shall be provided when indicated in the specifications or where they are part of the manufacturer's or AMC standard design. DSX panels and distributing frame blocks shall be designated with relay rack location, shelf number, circuit description and circuit numbers.

8.3.6 Designate all equipment line-ups on aisle signs, end guards, columns, or equipment uprights on both ends of the aisle to indicate added frames, bays, and cabinets. Designations shall consist of frame type and number (RR, BDFB, MT, MIS, M, etc.). From the end guard you are designating the order in which the frames shall appear is; i.e., top - closest, bottom – farthest away. These designations shall be stamped or labeled.

8.3.7 Remove all designations or entries for removed equipment and circuits; i.e., fuse/breaker panels, distributing frames, power bays, equipment frames, cable racks, etc.

8.3.8 Designate equipment drawing number and circuit equipment description (if not apparent) for units in frames, bays or cabinets.

8.3.9 All far end identification shall at a minimum identify relay rack, shelf and circuit number.

8.4 Connectors and Connectorized Cables

Designate connectors on connectorized cables as identified in the specification or drawing/record. All connectorized cables that could be removed and improperly replugged shall be identified with connector or jack number. Where connectorized cables are formed and stitched to prevent connecting errors, numbering is optional. A label or fine point, permanent, black ink marker may be used to accomplish these designations on either the cable or the connector.

8.4.1 Alarm interface cables shall be identified with the far end location at the alarm interface bay with a small fiber tag or comparable (Type equipment - RR# - SH# - CN#).

8.5 Distributing and Protector Frames

Designate distributing frames with vertical numbers and shelf letters on first, last and every fifth vertical on both horizontal and vertical frames. The frames shall be designated on the block mounting bar of unequipped positions or on the terminal block/cover for equipped frames. See 8.19, “Distributing Frame Exhibits.”

8.5.1 Designate all connecting blocks and covers on distributing frames as required (Frame, Bay or Cabinet, Equipment Type, Shelf/Plate/Bank, Functional and Numeric).

8.5.2 Designate all new distribution frames with the proper frame name designation on all exposed sides of the frame.

8.5.3 Designate ground side of twist plug and trolley run.

8.5.4 Designate or label “Disconnect Alternating Current Before Opening” on trolley coupling or end cap.

8.5.5 Attach a warning sign to ladder after addition of appliance outlet.

8.5.6 Modular frames shall be designated front and rear with module number, shelf number, and individual block numbers. Frames that are not accessible from the rear do not require rear designations.

8.5.7. Designation boards at the top of the vertical side of the distribution frame shall be designated to show the equipment and/or cable circuit count.

8.5.8 Designate the Equipment Assembly Drawing (ED or equivalent) on the first vertical or Module.

8.6 Drawings and Assignment Records

Mark all assignment changes on drawings/records as applicable.

8.7 AC Circuits

8.7.1 Designate all AC outlets with panel source and fuse/breaker number.

8.7.2 Designate all power service cabinets and power distribution panels with name, number, source and Voltage/Phase arrangement. Fuse/breaker assignments shall be identified on the panel designation card or next to the fuse/breaker.

8.7.3 Rectifiers powered by either 277 or 480V, 3 phase AC power shall be designated on the access panel or door in red lettering “Warning Hazardous Voltage of xxx” (277 or 480V).

8.7.4 Designate all AC circuits connected at utility outlets, inverters, rectifiers, and power strips. These circuits shall be designated at the source (panel) and at the equipment.

8.7.5 Receptacles

High voltage receptacles (those greater than nominal single-phase 120 VAC) shall have the receptacle cover plate marked with the appropriate voltage (e.g., 208V AC, 240VAC, 277V AC). Stamp or label with three sixteenths of an inch or equivalent font characters in vermilion (red) ink.

8.7.6 Electrostatic Discharge (ESD)

All framework connectors for ESD wrist straps shall be designated with the term “ESD” or shall be designated with the universal symbol for ESD.

8.8 Batteries and Battery Stands

8.8.1 Designate battery stands with string name, and voltage. Cell numbers shall be designated on the stand directly beneath each cell, on each cell or as directed by the battery manufacturer.

8.8.2 Designate the battery string install date at cell #1, the letters "TR" at the Temperature Reference cell (flooded strings only) and individual cell replacement date at the specific cell. These designations shall be on the cell itself or on the stand directly below the cell.

8.8.3 Reused battery strings shall be designated per 8.8.1 and 8.8.2. In addition the words "reused string" and the original install date shall be designated on or below cell #1.

8.8.4 Battery stings shall also be labeled per 8.23.1 and 8.23.2 of this document.

8.8.5 Any labeling provided or required by the manufacturer shall be done in accordance with their instructions.

8.8.6 Engine Start Batteries

Batteries or stand shall be designated with installation date, voltage and string name as close as possible to the positive connection. Individual cells or blocks of cells shall be numbered from lowest to highest beginning at the positive connection.

8.8.7 Battery Stands

Battery stands associated with battery back up of UPS systems shall be clearly designated in vermilion: "WARNING HAZARDOUS VOLTAGE."

8.8.8 Valve Regulated Lead Acid (VRLA) or other type batteries used in bulk power plant applications and placed on stands, racks or shelves shall have each string designated where it can be readily seen from the work space or aisle. Up or down arrows will be used as needed if confusion could occur given the smaller nature of these stands and racks. In addition, the voltage shall be designated at least once on the stand, rack, half-rack or frame where it can be readily seen from the work space or aisle.

8.8.9 VRLA batteries used in any application shall have the install date placed on each block of cells.

8.9 DC Breakers, Fuses, Switches, and Shunts

Designate all fuse/breaker panels with row designations (letters and/or numbers).

Designate each fuse/breaker with: Network Element location. If the unit is in the same frame a shelf number is sufficient. If the unit is external from the frame in which it is fused then the Frame/Bay/Cabinet and shelf number is required.

8.9.1 Designate fuse/breaker position number front and rear or on the point of cable termination.

8.9.1.1 GMT, 70 type, and miniature cartridge fuse panels shall be designated by first, every 5th, and last position.

8.9.1.2 Designate amperage on the front of the fuse / breaker panel or install a fuse designation pin, disc, or paint / adhesive dot. Where this is not possible, the fuse record sheet or book assigned to the panel shall be designated.

8.9.1.3 Circuit breakers and switches shall be designated to show the "ON - OFF" "positions.

8.9.1.4 All designation pins for fuses that are not assigned, shall be removed or assigned "DNA" on the fuse assignment record. Exception: Where fuse designation pins are factory installed for guard fuse positions (BDFB, etc.) or where the manufacturer specifies specific fuse values for each individual position (ringing plants). This exception does not remove the requirement for accurate fuse assignment records.

8.9.2 Designate all fuse record book covers with associated bay location.

8.9.3 Fuse panel detachable assignment records (sheets) shall be designated with frame, bay, or cabinet number and shelf or mounting location.

8.9.4 List all new, or added or changed (blue or black ink or approved label) and delete all removed circuits on the fuse/breaker panel, designation strip, fuse assignment card or fuse record book sheets. Update all fuse/breaker additions, changes, or removals on the office record sheets, books, or drawing(s)/record(s). with changes, additions or removals.

8.9.5 Excessive hand written changes or layers of designating tape are not acceptable and require replacement of the fuse record sheet (blue or black ink). More than 10 changes on a sheet are considered excessive.

8.9.6 Correction fluid (white out) is not permissible for changes. Correction tape is permissible.

8.9.7 Shunts shall have their amperage value and MV rating designated and visible.

8.10 DC Distribution Elements

8.10.1 All forms of DC distribution shall be clearly designated both front and rear as to frame, panel, row, plate, fuse / breaker position, voltage, and load so as to coincide with equipment and assignment drawings/records. BDFB fuse / breaker positions shall be numbered from the top down, with consecutive numbering for each LOAD. Fuse/breaker position numbers shall be considered adequate on the rear of each position and do not require tags where each fuse position number is designated on the rear. Power distribution cabinets used exclusively in switching environments may use a designation scheme of first, every fifth, and last or as required by the manufacturer.

8.10.2 Designate fuse/breaker panels with voltage designations front and rear.

8.10.3 Designate all locations associating alarm fuse with discharge fuse.

8.10.4 Designate fuse / breakers with far end frame number, equipment type, shelf number and fuse ampacity. Example (RR 102.35 FS / PNL-99 30 AMPS).

8.10.5 Fuse panels assignment designations shall show a minimum of Frame / Bay / Cabinet, shelf / plate number and amperage for all assignments external to the frame where the fuse panel resides. Fuse panel assignment designations located in the same frame as the fuse panel, shall show shelf/plate number and amperage as a minimum. All fuse panels assignments shall be designated using an approved labeling system (i.e. Designation card or label, fuse assignment book, direct labeling).

8.11 Conductors, Leads, Bonding/Grounding Points

8.11.1 Identification tags shall be affixed to each end of all equipment bonding, battery string connecting cables and grounding cables. Either or both sides of a tag may be used for designations. For specific grounding information refer to 11.11.1.

8.11.1.1 The information on the identification tags should contain the location where the opposite end of the cable is terminated.

8.11.1.2 Short lengths of bonding/grounding cables, #6 AWG and smaller, which are entirely visible, and shall remain so for their entire expected life, are exempted from this rule and are not required to be designated. However, they are not exempt from the green color requirement.

8.11.2 Place “Do Not Disconnect” tags on all removable grounding electrodes and all terminating locations of main ground reference conductors; i.e., Office Principle Ground Point Bus (OPGPB), Central Office Ground Bar (COGB), Ground Window (SPGB, MGB), AC entrance ACEG. etc.

8.11.3 The equipment end termination of battery and battery return leads shall be identified as to their source frame plate/panel, and fuse/breaker position; i.e., BDFB, PB, PDB, ringing, etc. Identification may be accomplished by adding the information on a visible, small fiber or plastic tag attached to the cable with twine or nylon tie. If the fiber tag is equipped with a small metallic ring, this ring shall be removed.

8.11.4 Equipment fused from power sources outside its common equipment frame shall have its battery and battery return leads designated with the frame, plate/panel, and fuse/breaker position of the source end. Equipment fused within the same frame does not require designation tags on the load end.

8.11.5 Battery return leads connected to bus bars within the BDFB / PBD shall have BDFB / PBD fuse position and equipment far end location designated.

8.11.6 Battery return leads connected to bus bars located externally from the BDFB / PBD shall have BDFB / PBD location and fuse position and equipment far end location designated (BDFB / PBD 0101.02 FS POS 22 LD-A ---- RR 0102.04 FS PNL 99 LD-A).

8.11.7 Power distribution frames that are dedicated and within a switching environment, do not require designation tags, provided the fuse/breaker positions are properly designated front and rear.

8.11.8 Circuits fused from another frame fuse panel require a designation tag at the equipment/circuit end. The designation tag shall require frame number, mounting location and fuse position.

8.11.9 Designate deliberate bond points made through surface contact, for Foreign Object Grounding (FOG) paths with “GRD” in 3/8 inch or 36 point font. Designations shall be placed so that they are visible from the floor.

8.12 Mechanical Equipment and Rooms

All mechanical equipment and machines, such as engine alternators, which contain moving parts and are capable of being activated automatically or remotely shall be designated with a warning label or placard.

8.12.1 The warning label shall be permanently attached in a conspicuous location and contain the information “Danger Auto Start.” Labels shall be placed at room entrance(s) and on unit.

8.13 High Temperature Surfaces

8.13.1 Exposed surfaces with temperatures greater than 115 Fahrenheit shall be marked with warning labels.

8.13.2 Surfaces with temperatures greater than 130 Fahrenheit shall be guarded as well as marked with warning labels.

8.14 Rectifiers, Converters, Inverters, Power Supplies

8.14.1 Each shall be designated with a group number.

8.14.2 Each shall be designated with the input voltage and fuse / breaker location in addition to any nameplate data placed by the manufacturer.

8.14.3 Each shall be designated with the nominal output voltage and maximum output current in addition to any nameplate data.

8.15 Bus bars and Ground Bars

8.15.1 All bus and ground bars shall be designated as to their potential and group designation in an area on or adjacent to the bar; i.e., COGB, -48 Volts, Load A, OPGPB, +130 Volt Ground, Etc.

8.15.2 All bars which constitute the ground window shall be designated “GROUND WINDOW” once, adjacent to the bars and visible from the floor. The individual bars shall be designated for “ISOLATED” and “INTEGRATED” areas.

8.15.3 Remote battery return bars associated with power frames and BDFBs shall be designated with the potential and associated frame(s).

8.16 Rolling Ladders

8.16.1 Designate the ground side of twist plugs and trolley run.

8.16.2 Designate or label “Disconnect Alternating Current Before Opening” on trolley couplings and end caps.

8.16.3 Attach a warning sign to the ladder under the step after the addition of an appliance outlet.

8.17 Cable Rack Systems

8.17.1 Switchboard and Power cable racks that have reached their allowable cable pile-up limit (See 5.5 “Cable Pile-up”), shall be designated “Restricted” in the area(s) of violation. These designations shall be located on the outside edge of both cable rack stringers, and at an interval not to exceed 10 feet. Restricted cable racks should be banded with 4 strands of twine every 5 feet to ensure, that additional cabling isn’t added.

8.17.2 Fiber optic cable rack shall be labeled “FIBER OPTIC CABLES ONLY” at five foot intervals on both sides. Designations shall be placed so that they are visible from the floor for the entire length of the cable rack.

8.17.3 Power cable rack with protected cables (fused or breakered) shall be labeled "FUSED POWER CABLES ONLY" at five foot intervals on both sides. Designations shall be placed so that they are visible from the floor for the entire length of the cable rack.

8.17.4 Power cable racks with cables that are not protected (not fused or breakered) shall be labeled "UNFUSED POWER CABLES ONLY" at five foot intervals on both sides. Designations shall be placed so that they are visible from the floor for the entire length of the cable rack.

8.18 Marking Records / Drawings

The following three color schemes shall be adhered to when updating COE-FM Records and drawings. All designation shall be legible. Use of approved abbreviations, and symbols is required. Mark all assignment changes on both copies of the drawing /records with the Qwest engineer approved changes as applicable.

8.18.1 Red - Mark in red all equipment additions, relocation’s, assignment changes, and record title box changes representing equipment being added, reconfigured, modified, or reassigned. When the number of frames, plug-in components, units, etc. have been changed, also show the new quantities in red.

8.18.2 Yellow - Show in yellow all equipment being removed from a Qwest facility. Whenever frame numbers, quantities, assignments, etc change, the old numbers, locations, or assignments are to be highlighted in yellow.

8.18.3 Green - Mark in green all “record only” changes. Central Office Equipment records which do not reflect equipment being added or remove, but which represent new information concerning existing COE configurations are record only changes and are marked in green.

8.18.4 One copy of the Marked Drawing /Record shall be returned to the Qwest engineer and one copy shall be included in the job packet.

8.19 Miscellaneous stenciling

8.19.1. All designations shall be located on parts that will not be removed during normal maintenance.

8.19.2. Fuse/Breaker designations on the rear shall consist of a position number or similar scheme to help personnel locate the fuse/breaker from the rear.

8.19.3. Sizes may be adjusted to fit required information on a limited area of space. All designations shall be legible.

8.19.4. Circuit blocks shall be designated at a minimum of every other row. Punching designations shall be designated once at circuit #1's location and at any change in circuit type. Circuit designations shall be aligned with the terminal they designate. Terminal designations shall be 1/8 inch or 12 points maximum and may be adjusted down in size to allow for additional information. All designations shall be legible.

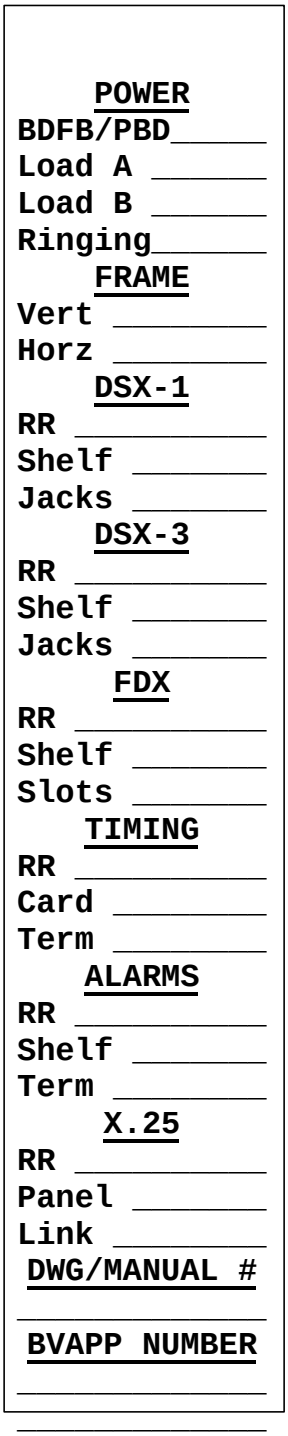
8.20 Distributing Frame Exhibits

```
P P1--:---:---:---P5--:---:---:---:---P10--:---:---:---:---P15-P16

N N1--:---:---:---N5--:---:---:---:---N10--:---:---:---:---N15-N16

M M1--:---:---:---M5--:---:---:---:---M10--:---:---:---:---M15-M16

L L1--:---:---:---L5--:---:---:---:---L10--:---:---:---:---L15-L16

K K1--:---:---:---K5--:---:---:---:---K10--:---:---:---:---K15-K16

J J1--:---:---:---J5--:---:---:---:---J10--:---:---:---:---J15-J16

H H1--:---:---:---H5--:---:---:---:---H10--:---:---:---:---H15-H16

G G1--:---:---:---G5--:---:---:---:---G10--:---:---:---:---G15-G16

F F1--:---:---:---F5--:---:---:---:---F10--:---:---:---:---F15-F16

E E1--:---:---:---E5--:---:---:---:---E10--:---:---:---:---E15-E16

D D1--:---:---:---D5--:---:---:---:---D10--:---:---:---:---D15-D16

C C1--:---:---:---C5--:---:---:---:---C10--:---:---:---:---C15-C16

B B1--:---:---:---B5--:---:---:---:---B10--:---:---:---:---B15-B16

A A1--:---:---:---A5--:---:---:---:---A10--:---:---:---:---A15-A16
   1   2   3   4   5   6   7   8   9   10   11  12  13  14  15  16
```

Note 1: Vertical designations would be number letter i.e. 1A, 4F, 6K, etc.

8.21 Bay Equipment Labels

RG 47-0130



FRAME UPRIGHT LABEL
(Form RG 47-0130)

```
RG 47-0131
BDFB/PBD _________ Load A _____ Load B _____
Ringing _________ Frame Location _____________
DSX-1  RR _______ Shelf _______ Jacks ________
DSX-3  RR _______ Shelf _______ Jacks ________
FDX    RR _______ Shelf _______ Jacks ________
Timing RR _______ Card/Terminals _____________
Alarms RR _______ Shelf/Terminals ____________
X.25   RR _______ Panel _______ Links ________
Drawing/Manual #_____________________________
BVAPP NUMBER_________________________________
```

BASE PLATE OR COVER LABEL
(Form RG 47-0131)

8.22 Temporary Removal and Installation Tag

RG 47-0144

TEMPORARY REMOVAL AND INSTALLATION TAG

This equipment was temporally installed or removed from service on: __/__/__
Qwest Design Engineer: _____ Phone: ( ) ____-_____
Requisition Number: BV_____ Authorization Number _____
Supplier Order Number: _____
Equipment to be replaced by: __/__/__
Service Supplier Contact: **_____ *Phone: ( ) ____-***
_____

TEMPORARY REMOVAL AND INSTALLATION TAG
(Form RG 47-0144)

These labels may be ordered through Forms Associates, Inc. 4417 South 89th Street, Omaha, NE 98127-0048, (402) 592-7888, Fax (402) 592-1961.

8.23 Labels

8.23.1 Discharge Body Static -Red Label

This label is required on all battery stands, and is to be placed on all exposed sides as near to the center and eye level as can be.

DANGER

Discharge Body Static

Personnel doing work on battery cells shall discharge body static prior to touching battery or intercell connectors. To discharge "body static" touch any suitable equipment ground. If battery stand is made of an insulating material and a suitable equipment ground can not be reached, then a grounded touch plate must be provided.

8.23.2 Battery Hazard Label - Gray Label

This label is required on all battery stands, and is to be placed on all exposed sides as near to the center and eye level as can be.

DANGER EXPLOSIVE

Can cause blindness or severe injury. Protect eyes when working around battery. Static electricity, sparks, flames or cigarettes can cause explosion. Tools and loose connections can cause sparks.

IMPORTANT

- Follow written instructions when servicing or charging.
- Do not remove flame arrestor vent cap.
- Provide adequate ventilation when charging.

ACID POISON

- Can cause severe burns.
- Contains sulfuric acid.
- In case of contact, flush immediately and thoroughly with water. Obtain prompt medical attention when eyes are affected.

8.23.3 Voltage Operating Ranges - Yellow Label

This label is to help personnel be aware of voltage requirements for a switch type. Usually the switch is the most voltage sensitive unit with in a facility. As you can see by the voltage layouts, and the currently recommend float voltage of 52.8V, we could have warrantee problems in a 1A/2BESS switch. This label is located on the main DC Distribution Panel.

VOLTAGE OPERATING LIMITS:

SWITCH TYPE	**LOW**	**HIGH**
1AESS	-43.75	-52.50*
2BESS	-43.75	-52.50*
5ESS	-42.75	-53.22
AXE	-41.50	-54.00
DMS-100/200	-43.85	-55.80
DMS-10	-42.00	-56.00

Service Assurance (24) Hour Contact: (800) 713-3666
***=Measured at the "PD" Frame**

These labels shall be placed just above the meter in BDFB's so equipped or at eye level on BDFB's without meters.

As of ___/___/___ This BDFB has been EMBARGOED for new growth due to load!

PID # 2407924

The Maximum continuous drain on each feeder to this BDFB is 200 Amperes.

PID # 2407882

The Maximum continuous drain on each feeder to this BDFB is 112 Amperes.

PID# 2407890

The Maximum continuous drain on each feeder to this BDFB is ____ Amperes.

PID# 2407916

CONTENTS

Chapter and Section **Page**

Figures

9. Power

Reference: 1. Qwest Technical Publication 77385, “Power Equipment and Engineering Standards.”

2. The Architecture, Models, and Configurations (AMC) of some specific types of equipment and Qwest Drawing Standards may supersede some requirements identified in this chapter.

Notes:

- All connectors, wiring, conduit, fixtures, etc. installed in Qwest locations shall meet the requirements of the National Electric Code (NEC), National Electrical Manufacturer's Association (NEMA), Underwriters' Laboratories (UL), or Canadian Standards Association (CSA).
- Service Suppliers engaged in the installation, removal, or modification of live power equipment shall protect exposed live conductors, bus bars, adjacent equipment, etc. with power insulating blankets. Materials other than power insulating blankets shall not be used. Refer to cautionary notes in 2.4.8.
- No work shall be performed on LIVE AC Circuits by anyone other than a Qualified Electrician. Since most AC circuits and some DC circuits can be worked on with the energy removed, the MOP shall contain the reason for working on any live AC circuits. Work on live circuits shall not proceed without the specific approval of the authorized Qwest person. For AC circuits that can be de-energized, lock-out / tag-out procedures must be followed.
- The building location Single Line AC drawing shall be updated with any installation of major AC components. Identification shall be placed on added AC components to agree with the identification on the Single Line AC drawing. Major components are defined as panels, switchboards and other distribution equipment from which individual circuits are derived.
- The real estate document “Building Equipment Design Guidelines” for electric (division 16) shall also be adhered to.
- The removal of a fuse or the opening of a breaker for the purposes of de-energizing a DC circuit shall be done by a Qwest employee. Prior to de-energizing, a current probe or clamp on ammeter capable of reading DC current shall be used to identify zero current flow. Only one LOAD of current to any one element shall be de-energized at one time.

9.1 AC Circuits

Note: AC circuits serving an "Isolated" ground plane shall not be extended to serve an "Integrated" ground plane.

9.1.1 Wire Type and Color

9.1.1.1 AC wire for distribution shall be THWN, THW, or THHN type.

9.1.1.2 Exposed ACEG conductors shall be green in color.

9.1.1.3 Green conductors shall not be used for any purpose other than an ACEG conductor, interior ring ground, or Central Office grounding conductors.

9.1.1.4 Neutral conductors shall be white or gray, or taped gray/white at all appearances.

9.1.1.5 Hot or phase conductors shall conform to the following color configurations:

Typical Power Wiring Color Code

120/240Volt		277/480 Volt	
Black	Phase 1 (a)	Brown	Phase 1 (a)
Red	Phase 2 (b)	Orange	Phase 2 (b)
Blue	Phase 3 (c)	Yellow	Phase 3 (c)
White or Gray	Neutral	White or Gray	Neutral
Green	Ground	Green	Ground

9.1.2 AC Connecting Methods

9.1.2.1 Compression connections are preferred for AC termination.

9.1.2.2 Mechanical and single hole connectors are permitted where allowed by the National Electrical Code (NEC) and are readily accessible for inspection, repairs and maintenance. They may not be used when the conductors terminate in vibrating machinery (generators, etc).

9.1.2.3 Connectors shall be the proper size specified by the manufacturer for the wire gauge and type, copper or tin-plated copper and the correct hole size for mounting hardware.

9.1.2.4 Connections of ACEG conductors shall not be made by wrapping the conductor under a mounting screw/bolt. A two-hole connector, ground bar or terminal strip shall be used. The exception is when connecting the ACEG to a common NEMA configuration outlet box, switch and/or receptacle.

9.1.3 Wire Nut Connections

9.1.3.1 Shall be placed so as to be accessible for maintenance and inspection.

9.1.3.2 Shall be made in an approved enclosure; i.e., junction box, conduit box, or pull box.

9.1.3.3 Splices shall not be made in the open areas of frame bases, vertical cable ducts, or end guards unless they are a raceway approved for splicing.

9.1.3.4 Shall be the correct size for the wire gauge and number of conductors being joined.

9.1.4 Enclosures, Cabinets, Boxes and Panels (Commercial and Emergency Service)

Protective metallic coverings (such as conduit, armor, lead covering, raceways, boxes, fittings, cabinets and fixtures) shall be grounded. Underwriters Laboratory (UL) approval of these coverings and devices assure that they will extend ground to one another when mechanical connections are made up tight. Ground is provided to the house service cabinet and ground continuity is extended to the power consuming device through these enclosures.

9.1.4.1 Qwest requires that a separate AC Equipment Ground conductor (ACEG) is extended in all raceways of all circuits.

9.1.4.2 The ACEG shall be enclosed in the same conduit or raceway with the phase and neutral conductors.

9.1.4.3 All enclosure covers, service panel covers or doors removed during installation shall be replaced at the end of each working day.

9.1.4.4 All AC enclosures, where knock outs or circuit breakers have been removed, shall be equipped with appropriate plugs, caps, or covers.

9.1.4.5. All unused, punched knockouts or holes in boxes and cabinets shall be closed. NEC 110-12a.

9.1.5 Conduit

9.1.5.1 All wall mounted conduits shall be run per job drawing / record, securely fastened at a maximum interval of ten feet and within three feet of each outlet box, junction box, device box, cabinet, conduit body or other tubing (see termination's. NEC 348-13, NEC 370-18). Refer to the Qwest Technical Publication 77351 for conduit requirements within a typical toll environment.

9.1.5.2 Conduit shall be attached to the ceiling, suspended as close as possible and placed so as not to block future cabling, ladders, etc.

9.1.5.3 All rigid, Electrical Metallic Tubing (EMT), and liquid tight flexible metallic conduit runs shall be made with compression or threaded type fittings, couplings, and junction boxes. Set screw or stake type fittings and couplings shall not be used in Qwest locations. Exception: Screw type fittings and couplings may be used on armored cable and flexible metallic conduit.

9.1.5.4 PVC conduit is not allowed for running AC circuits.

9.1.5.5 Conduit, flex conduit, or armored cable may not be run in cable rack or on hangers with switchboard, fiber or power cable.

9.1.5.6 Flex conduit or armored cable shall not be run exposed for a distance exceeding three feet. Insulated-coated armored cable or liquid tight flexible metallic conduit may be run in excess of three feet when properly supported.

9.1.5.7 No wire splices are permitted within conduits. Make splices only in authorized boxes, fittings, wireways, etc. See 9.1.3, "Wire Nut Connections."

9.1.5.8 Conduit shall, where possible, be run parallel and adjacent to auxiliary framing or cable rack.

9.1.5.9 All bends made to EMT or rigid conduits shall be made with a tool specifically designed for that purpose. The conduit bends shall not contain kinks or other imperfections.

9.1.6 Branch Circuits

Note: Use UL approved spring clips, wire nuts, solderless connectors, etc. to make connections.

9.1.6.1 When adding branch circuits from the distribution panel or extending existing circuits, verify that no continuity exists between the added neutral (white/gray wire) and the ACEG (green wire) before the connection is made.

9.1.6.2 Lighting circuits and appliance outlet circuits shall not be supplied by the same branch circuit. However, conductors for both types of circuits may be run in the same conduit/raceway providing the conduit/raceway is properly sized for multiple circuits. Circuits from protected sources (i.e. inverters) are to be separately identified per NEC 200-6d.

9.1.6.3 Lighting circuits supplied by polyphase service shall be assigned in such a manner as to balance the load on the different phases/legs as closely as possible. One neutral conductor of the same size as the phase conductor(s) shall be run with each phase conductor set.

9.1.6.4 All AC circuits shall have a separate ACEG (green wire) run with phase conductors.

9.1.7 Appliance and Utility Outlets

All outlets shall be of the standard type that connects its grounding terminal to its frame. Isolated ground or “Orange” outlets are not allowed in QWEST locations.

9.1.7.1 Grounding and polarity verification of outlets is required.

9.1.7.2 When removals involve AC, as with appliance/base outlets, utility outlets, or permanently mounted power strips, all remaining AC conductors shall be properly terminated.

9.1.7.3 In Stored Program Control Systems (SPCS) equipment, the appliance outlets will be provided as an integral part of the SPCS. In no instance shall appliance outlets be added to any SPCS equipment without meeting all interface and grounding requirements of that SPCS equipment.

9.1.7.4 In non-switch areas or where standard configurations specify, appliance outlets for equipment frames shall be spaced approximately every six feet or every third frame, front and rear. When only one frame is installed initially in a line-up, an outlet shall be provided in that frame. Power distribution frames and BDFB’s are exempt from this requirement. Miscellaneous frames in the power room or power area that do not contain distribution or rectifiers are not exempt.

9.1.7.5 Outlets shall have their ground terminal referenced to the frame in which they are mounted.

9.1.8 Multiwire Circuits

All multiwire (two or more ungrounded conductors) branch circuits shall be wired with a continuous grounded conductor (neutral). “. . .the continuity of a grounded conductor shall not be dependent upon device connections, such as lamp holders, receptacles, etc., where the removal of such device would interrupt the continuity.” NEC 300-13b.

9.1.9 Flexible Cordage

9.1.9.1 Excess flexible cordage shall be bundled, secured, and stored in a manner that prevents accidental disconnection or snagging.

9.1.9.2 Flexible cordage shall not be used to extend “base outlet” AC supply to permanently mounted equipment. A dedicated circuit is required for this type of installation.

9.1.9.3 Exception: When temporary AC power is required to rewire or remove an existing dedicated circuit, flexible cordage of the proper type and gauge may be temporarily used to supply power to permanently mounted equipment. (See 9.1 “AC Circuits.”)

9.1.10 Receptacles

High voltage receptacles shall have the receptacle cover plate marked with the appropriate voltage (e.g., 208V AC, 240V AC, 277V AC, etc.). Stamp with three sixteenths of an inch or equivalent font characters in vermilion (red) ink. Receptacles protected at over 20 amps shall have the protection size stamped as above.

9.1.11 Dedicated Circuits

Frame mounted equipment (modems, permanently mounted test equipment, etc.) that require AC utility outlets or power strips, shall have a dedicated circuit. This circuit shall be designated at both ends. Protected AC circuits shall be utilized for this purpose if available in the central office. Dedicated AC circuits should be in a separate conduit from the equipment to the AC source. Where this is not possible, such as limited surface opening space on the panel or only gutter access to the panel is provided, this circuit can share the same conduit or gutter with existing outlet circuits if all NEC code requirements (conductor fill, etc.) are met. A dedicated circuit that is in a shared enclosure, junction, or pull box shall be designated at each enclosure, junction, or pull box.

9.1.12 Work Performed On Live Circuits - Lock Out/Tag Out

All persons that intend to work on or around energized circuits or circuits that could become energized shall be familiar with and adhere to the Qwest practices described in the safety and loss prevention manual that applies to lockout / tagout. This practice is consistent with OSHA requirements.

9.1.13 Temporary AC Circuits

When work requirements dictate the necessity to power permanently mounted equipment with temporary AC power, flexible cordage, such as type SJ00-junior hard service cord, may be used. However, suitable disconnecting switches at plug connectors shall be installed to permit the disconnection of all conductors of each temporary circuit simultaneously (NEC 305-3). For Qwest purposes, temporary AC power refers to any wiring configuration installed to supply AC power that will be disassembled and removed prior to the actual completion of a job and includes extension cords. All such circuits shall be Ground Fault Interrupter (GFI) type and run in a manner that properly supports and protects the temporary circuit and personnel and does not present a safety hazard.

9.1.14 Frame and Aisle Lighting

Frame and aisle lighting shall conform to standard design configuration, or follow approved existing office convention. Service Supplier shall follow the switch manufacturer's requirements as determined by the job site situation.

9.1.15 The operating temperature of all AC and DC wiring in UPS equipment will not exceed 20 degrees Fahrenheit higher than the ambient temperature, or 115 degrees Fahrenheit, whichever is higher.

9.1.16 High Temperature Surfaces

9.1.16.1 Exposed surfaces with temperatures greater than 115° Fahrenheit shall be marked with warning labels.

9.1.16.2 Surfaces with temperatures greater than 130° Fahrenheit shall be guarded as well as marked with warning labels.

9.2 Primary & Secondary Distribution

9.2.1 Run all leads in continuous lengths per job specification**.** Power work at a Power Board or BDFB shall be completed before the total job has reached 70% complete.

9.2.2 All battery and battery return cables shall be run closely coupled and in pairs. Power cables (Battery and Battery Return) run on panned racks shall be paired and secured together at 24-inch intervals. ("Paired" is defined as placing these cables above/below or at the side of each other such as would be done when sewing on power cable rack with existing conductors.)

9.2.3 Power cables protected with 70 amp or less fuses / breakers may be run on cable racks utilized for switchboard cabling if they are sized at 4/0 or smaller. All power cables larger than 4/0 regardless of fuse / breaker size shall be run on dedicated FUSED POWER CABLE ONLY cable racks (TP 77385). The placement of any type of cable used for anything other than power on FUSED POWER CABLE ONLY racks is strictly prohibited. The issuance of Letters of Deviation waving any of these requirements shall be considered invalid. Also refer to Chapter 5.

9.2.4 Primary DC power distribution cable shall be run on a dedicated DC power cable rack. Primary DC power distribution is defined as leads from the power plant to the BDFB or the power distribution frame dedicated to a switch. Secondary DC power distribution is defined as power from the BDFB to the equipment.

9.2.5 When secondary power cable is tapped down for entry into equipment frames, taps shall be placed on the cable rack, and staggered above or within two feet of either side of the frame, bay, or cabinet.

9.2.6 All tap connections shall be accessible for inspection. Connections that are taped and have covers applied shall be considered accessible. Heat shrinkable tubing, other than clear, is not considered accessible.

9.2.7 Main conductors and feeders in the plant should be sized for the ultimate capacity of the plant (see TP 77385).

9.2.8 Unfused cables from chargers to batteries and from batteries to discharge panel or bus shall be on a separate cable rack from all other cables.

9.3 Battery Primary Conductors

Battery distribution circuits protected at 100 AMPs or greater shall be equipped with a means to monitor the load.

9.3.1 On new installations of primary DC (unfused) power cable, the cable shall not share a cable rack with any other type cable and shall be run on dedicated DC power cable rack.

9.3.2 Run all leads in continuous lengths per job specification**.**

9.3.3 All battery and battery return cables shall be run closely coupled and in pairs. with the following exceptions:

9.3.3.1 This "pairing" requirement does not apply to cabling between the power plant and batteries and/or primary distribution board, or the cable within a few feet of the return bus of a secondary distribution center — e.g. BDFB.

9.3.3.2 It also is not required for Outside Plant applications — cabinets and Customer Premise — where the DC plant size does not exceed 100 Amperes.)

9.3.3.3 In cases of a remote ground window where the served equipment is not on the same floor as the remote ground window the battery feed leads do not have to be paired with the battery return leads all the way to the ground window. For the portion of the run where the battery feed and the battery return leads are not paired, the battery return lead shall be paired back on itself, (this includes going through the same cable hole). The total impedance of the battery feed and the total impedance of the battery return must be equal (i.e., the voltage drop must be divided equally between the battery feed and the battery return — 0.5 V one-way drop for both the feed and return). Refer to Qwest Pub 77355 for ground window guidelines as required.

9.3.3.4 Between the bays and/or battery stands, internal to the power plant, paired battery and return are preferred. However, unpaired leads are allowed internal to the power plant under the following conditions:

- They are run as closely as possible;

- No other cables are placed between them; and

- No non-referenced (grounded) equipment within ten (10) feet.

9.3.3.5 The battery return leads are not to be confused with the grounding conductors and are exempt from the green color requirement. They are not to be marked or otherwise identified with the color green**.**

9.3.3.6 Occasionally it is required to run DC conductors inside of a conduit. When this is required, both the battery and battery return shall be paired in the same conduit.

9.4 Bus Bars

9.4.1 Bus bars shall be free of sharp edges, burrs, corrosion, etc. and shall be copper or tin-plated copper.

9.4.2 Bus bars shall be properly supported per drawings/records and insulated from surrounding metal work.

9.4.3 Coating and Plating

A metallic coating or plating is sometimes used on bus bars to reduce the resistance of the connecting joints. These contact surfaces should be cleaned with a clean, dry cloth to remove grease and other foreign matter, but should not be sanded or the surface otherwise scratched. Non-plated copper bars shall have connection points cleaned. See 9.4.6, "Bolts, Screws, Nuts and Washers," and Section 9.6,"Connecting."

9.4.4 Aluminum Bus Bars

9.4.4.1 Aluminum bus bars are not authorized for new installation. Where aluminum bars exist, contact the QWEST Design Engineer for approved connecting procedures.

9.4.4.2 Existing 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.

9.4.5 Bus Bar Clamps

Install a pal nut or locknut on each bus bar clamp bolt. Verify that regular nuts are tight before applying the pal nuts or locknuts.

9.4.6 Bolts, Screws, Nuts and Washers

Ferrous bolts, screws, nuts, washers, bus bar supports and clips used in fastening copper to copper, or combinations of metals shall be zinc or cadmium plated; however, copper, copper plated, tin-plated copper and stainless steel parts may be used when furnished.

9.4.7 Protective Enclosures

Bus bars which are located external to an equipment framework enclosure, and have a potential different than the surrounding or supporting metal work shall be protected from short circuits by means of an insulated removable cover. The intent of this requirement is to prohibit the practice of using tape as the protecting medium on bus bars and to allow protection to be removed and reinstalled for growth and/or maintenance activities.

9.4.7.1Bus bars requiring protective covers:

- All battery bus bars and splice plates not located within the power room or within a framework enclosure.
- Battery return splice plates where the potential of the plates are associated with an isolated ground plane, but are physically located and/or supported from ironwork associated with the integrated ground plane.

9.4.8 Bus bars that do not require protective covers:

9.4.8.1 All bus bars or splice plates located on a battery stand or in a power room, unless they present a safety or service hazard.

9.4.8.2 Battery return distribution bars located above a BDFB. Even if the power source feeding the BDFB is used to power a SPCS, the BDFB should appear subsequent to the Ground Window; therefore, contact between the return bus bar and surrounding metalwork would not constitute a single point ground violation.

9.4.8.3 Bus bars used as the Main Ground Bar (MGB). This is the point of interface between the two ground planes (commonly referred to as the Ground Window). Therefore, accidental and / or additional contact with either ground member would have minimal effect.

9.4.8.4 Bus bars that are used as a grouping point to bond integrated ground members together or to the MGB when required.

9.4.8.5 Central Office (COGB), Principal Ground Point (PGP) and Office Principle Ground Point (OPGP) bars.

9.4.9 Separation of Bus Bars from Surrounding Objects

9.4.9.1 All Bus Bars shall be a minimum of 3 inches from any metal objects. All Bus Bars shall be installed as to afford ready access.

9.4.9.2 All Bus Bars shall be installed as to afford ready access to the connecting surface.

9.5 Cabinets

Isolated cabinets such as motor starters, self-contained power distribution service cabinets, generator control bays, floor mounted rectifiers, etc., shall be secured to the floor with a minimum of four approved 12mm, torque indicating, expansion anchors. See Paragraph 3.21, ”Floor Anchors and Installation Instructions.”

9.6 Connecting

Electrical resistance shall be kept as low as practical.

9.6.1 Contact surfaces shall be cleaned so that direct metal to metal contact is made. Non conductive coatings (such as paint, lacquer and enamel) on equipment shall be removed to assure good electrical continuity. Copper bars may require the use of low abrasive pads to remove oxidation.

9.6.2 Plated surfaces, such as silver or lead plated copper, etc., are plated to prevent oxidation and reduce contact resistance and, therefore, should never be sanded or abraded. If cleaning is required, wipe with a dry cloth.

9.6.3 Mating surfaces shall be flat to ensure maximum cross-sectional area contact.

9.6.4 A non-oxidizing agent shall be applied to inhibit corrosion on all battery, battery return, and grounding connections, ie. at all contact points, bolts, washers, nuts, "H" taps, "C" taps, lugs and other items. This non-oxidizing agent is an insulator, so only a thin coat should be applied.

9.6.5 Pressure or clamping devices shall be tight.

9.6.6 DC power, return, and bonding/grounding lead connections shall have lock washers installed to ensure secure connections. Use shake proof (star) lock washers under mounting screws and split ring lock washers with bolts and nuts, except where double or locking nuts are standard. Lock washers shall not be placed between the connecting terminal and the contact surface. Connections that require annual retorquing routines do not meet Qwest Standards and are not acceptable. Batteries are exempt from this requirement.

9.6.7 General Connecting Methods

Attach only one lead to a punching, lug or connector that is designed to accommodate one lead.

9.6.7.1 Attach only one connector with the same mounting screw(s) or bolt(s) unless specified in the associated equipment AMC configuration. Frame ground connectors, chassis, shield, and equipment bonds shall not be stacked one on top of the other under the same mounting hardware.

9.6.7.2 Any connector drilled with two holes shall be secured using both holes.

9.6.7.3 On BDFB and Power Boards all alarm wiring for power fuses and associated alarm fuses shall be connected initially whether the locations are to be fused or to be made spare.

9.6.7.4 Stranded cables shall retain all of their strands at the point of termination.

9.6.7.5 All connectors with a potential other than ground shall be protected if they extend out beyond a protective cover and if they are within 3 inches of any differing potential. Suitable protection shall be clear heat shrinkable tubing or one wrap of fiber paper.

9.6.8 Crimp/Compression Connections

The integrity/quality of a crimp connection is dependent upon the following:

9.6.8.1 Correct size connector for the particular wire size(s) involved.

9.6.8.2 Insulation removed so that the wire extends the full length of the barrel or groove.

9.6.8.3 Preparation of the wire end and connector as required.

9.6.8.4 Use of a non-oxidizing agent on the wire and in the connector as required.

9.6.8.5 Full insertion of the wire into the connector. The wire shall be inserted to within 1/8 inch of the inspection hole for wire sizes #2 AWG and smaller and within 1/4 inch for wire sizes 1/0 AWG and larger.

9.6.8.6 Compress the connector the correct amount and in the proper sequence using the lug manufacturer's recommended tool and die set.

9.6.9 Power/Grounding Connections

9.6.9.1 DC wire for distribution and grounding, 14 AWG and larger shall be RHW, XHHW and for super flex applications RHW flex. The color of DC cables is optional, however, the color green is required on grounding conductors.

9.6.9.2 Mechanical connectors shall not be used in DC power distribution and grounding systems.

9.6.9.3 All electrical connections shall be smooth and treated with a non-oxidizing agent.

9.6.9.4 Parallel taps for branching or frame entry on power and grounding conductors shall be equal to or smaller than the feeder conductor being tapped.

9.6.9.5 Ground connections made with C-taps/H-taps do not require protective covers.

9.6.9.6 Battery and battery return connections made with C-taps/H-taps require the connection to be taped, a cover applied, and secured with twine.

9.7 Fuse Bays, BDFBs, POWER BOARDs, etc.

9.7.1 All fuses and circuit breakers shall be of the proper type and capacity specified in job drawings/records and shall be in compliance with manufacturers' design specifications. ***Cable ampacity shall equal or exceed the protecting device size.*** When manufacturers specify multiple loads (A&B, etc.) they shall be fused from different power board feeders. Fuses shall be installed or breakers operated at the completion of the job to identify the correct polarity of the connection at the fuse panel, and test records shall be provided.

9.7.1.1 Lock Out/Tag Out warning labels shall be used on all DC circuits that are connected to the distribution source and are not energized at the time of termination.

9.7.2 All cartridge, knife type fuses, and fuse reducers being installed shall be cleaned and lubricated with a non-oxidizing agent.

9.7.3 A non-oxidizing agent shall be applied to inhibit corrosion on all battery, battery return, and grounding connections.

9.7.4 Dummy fuses shall be installed where fuse holders depend on the dummy fuse as tensioning agents. Dummy fuses are no longer required at all unassigned fuse locations.

9.7.5 Alarm fuses shall be installed or an alternate system provided to indicate when a feeder fuse has opened.

9.7.6 Fuse reducers shall not be used in “dead front” fuse panels. Dead front is defined as having no exposed electrical potential. Fuse reducers shall not be used to reduce the fuse size more than once (double reducers).

9.7.7 All unassigned circuit fuses, their designations/pins, and associated alarm fuses shall be removed. Dedicated alarm fuse designation pins may remain in place. See Chapter 8 “Breakers, Fuses, Switches, and Shunts.”

9.7.8 All “live front” power distribution bays designed to have front protective covers, shall have those covers installed. Live front is defined as having exposed electrical potential.

9.7.9 All unequipped fuse/breaker block positions or panels shall have blank panels installed, no holes shall be permitted.

9.7.10 The largest fuse permitted in a BDFB is 100 amps. Feeds to collocators physical and shared locations, may be exempt from this rule. In those cases the largest fuse that can be used is per the BDFB manufacturer’s requirements.

9.7.11 No cable larger than a #2 AWG shall be terminated to a BDFB fuse position. Larger distribution cables shall be tapped down to a maximum of a #2 AWG before entering the BDFB. Products such as knife type fuse bays, which will not accept connection of #2 AWG or smaller connectors without modification, shall be considered exempt from this requirement. Feeds to collocators physical and shared locations, may be exempt from this rule, and may use cables 1/0 AWG and smaller. Taps are not permitted if the cable being run meets the sizing requirements for direct connection to the return bus bar.

9.7.12 BDFB fuse positions shall be assigned from the bottom up.

9.7.13 When power cables are tapped down in size for entry (see 9.7 “Fuse Bays, BDFBs, POWER BOARDs, etc.”), taps shall be placed within six feet of the entry point into the BDFB. Taps shall be staggered to prevent pileups.

9.7.14 All tap connections shall be accessible for inspection. Connections that are taped and have covers applied shall be considered to be accessible. Heat shrinkable tubing, other than clear, is not considered to be accessible.

9.7.15 Equipment shall not be powered from BDFBs not located on the same floor or from BDFB’s supplied by different power plants.

9.7.16 Equipment loads on a BDFB feeder, shall never exceed 50% of their fused value.

9.7.17 Use only DC type fuses and breakers for DC circuits, and only AC type fuses and breakers for AC circuits.

9.7.18 No circuits shall be energized without both ends of the circuit identified and connected,

9.8 Fuse Contact Preparation and Protection

9.8.1 Fuse ferrules, blades, and contact area of their associated clips shall be coated with a thin film of a non-oxidizing agent.

9.9 Knife Switches, Fuses and Fuse Mountings

Power shall be disconnected whenever possible from switches, fuses, clips or connections before they are worked on. If the potential cannot be removed, protect adjacent parts of opposite polarity with insulating materials.

9.10 Standby Engines

9.10.1 The Qwest Design Engineer shall specify, prior to the start of installation, the electrical, intake, exhaust, fuel, and floor grade requirements based on the engine manufacturer's recommendations for the particular engine being installed.

9.10.2 Fuel systems shall be free of copper or galvanized metal.

9.10.3 Engine areas shall be labeled to provide warnings of hazardous conditions, as follows:

9.10.3.1 Noise: “Ear Protection Required” on or at Entrance and Exit doors.

9.10.3.2 Voltage: "Danger High Voltage." AC Service Panels, Transfer Switch, Distribution Panel, Served Equipment (rectifiers etc.).

9.10.3.3 Fuel: "Danger Propane NO SMOKING or Open Flame" on or at Engine room and fuel storage systems and cabinets.

9.10.3.4 Temperature: "Danger HOT" on or at Engine exhaust system.

9.10.4 New standby engine-alternator installations and modifications to existing ones shall comply with TP 77385 and all current Standard Configurations. This includes "temporary" installations of any kind. All onsite testing, including connections to the site systems, shall have an authorized Qwest representative in attendance. The MOP for the job shall reflect the date for the work to start, to complete and include reference to having a Qwest person on site.

9.10.5 Cutovers/Turn-ups shall not occur unless all alarms are connected and tested.

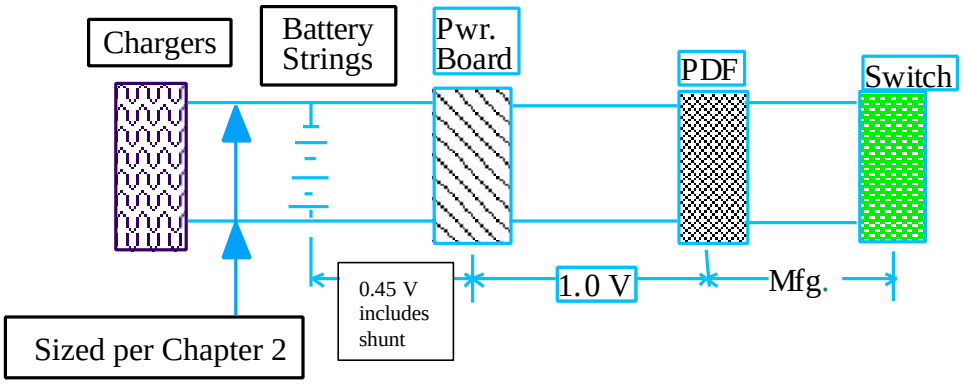


Figure 9-1: Switch Distribution Voltage Drops Loops

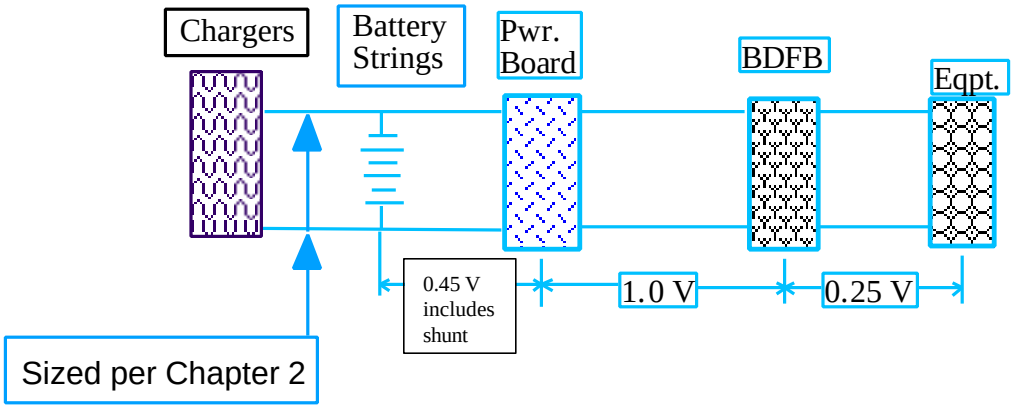


Figure 9-2: Equipment Distribution Voltage Drops Loop

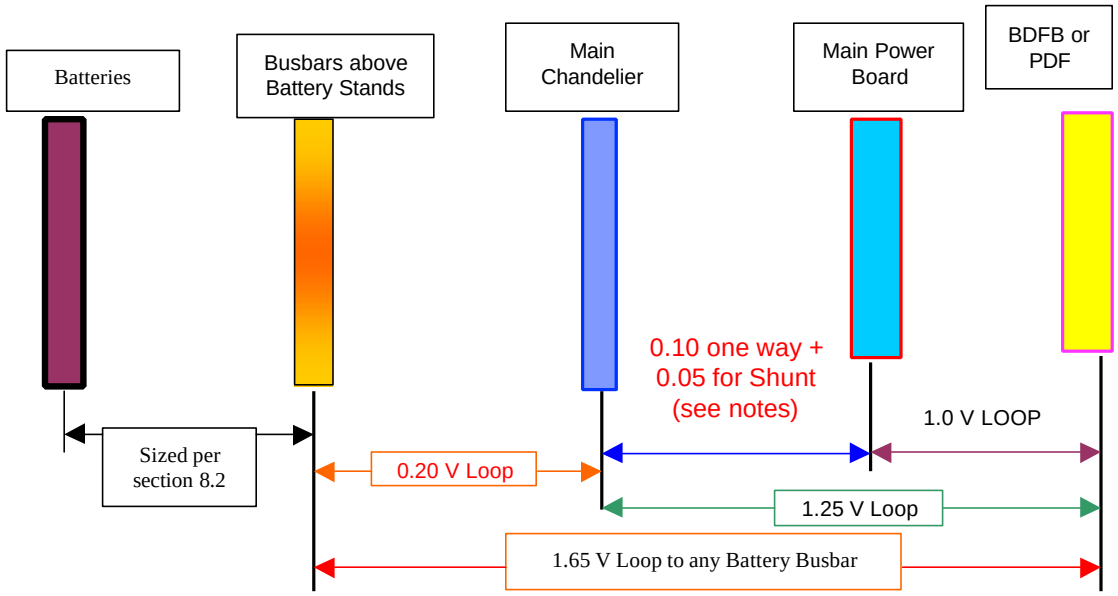


Figure 9-3: Voltage Drops from Battery Strings to BDBs

9.11 Wire Information Table

The cable is sized by the Design Engineer for ampacity and voltage drop. The installer is responsible for verifying that the circuit protection device is sized correctly for the cable.

WIRE INFORMATION					
WIRE SIZE	AMPS*	CIRCULAR MILLS	WEIGHT PER FT	DIA. OVER INSULATION	BEND RADIUS
14 AWG	15	4,110	0.026#	0.19"	2.28"
12 AWG	20	6,530	0.035#	0.21"	2.52"
10 AWG	30	10,380	0.049#	0.24"	2.88"
8 AWG	45	16,510	0.084#	0.31"	3.72"
6 AWG	65	26,240	0.126#	0.40"	4.80"
4 AWG	85	41,740	0.190#	0.45"	5.40"
2 AWG	115	66,360	0.275#	0.51"	6.12"
1/0	150	105,600	0.443#	0.63"	7.56"
2/0	175	133,100	0.540#	0.68"	8.16"
4/0	230	211,600	0.814#	0.75"	9.00"
350MCM	310	350,000	1.310#	0.98"	11.76"
500MCM	380	500,000	1.815#	1.12"	13.44"
750MCM	475	750,000	2.700#	1.34"	16.08"
1/0 FLEX	150	111,100	0.510#	0.66"	7.92"
2/0 FLEX	175	131,300	0.630#	0.72"	8.64"
4/0 FLEX	230	222,200	0.890#	0.84"	10.08"
350MCM FLEX	310	373,700	1.490#	1.07"	12.84"
500MCM FLEX	380	535,300	2.000#	1.24"	14.88"
750MCM FLEX	475	777,700	2.900#	1.54"	18.48"

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10. Storage Batteries

See Qwest Technical Publication 77385, "Power Equipment and Engineering Standards."

10.1 Cautions

10.1.1 Battery gases, which are present during a charge or which remain near the cell at the completion of a charge, can exist in sufficient concentration to explode. The Service Supplier shall ensure that sufficient ventilation is provided. The Service Supplier shall post, in a conspicuous location(s) near the batteries, one or more warning signs, lettered in large vermilion/red characters as follows:

*****WARNING*****
Battery gases are explosive.
No sparks or open flame near cells.

10.1.2 Flame arrestors shall be in place at all times except for as stated in 10.1.7. All flame arrestors shall be equipped with dust covers and remain in place at all times. If removed to access the electrolyte they must be replaced upon completion of work operation. Flame arrestors equipped with thermometers shall have the dust cover drilled to accommodate the installation of the thermometer.

10.1.3 Prior to working on a battery cell, discharge static from yourself and any object before touching the cell. Static can be discharged by touching a grounded surface.

10.1.4 After the end of initial or boost charge, the battery must be on float or open circuit for more than 48 hours before any cell connections can be made. The same applies to work near the cells, and to the use of open flames near the cells.

10.1.5 For personal protection and protection of clothing, use chemical safety goggles, rubber gloves, coveralls and/or aprons as required**.**

10.1.6 Do not lift cells by means of intercell connectors or cell posts.

10.1.7 Flooded batteries shall not be sealed air tight for transportation or for any other reason, the manufacturer's shipping caps/detail should be used to allow gas buildup to escape.

10.2 General Requirements and Procedures

Note: Manufacturer's requirements and procedures shall be followed for all installations of batteries.

NOTE: An authorized Qwest representative shall be present during the following, or the installation cannot proceed:

1) Delivery of flooded cells to the site.
2) Start and end of initial charging.
3) Connecting or disconnecting string(s) at the bus bar(s).
4) Connecting or disconnecting cell(s) in string(s).

10.2.1 The installer shall insure that the following items are on site and accessible prior to the start of any work involving batteries:

- Goggles or Face Shields
- Nitrile Rubber Gloves
- Rubber Apron
- Eye Wash Kit
- Spill Cleanup Kit*

* The Service Supplier is required to furnish and use their own spill kits. See **"**Chapter 12", "Hazardous Material Handling" Qwest Environmental Manager in your area for required contents of spill kits.

10.2.2 When permanently installing new or reused batteries, cells from different manufacturers shall not be placed in the same string. Batteries of different manufacturers may, however, be placed in parallel; i.e., String A, String B, etc.

10.2.3 When replacing cells in a string, the replacing cells shall have the same ampere-hour capacity, the same number of plates and shall be of the same technology.

10.2.4 Clean battery case with distilled water only. Clean and neutralize battery posts.

10.2.5 Petroleum-based lubricants for moving batteries are prohibited. The only approved product(s) are water-based lubricants.

10.2.6 Flame arrestors equipped with thermometers shall have the dust cover drilled to accommodate the installation of the thermometer.

10.2.7 Flooded Lead Acid cells may be tipped as much as 15 degrees, for periods not to exceed 20 minutes, in order to get through windows or past other obstructions, provided the vented shipping plugs are in place. All other cells containing electrolyte shall not be tipped to a point that their electrolyte leaks from cell.

10.2.8. All moving / installation of Batteries within the Qwest building or sites shall be done by the HAZMAT certified personnel.

10.2.9 Distilled or de-ionized water shall be used to replenish the cells.

10.2.10 Battery Storage Report

10.2.10.1 Storage Battery Report, Form RG 47-0001 shall be maintained on each battery throughout the installation and charging phases for battery installations.

10.2.10.2 Completed battery report(s) shall be turned over to the Qwest representative at the completion of the job. A copy of these records shall be left in the job packet and a copy retained with the battery string at the job site. The Service Supplier and Design Engineer shall ensure that a representative of Qwest NROC (Power Maintenance Engineer) or COO (Power Technician) reviews the battery report.

10.2.11 Temperature Reference Cell(s) (TR)

10.2.11.1 One cell in each newly installed flooded string shall be chosen as the TR cell. It shall be the cell on the upper tier with the lowest voltage reading at the end of the initial charge. It shall be recorded in the battery report forms.

10.2.11.2 Remove shipping compound from battery posts and apply a non-oxidizing agent as specified by the manufacturer before installation.

10.2.11.3 Temperature variation across a battery string shall not exceed 5 degrees Fahrenheit. Recommended temperature is 77 degrees Fahrenheit. Facilities that fail to meet this standard need consideration in adjusting float voltage and calculation of battery reserve time. Contact the Power Design Engineer or NROC Power Maintenance Engineer.

10.2.12 Intercell Connections

10.2.12.1 The rounded side of the stainless steel washers shall be placed against the surface of the lead-plated straps to prevent cut through of the lead plating. See Chapter 7, "Connecting."

10.2.12.2 Bolts shall be torqued to battery manufacturer's requirements and marked as torqued.

10.2.12.3 Lead bolts shall not be used.

10.2.12.4 Inter cell cables shall be of equal length and shall not extend into an aisle way in such a manner as to be subject to damage.

10.2.13 Inter tier connections

10.2.13.1 Cables shall be routed so as not to place undo strain on battery posts. 180 degree sharp bends are not permitted.

10.2.13.2 Cables shall be of equal length.

10.2.13.3 Cables shall be secured to the battery stand at a minimum of one location.

10.3 Initial Battery Charge Procedures for Flooded Cells

Note: The manufacturers' requirements and procedures shall be followed for all charging of flooded cells.

10.3.1 An initial charge shall be given to all lead-calcium cells prior to turnover to Qwest. Verify that shipping plugs are removed and flame arrestors and dust covers are in place before charging cells.

10.3.2 A portable battery charger and protective fuse box should be used for charging batteries. In the event a portable charger is not available, then job site rectifier (if readily available) can be used.

10.3.3 The charge voltage maximum limit is between 2.38 and 2.50 volts per cell average; and the battery manufacturer's charging rates, voltages, times, and limits should generally be used.

10.3.4 In order to ensure the proper battery charging the charging device shall be at least $1/100^{th}$ of the battery Ampere-hour rating. Example: 4000 amp hour batteries would require a minimum of a 40-amp charger per string.

10.3.5 Immediately prior to the start of initial charge, measure the cell temperature of each cell and determine the total length of initial charge requirement by referring to the manufacturers' specification. If no manufacturer recommendation can be found, refer to the corresponding cell temperature column and time on open circuit column from 10.4 “Flooded Lead Acid Type Battery Charging”.

10.3.6 While on initial charge, the electrolyte level may rise above the maximum level line. If it does, do not be alarmed. The electrolyte level in square cells is preadjusted by the manufacturer to be between the level lines when the cells are floated between 2.17 and 2.22 volts per cell (determined by power plant configuration, as specified in the Appendix of Qwest Technical Publication 77385) for an extended period of time.

10.3.7 Do not remove any electrolyte from the battery cells. If the level rises in any cell to the point where overflow may occur, immediately contact Qwest technical support, the Qwest engineer or authorized Qwest local representatives for further instructions.

10.4 Flooded Lead Acid Type Battery Charging

Note: The manufacturers' requirements and procedures shall take precedence over this table.

Total Hours of Charge at 2.38 - 2.50 Volts per Cell

Time on Open Circuit	**81°F and Above**	**65°-80°F**	**64°F and Less**
Less than or equal to four months	**100 Hours**	**150 Hours**	**200 Hours**
Greater than four months and less than or equal to six months	**150 Hours**	**200 Hours**	**250 Hours**

10.4.1 The time on open circuit is to be determined from the “charge by” date on the shipping container. The “charge by” date is that date when battery has been on open circuit for six months. The Service Supplier shall notify the Design Engineer if this time period has been exceeded.

10.4.2 Cell temperature is measured at the open circuit voltage before initial charging begins.

10.4.3 Total charging time shall not exceed 250 hours. The Service Supplier shall notify the Design Engineer if this time period has been exceeded.

10.4.4 Battery Charging Procedure
Upon Receipt of Batteries:

1. Obtain correct Battery Record Form (RG 47-0001, and TP 77350).
2. Record Serial Number of each cell.
3. Record open cell voltage of each cell.
4. Record physical condition of each cell.
5. Record specific gravity of each cell.

Initial Charge:
1. Charging will begin after the first cell reaches -2.38 volts without any cell exceeding -2.50 volts. The output of the charger shall not exceed -60 volts.
2. On a daily basis, record the voltage of each cell on Form RG 47-0001.
3. Charge the battery string for 100 – 250 hours.

At the End Of Charge:
1. String voltage shall be between -57.12 and -60 volts.

2. Calculate average cell voltage for the string.

IF: Individual cell voltages are within +/- .05 volts of the average cell voltage for the string.
THEN: Reduce charge to float voltage (-52.08 or -52.80) of the existing power plant.

IF: The voltage of any cell is not within +/- .05 volts of the average cell voltage for the string.
THEN: Charge for an additional 50 hours and recalculate average cell voltage.

IF: Any cell's voltage is not within +/- .05 volts of the average cell voltage for the string.
THEN: Consult cell manufacturer.
ELSE: Wait 24 hours after reducing to float and recheck average cell voltage (should be within +/- .05 volts of string average).

3. Contact Local Power or Central Office Technician for acceptance.

Notes:

1. Charge procedures recommended in manufacturer's literature may be used in place of these.

2. Towards the end of initial charge (approximately 100 hours or more), individual cell readings for any single cell should remain constant for 3 successive hourly readings of that cell (that should be true of every cell).

10.5 Initial Charge and Turnover Requirements for Flooded Cells

10.5.1 Before stopping the initial charge, record the following:

- Total hours of charge.
- Presence or absence of crystals for each cell.

10.5.2 Cells/battery shall not be handled during boost charge or for 48 hours thereafter.

10.5.3 After a satisfactory initial charge, there should be no lead-sulfate crystals or gray coloration present on the positive plates or straps when examined with a nonmetallic flashlight. Normally only the positive strap will be accessible for examination. In some arrangements the edges of the positive plates will also be visible. The visible positive elements shall be black or dark brown and totally free of any diamond-like crystals or gray coloration. The disappearance of crystals normally occurs in three distinct phases:

- Phase 1: Black and crystalline
- Phase 2: Gray and lightly crystalline Phase 3: Black or dark brown and crystal free

10.5.4 The disappearance of crystals or gray coloration occurs from top to bottom during initial charge. To ensure total absence of crystals or gray coloration, inspection for crystals should be concentrated at the bottom of the positive plate vertical columns. Crystals can readily be seen on the positive plate. Use a flashlight held close to the jar wall at an angle of approximately 45 degrees to inspect for crystals. The lead-sulfate crystals will appear as sparkling diamond-like reflecting particles or as a gray coloration.

10.5.5 Cells which are not free of crystals after the initial charge may be shorted. If some cells are still crystalline after initial charge, it is recommended that the battery string be continued on boost charge at -2.38 to -2.50 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 should be referred to the Qwest Power Design Engineer.

10.5.6 For cells shipped dry, follow the same requirements for the end of the initial charge as outlined above.

10.5.7 The float voltage shall be a either -2.17 or -2.20 volt per cell average, depending on power plant configuration (24 cell configuration only.) Some older power plants cannot easily have the float voltage raised to -52.8 V due to HVSD settings and other considerations. Power plants that will not function with a float voltage of -2.20 volts per cell must be configured at the traditional -2.17 volts per cell.

10.5.8 Specific Gravity = 1.215 ±0.010.

10.5.9 Electrolyte Level Adjustment

Electrolyte levels should be adjusted after the cells have been on two weeks of continuous float to maintain specific gravity of 1.215 ±0.010.

10.6 Initial Charge Procedures for Valve Regulated Lead Acid Cells

Note: The manufacturer's requirements and procedures shall be followed when installing and charging VRLA batteries. As a general rule, VRLA batteries should not be charged above normal float voltages for initial charge, boost charge, or any other reason. Any questions not answered by the manufacturer or documentation shall be referred to the Qwest Power Design Engineer or Qwest NROC Power Maintenance Engineer.

10.6.1 The float voltage shall be between -2.25 to -2.28 volts per cell unless otherwise required by the manufacturer.

10.6.2 All VRLA battery installations shall be -48v nominal or +/-24v nominal.

Caution: Served equipment must be able to tolerate voltages up to -54.8 volts (+2.0 volts).

10.6.3 Provide ventilation to avoid buildup of explosive hydrogen gas.

10.7 Electrolyte Spills

Reference: Chapter 12, “Hazardous Material Handling.”

Whenever a spill of electrolyte occurs, the Service Supplier shall:

10.7.1 Take steps to stop the flow of electrolyte.

10.7.2 Contain the flow of electrolyte by using a spill kit.

10.7.3 Take steps to neutralize any electrolyte coming in contact with the body.

10.7.4 Seek medical attention if necessary.

10.7.5 Report the incident immediately to UNICALL at 1-800-654-2525 when the spill has been contained.

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Figures

11. Bonding and Grounding

Note: It is required that a current copy of Qwest TP 77355, "Grounding Central Office and Remote Equipment Environments," be present on site and available for use on any job that includes grounding. Any issues not addressed in this chapter are to be found and followed in the 77355.

The Architecture, Models, and Configurations (AMC) of some specific types of equipment and Qwest Drawing Standards may supersede some requirements identified in this chapter.

11.1 General Requirements

11.1.1 All grounding conductors shall be run exposed and supported to existing cable rack, hangers, or suitable framework using nylon/plastic tie wraps or twine.

11.1.2 Grounding conductors 1/0 and smaller may be secured directly to the side of cable racks.

11.1.3 Grounding conductors larger than 1/0 shall be suspended on and secured to cable hangers. Cable hangers shall be placed at eighteen-inch intervals.

11.1.4 Grounding conductors shall not be run on cable racks.

11.1.5 All connections shall be made with a crimp compression parallel copper connector (C-tap or H-tap) or a two-hole crimp compression copper / tinned copper connector. Two-hole crimp connectors shall be secured with an approved lockwasher placed between the connector and the head of the screw or nut.

11.1.6 Grounding conductors, bonds and taps to ground conductors shall be arranged to flow fault currents in the direction of the OPGPB or ground source.

11.1.6.1 180 degree bends in grounding conductors are not permitted.

11.1.6.2 Minimum bending radius of a grounding conductor is 12 inches.

11.1.7 All shielded cable and wire shall be grounded at one end or as directed in the job specification, drawing/record, or manufacturers' specification.

11.1.8 All chassis, shield, and equipment ground bonds may be made using a solderless wrapped connection, a soldered connection, or single hole ring type crimped connector mounted to a properly prepared surface of the frame, bay, or cabinet with suitable hardware and shakeproof lock washer. The placement of the lock washer shall be between the head of the securing device and the connector, not between the connector and the contact surface.

11.1.9 Frame ground connectors, chassis, shield, and equipment bonds shall not be stacked one on top of the other under the same mounting hardware.

11.1.10 A grounding conductor shall not be secured or supported by metallic clamps which completely encircle the conductor (see girdling 11.12).

11.1.11 Stranded RHW or XHHW type insulated copper wire, where the insulation is colored green, is the standard interior central office grounding conductor. (In accordance with the NEC, wires other than “grounding” conductors shall not be colored green. For example, the “grounded” -48 VDC battery return conductor[s] shall have insulation colored gray or black. Although it is recommended for smaller wires, including chassis grounds, it is not required.) Alternately, bare copper wire (stranded or solid) is also allowable in some situations as specified in Qwest Standard Configuration documents.

11.1.12 Attachments to raceways shall only be made per NEC 300-11b.

11.1.13 Ground conductors shall be run so that they are visible from the floor.

11.1.14 Ground conductors shall be run so that they may be accessible throughout their expected life.

11.2 Central Office and Facility Main Ground Systems

11.2.1 The vertical ground riser shall be continuous and free of sharp bends and contain no bends with a radius of less than 12 inches.

11.2.2 A 750-kcmil ground conductor shall be run from the OPGP to the last CO ground bar in the vertical riser system.

11.2.3 PVC or other nonmetallic sleeves are required for routing the vertical equalizer (or riser) through floors or walls. Metallic sleeves may be required by local codes. If running the conductor through a metallic sleeve is unavoidable, the sleeve should be less than 3 feet in length and both ends of the metallic sleeve shall be bonded with #6 AWG stranded copper wire to the conductor extended through that sleeve. Under no circumstances shall the installer run cable through non-sleeved holes.

11.2.4 The PVC sleeve shall extend four inches above and two inches below floor levels and be properly firestopped. See Chapter 4,” Cable Holes, Penetrations, and Fire/Smoke Protection.”

11.2.5 A bond strap across the water meter is required. Water valves and pipe unions should be within the bond.

11.2.6 Exothermic weld connections on a ground well head shall be protected from the environment with a suitable polyurethane caulk or sealer such as “Vulkem", “450/451”, “Sikaflex - 1A”, or “Sonneborn".

11.3 Grounding Frames, Bays and Cabinets

See Qwest Technical Publication 77355 for additional information and requirements.

11.3.1 All frames, bays, and cabinets shall be individually grounded with a minimum #6 green covered or bare RHW, XHHW or bare AWG copper stranded wire as specified by Qwest Standard Configuration documents. Frames, bays and cabinets shall be welded steel type construction, no aluminum or bolted bays shall be allowed on new equipment additions.

11.3.3 All ground connections shall be secure.

11.3.4 All contact surfaces shall be cleaned and treated with a non-oxidizing agent.

11.3.5 Frame support pipes shall not be used for frame grounds. If necessary, the installer shall contact the Design Engineer to arrange for the necessary material to provide a proper #2 AWG stranded, insulated, copper conductor, supported on hangers, extending the full length of the line up.

11.3.6 Frame, bay and / or stand extension supports (extenders) shall be bonded to the frame with a minimum #6 AWG conductor and shall not contain bends exceeding 90 degrees.

11.4 Equipment Chassis Shield and Quiet Grounding Connections

11.4.1 Chassis and shield grounds may be made using single-hole crimped compression connectors or by soldering to a frame chassis ground detail or by wire wrapping to an approved wire-wrap terminal. If a manufacturer provides a termination for a chassis, shield, or quiet ground, that bond shall be made.

11.4.2 All shielded cable and wire intended to be provided with a quiet/shield ground, shall have its shield bonded to ground on one end or the other, but not on both ends unless specified by standard or manufacturers drawing. See Chapter 2, "General Requirements."

11.5 Isolated Ground Systems for Stored Program Control Systems

11.5.1 Stored Program Control System (SPCS) Frames or Equipment shall not be located more than one floor away from the ground window.

11.5.1.1 A two inch air separation or approved insulator is required between a member associated with the integrated (building) ground system and a member of the SPCS isolated ground system.

11.5.2 All frames, bays, and cabinets installed in an isolated ground plane shall have a low voltage (resistance) and a high voltage (breakdown) test applied prior to the installation of the frame ground conductor or any other cabling to assure that the frame is truly insulated. The results must appear in the test record documentation required to be turned over to the COO at the completion of the job.

11.5.2.1 Two wraps of sheet fiber/protective tubing or other approved insulator shall be used to isolate conduit and other members of the isolated ground plane from different grounding systems. Isolation material shall extend 2 inches on either side of the point of incidence.

11.5.2.2 Any AC raceway, communications circuit or ACEG conductors that have connections to both the integrated and isolated ground planes shall pass through the ground window and be bonded to the main ground bus.

11.5.3 Isolated Conduit and ACEG

11.5.3.1 The length of the bond lead to the main ground bus for conduit, raceway or grounding conductor entering the SPCS at integrated ground plane potential, shall not exceed three feet from the main ground bus and shall be connected to the integrated side.

11.5.3.2 The continuity of metallic conduit providing AC service shall not be broken by an air gap or insulating coupling.

11.5.3.3 The continuity of metallic conduit used for the routing of DC alarms and low voltage lighting control lead(s) into the SPCS environment shall be broken by an air gap or insulating coupling when the conduit is not routed through the ground window and bonded to the main ground bus.

11.5.4 The Main Ground Bus (MGB) in the Ground Window

11.5.4.1 The Main Ground Bus (MGB) in the Ground Window shall be connected to CO Ground with a 750-kcmil Ground cable. The MGB in the ground window shall be configured so that the CO ground connection is the separation of the isolated ground and integrated ground connections.

11.5.4.2 Only one "Ground Window" shall be provided per power plant when one or more SPCS offices share the same power plant. The power plant (positive bus in negative voltage systems) shall be ground referenced with a separate conductor to the MGB in the ground window.

11.5.5 Battery return leads for non-SPCS equipment sharing the SPCS power plant shall be bonded to the integrated side of the MGB in the ground window. The battery and return conductors shall be paired and closely coupled to the greatest extent practicable between the power plant and the equipment being powered. (see Section 9.3 "Battery Primary Conductors" for exceptions to this rule). Multiple return conductors from the same source may be bonded together with one bond to the MGB. The bonding lead shall not exceed three feet and shall be connected to the integrated side of the MGB.

11.6 Circuit Pack Storage Cabinets

11.6.1 Circuit pack storage cabinets located or placed in lineups with SPCS equipment shall be insulated from the integrated environment and bonded to the isolated ground.

11.6.2 Circuit pack storage cabinets that do not meet Paragraph 11.6.1 restrictions, that are located within six feet of SPCS equipment, shall be bonded to the Foreign Object Ground (FOG) system.

11.6.3 Circuit pack storage cabinets that do not meet the requirements of Paragraph 11.6.1 or 11.6.2 shall be grounded to the central office grounding system.

11.7 Foreign Object Grounding

Metallic Members of the integrated ground plane located within six feet of metallic members of the isolated ground plane shall be bonded to the Integrated portion of the Ground Window/Single Point Ground (SPG, MGB). Steps shall be taken to ensure that there is electrical continuity between members of the nearby metal mass, verifiable by a reading of less than 1-ohm resistance, measured between metallic members. If the reading is greater than 1 ohm across junctions, then the metal objects shall be deliberately bonded.

11.7.1 In areas adjacent to, and within 6 feet of, Isolated Ground Plane Systems the Service Supplier shall ensure that Foreign Object Ground paths are not disturbed. If equipment and ironwork that is Foreign Object Grounded is removed, the Service Supplier shall ensure that ground paths are properly reestablished to remaining equipment and ironwork. See Qwest Technical Publication 77355, "Grounding Central Office and Remote Equipment Locations", for additional information.

11.7.2 Metallic objects that are commonly found within the six foot radius of an Isolated ground plane are listed, but not limited to: tip and ring cable racks, power cable racks, cable rack screening and panning, auxiliary framing including support rods and earthquake bracing, conduits, AC service panels, lighting fixtures, HVAC ducts, alarm panels, desks and cabinets, facility and radio equipment frames.

11.7.3 Care shall be taken to limit environmental contamination caused by dust, drilling, and or paint removal. Whenever possible, this work shall be performed outside the switch area or before the installation of switch equipment. If the work shall be done near the switch or other working equipment, then steps shall be taken to collect all dust, paint chips, and metal bits. The use of a HEPA vacuum cleaner and proper equipment protection such as canvas tarps, insulating blankets, or masonite is required.

11.7.4 Where switch frames or lineups are added to new or existing SPCS environments, the Service Supplier is required to provide the foreign object grounding. Some SPCS environments may not have existing foreign object grounding. In these instances, the Service Supplier is required to extend a #2 AWG stranded insulated conductor from the area above the switch to the integrated portion of the ground window, and bond metallic members within six feet of the added equipment.

11.7.5 Objects in the integrated ground plane may be extended individually to the integrated portion of the ground window or may be collectively referenced through a foreign object ground bar which is connected to the integrated portion of the ground window with a minimum #2 AWG stranded insulated conductor. It shall be permissible to branch #6 AWG conductors from the #2 AWG conductor to bond individual items.

11.8 Minicomputer Systems

Minicomputers referred to in this section are generally composed of several floor supported equipment cabinets, each equipped with one or more integral regulated power supply units served by a cord connected to AC service.

11.8.1 Minicomputer system cabinets (i.e., processor boxes, expansion cabinets, peripherals, communications cabinets, a floor mounted AC distribution center, and floor mounted air handling equipment) shall be grounded to the raised floor grid using a flat braided strap to the nearest floor grid-work structure. This arrangement provides the necessary high frequency return path and minimizes the difference of potential throughout the complex. The raised floor grid shall be connected to the CO ground system.

11.8.2 All connections to the equipment cabinets and the raised floor metallic grid shall be made with two-hole crimped copper lugs.

11.8.3 Each minicomputer cabinet shall be connected to an AC supply system by means of an electrical cord equipped with an ACEG conductor (green wire).

11.8.4 AC outlets shall be NEMA-spec and compatible to the AC plugs provided by the minicomputer supplier, for each cabinet requiring AC connection.

11.8.5 Alternating current outlet boxes shall be NEMA-spec and metal to reduce noise.

11.8.6 The ACEG shall be extended to the equipment ground bus of the AC power service cabinet.

11.8.7 In no case shall the ACEG be interrupted.

11.8.8 In no case shall the ACEG be routed between the computer cabinets and the AC power service cabinet in other than cord and AC branch circuit raceway.

11.8.9 The Service Supplier shall ensure that AC service complies with the manufacturer's specifications. If the AC service is not in compliance, the Service Supplier shall contact the Qwest Design Engineer for resolution.

11.9 Facility and Radio Site Ground System

Reference: Qwest Communications Inc. Technical Publication 77355, “Grounding - Central Office and Remote Equipment Environment.”

11.9.1 Use only #2 AWG solid, tinned copper conductor for the construction of and bonding to the external ring ground system.

11.9.2 All bonds to the external ring ground shall be made using exothermic welds or exothermic welded connectors.

11.9.3 Use only insulated #2 AWG and #6 AWG stranded copper conductors for construction of the interior ring system.

11.9.4 All connections to the interior ring ground system shall be made with copper/tinned copper crimp compression connectors or other Qwest approved connectors.

11.9.5 The interior ring ground shall be bonded at each corner to the external ring ground solid conductors extended to the inside of the building using exothermic welds or two compression crimp copper C-taps or H-taps of the correct size placed in line with one another.

11.9.6 Wave-guide hatch plate(s) shall have two connections to the primary ring conductor, flowing in opposite directions.

11.9.7 The primary interior ring ground conductor shall be supported to the interior walls at two foot intervals and shall be constructed at either the seven foot or nine foot level, depending on the height of equipment frames.

11.9.8 The supplementary ring conductors shall be #2 AWG wire, extended down each equipment aisle, and supported using the cable rack runners and auxiliary framing bars. The conductors shall be connected at both ends to the primary system. Connections shall be formed in the direction of the wave guide hatch plate(s).

11.9.9 All bends and turns of conductors shall have a minimum radius of twelve inches. Bends and turns in a single conductor shall be kept to a minimum. Bond conductors shall be as short as possible while meeting above requirements.

11.9.10 All frames, bays, cabinets, cable rack sections, auxiliary framing, conduits, vents, metal doors/frames, and other metallic objects within six feet of the radio equipment area shall be bonded to the ring ground system.

11.9.11 All frames, bays, and cabinets shall be bonded at or near the top of each side or upright to the supplementary ring conductor. Individual bonds shall be formed flowing toward the wave-guide hatch plate(s) in opposite directions. It shall be permissible to use a single conductor bonded to each upright and connected in the middle to the supplementary conductor.

11.10 Standby Engines and Engine Room Equipment

11.10.1 Standby engines located indoors shall be bonded to a COGB or OPGPB (which ever is closer, but not to exceed 200 cable feet) with a minimum #2 AWG stranded copper conductor attached to the engine support framework with a two hole connector. This conductor shall also be used to branch #6 AWG stranded copper conductors to bond other metallic objects and equipment within the engine room. Mechanical connectors shall not be permitted.

11.10.2 The standby engine shall be bonded to engine support framework.

11.10.3 Ground bonds shall be extended to all metallic objects such as: day tanks, in-room fuel tanks, start battery stands, AC panels, air intake louvers, transfer switches, conduits, remote engine shut-off switches, alarm control boxes, etc plus any metallic items extending outside, such as radiator pipes, exhaust, etc.

11.10.4 Bonds shall be placed around flexible metallic conduits that are terminated with mechanical connectors.

11.10.5 A #6 AWG bond shall be placed across flexible non-metallic sections of raceway.

11.10.6 Standby engines located outdoors will ground and bond as above except that the #2 AWG conductor shall connect to the exterior perimeter ground system instead of an interior bar.

11.10.7 External items associated with the engine that are located outdoors (radiators, fuel tanks, etc.) shall bond to the exterior perimeter ground system.

11.11 Fuel Storage Tanks and Fuel Lines

11.11.1 Fuel intake and return lines from buried metallic storage tanks shall be bonded to the OPGPB with a dedicated, minimum #2 AWG stranded copper conductor.

11.11.2 Above ground fuel storage tanks shall be grounded in accordance with their specific situations and in compliance with Qwest TP 77355, “Grounding Central Office and Remote Equipment Environments.”

11.11.3 Connections made in exposed outdoor environments shall be protected from the environment with a suitable polyurethane caulk or sealer such as “Vulkem", “450/451”, “Sikaflex - 1A”, or “Sonneborn".

11.12 Girdling

Girdling refers to the encirclement of single grounding conductors by a ring of ferromagnetic metal. Refer to Qwest TP 77355.

This occurs in these typical situations:

- Steel conduit used for physical protection of conductors.
- Steel rings used for supporting conductors.

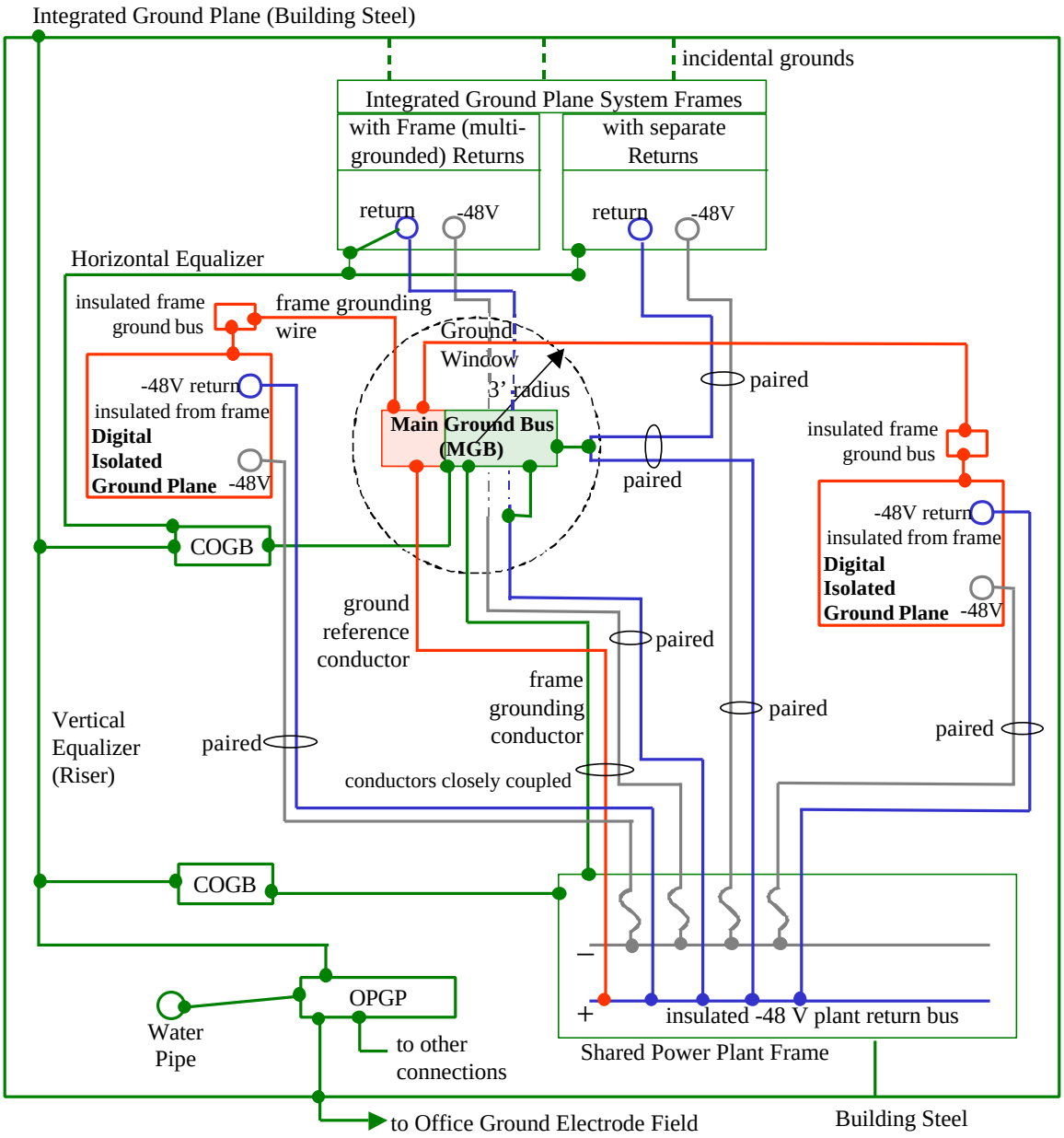

Figure 11-1 Grounding For Integrated and Isolated Ground Planes Powered From Common Power Plant

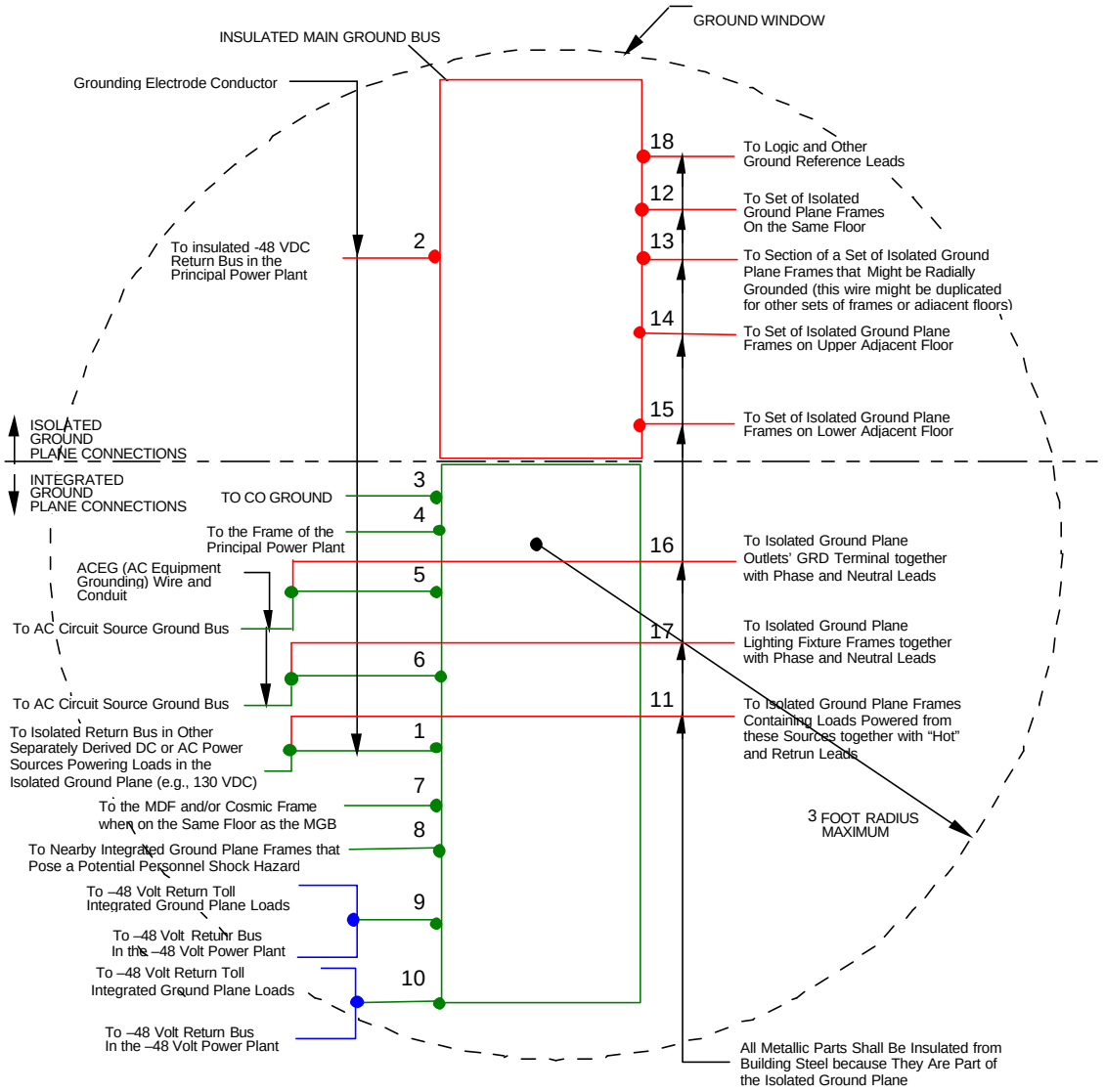

Figure 11-2 Typical Sequence of Connections to a Separate Ground Window

Conductor **Identification** (see Figure 8-6)		**Can Conduct**				Required		Required	**Wire Size** (AWG)
		Lightning **Current**		**Fault Current**		**in All Plants**		**in Some Plants (Yes)**	
		Yes	**No**	Yes	**No**	Yes	**No**		
1	External Power Sources Grounding Conductors	**x**		x			**x**	**x**	#6
2	Principal Power Supply Grounding Electrode Conductor		**X**	**x**		**x**			750 kcmil
3	Main Ground Bus to CO Ground (COGB) Connection	**x**		**x**		**x**			750 kcmil
4	Principal Power Plant Frame Grounding Wire	**x**		**x**		**x**			#6: <70’ 1/0: 70-240’ 2/0: >240’
5 **6**	External Power Sources Grounding Conductors	**x**		**x**			**x**	**x**	#6
7	Main Distributing Frame (MDF) and/or Cosmic Frame Protector Frames’ Grounding Wires (only applies when this frame is on the same floor as the MGB)	**x**		**x**			**x**	**x**	1/0
8	Grounding Wires for Nearby Integrated Ground Plane Frames that are a Shock Hazard	**x**		**x**			**x**	**x**	#6
9 **10**	Toll (Integrated Ground Plane) Loads’ –48 V Return Load Conductors	**x**		**x**			**x**	**x**	same size as the load conductor (maximum 1/0)
11	Continuation of Grounding Conductor (and Conduit) from Associated External Sources		**X**	**x**				**x**	same size as the associated phases and neutral
12 **-** **15**	Isolated Ground Plane Grounding Conductors		**X**	**x**		**x**			1/0 minimum
16 **17**	Continuation of Grounding Conductor (and Conduit) from Associated External Sources		**X**	**x**				**x**	same size as the associated phases and neutral
18	Logic and other Ground Reference Leads in the Isolated Ground Plane			**x**			**x**	**x**	per switch vendor requirements

Figure 11-3 Tabulation of Typical Ground Window Connections

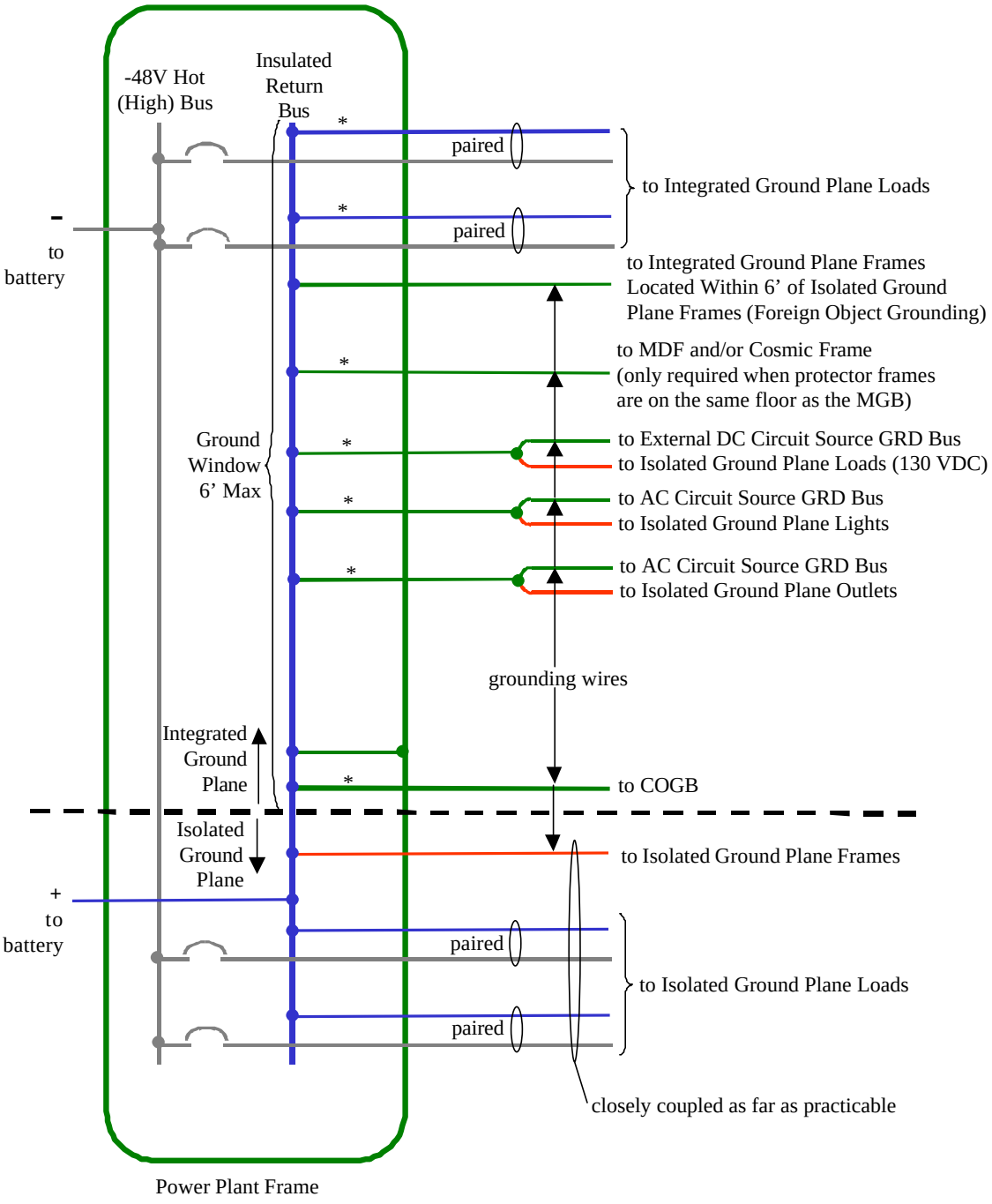

Figure 11-4 Using An Insulated Return Bus As The Ground Window

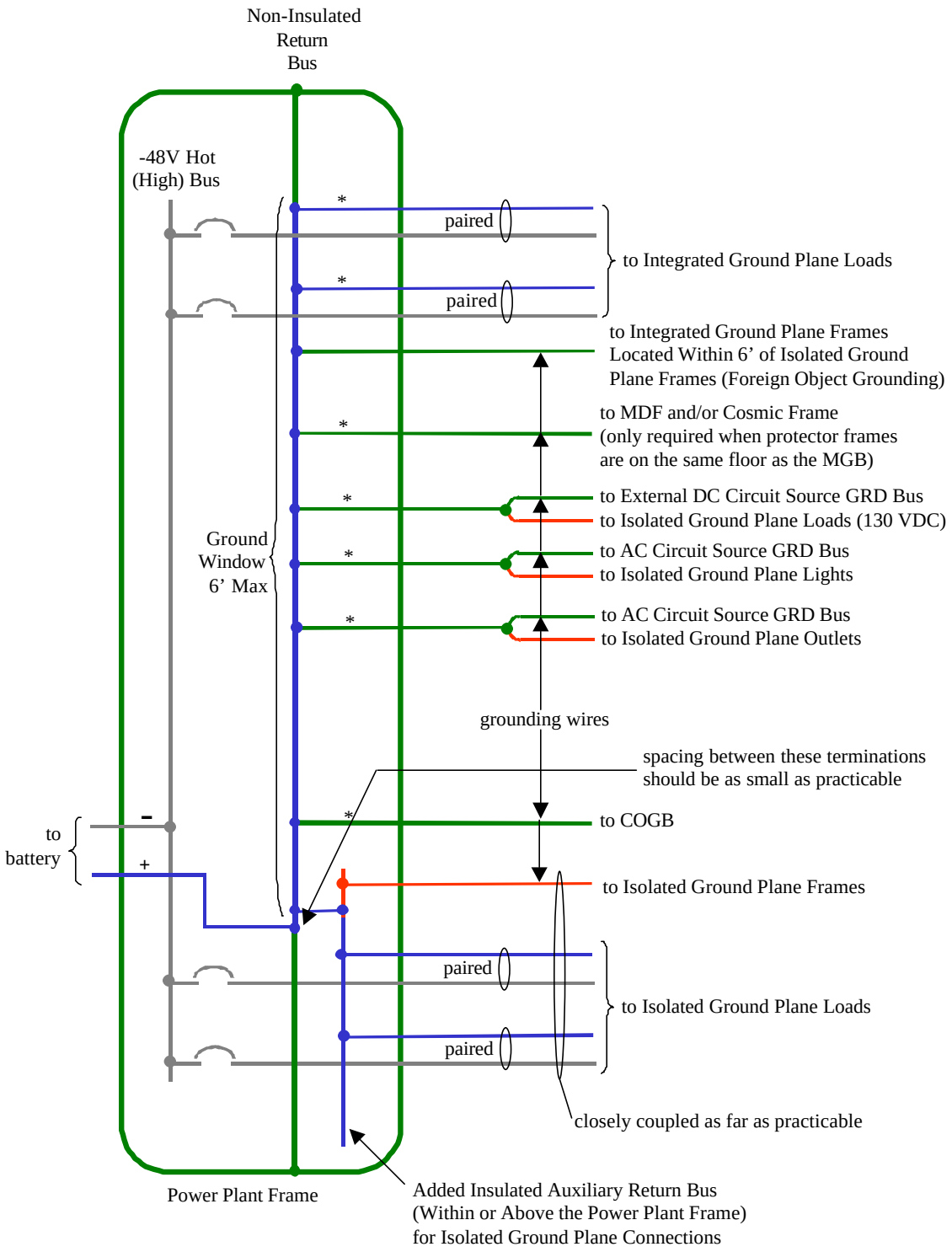

Figure 11-5 Using A Noninsulated Return Bus As The Ground Window

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Table

12. Central Office Equipment Wreckouts and Installs: Hazardous Materials

12.1 Introduction

When handling hazardous materials, waste materials, and equipment, the contractor is expected to comply with all applicable local, state, and federal environmental and transportation laws, regulations and ordinances.

The intent of this chapter is to make clear what activities the contractor is responsible for performing, and to alert the contractor to potentially hazardous materials present in the central office and in the switch equipment.

12.2 The Qwest Supplier is responsible for:

12.2.1 Compliance with applicable local, state, and federal environmental and safety laws, regulations and ordinances.

12.2.2 Development and implementation of there own environmental and safety programs.

12.2.3 Coordinating and ensuring compatibility of their safety, health, and environmental programs with other employers including Qwest, when other employers are present at the workplace.

12.2.4 Prompt correction of all violations of applicable environmental and safety regulations within the scope of the independent contractor's work.

12.2.5 Indemnifying and holding Qwest harmless from any and all environmental, health and safety liabilities assessed against the independent contractor or Qwest, as a result of the contractor's conduct.

12.2.6 Being aware of and adhering to the Qwest Safety and Loss Prevention Program.

12.3 Equipment Bays And Mercury- Containing Equipment

During a Central Office equipment replacement, the old equipment will be broken down - to the *largest possible piece* that can be safely lifted and moved out of the Central Office for transportation to the Qwest Materials Reclamation Center (MRC).

12.3.1 Individual components are not to be broken down at the Central Office. A Qwest employee will call the SMC (Qwest-Ryder Shipment Management Center on 877-879-7447) to arrange for the old equipment to be transported to the MRC or a "pack-n-hold" warehouse. If a Qwest employee is not available to call the SMC, then the contractor may call them. However, they need to have these three pieces of information available before calling the SMC:

- RC code
- GEO-location code
- main and sub account numbers

12.3.2 Transportation to the MRC (or "pack-n-hold" warehouse) is coordinated by the SMC. A Qwest employee must sign the transportation document.

12.3.3 The MRC will handle purging of the individual electronic components and subsequent recycling and/or disposal. THERE IS TO BE NO PURGING (REMOVING) OF MERCURY COMPONENTS OR OTHER HAZARDOUS COMPONENTS AT THE CENTRAL OFFICE. *The only exception to this is glass tubes containing krypton or radium; these should be removed and placed in appropriate containers for transport to the MRC.*

12.3.4 It is the contractor's responsibility to ensure the that the removed switch equipment is properly loaded to ensure that no damage occurs during transport to the MRC. In addition, the equipment bays and frames must be adequately protected from weather and sunlight before the shipment is sent to the MRC.

- They must be loaded to ensure that no components of the bay or frame become separated from the bay/frame.
- There must be no damage to the switch equipment during transport to the MRC.

12.4 Batteries- Flooded Lead Acid

The Service Supplier performing the wreckout may be moving flooded lead acid batteries *within the same building* - from their operating location to a pallet or to a specific part of the building. The Service Supplier is required to follow all applicable environmental and safety regulations when moving these batteries.

Flooded lead-acid batteries that are ready to be shipped off-site (anywhere outside of the building) are moved and packaged *only* by certain contractors specifically hired to move them. If the batteries are going to the designated recycling facility or to another Qwest building, they are *only* to be moved by the contractor specifically hired for moving wet batteries. Currently, there is one main flooded battery transporter that should be used. This contractor’s employees are specifically trained in moving, packaging, labeling, and transporting flooded batteries. Call your Environmental Manager for information on this company. These batteries are *not* to be sent to the MRC.

12.5 PCB-containing Capacitors And Ballasts

Small capacitors and light ballasts manufactured through 1978 may contain PCB’s (polychlorinated biphenyls). Capacitors and ballasts should not be removed from the equipment bay.

12.6 Radioactive Tubes

These tubes are glass, usually painted black or purple, and range in size from 1 to 3 inches. See Table 12-1.

These are normally removed from the equipment bay to avoid any breakage during transport. *(These tubes are the only hazardous component that is allowed to be removed at the C.O. before transport.)* When removed, they should be properly packaged so that no damage occurs during transport. They are to be shipped to the MRC.

12.7 Fluorescent Light Tubes

If the Service Supplier removes any fluorescent light tubes, these should be properly packaged and sent to the MRC. The contractor is responsible for proper packaging to ensure that the tubes do not break during transport to the MRC. Alternately, these light tubes may be stored at the Central Office in a cardboard box of the proper size, and picked up directly by the Qwest transporter for shipment to one of our approved lamp recyclers. Check with the state Environmental Manager if you have any questions.

12.8 Asbestos Floor Tile

During C.O. equipment installs, the contractor may be drilling or handling floor tiles. The floor tiles in many buildings may contain asbestos. Since the regulations governing the removal of asbestos containing materials vary by state, contact should be made with the state Environmental Manager before disturbing any potential asbestos containing materials. The independent contractor must follow all applicable safety, health and environmental regulations governing asbestos containing materials.

The contractor is expected to properly bag and label asbestos-containing floor tile that he/she generates, and to contact the state Environmental Manager or the NTC (Qwest National Traffic Center) to arrange for disposal at the proper facility.

During an equipment wreckout, no asbestos-containing materials should be removed from equipment bays.

Other asbestos containing building materials that the contractor may encounter are:

- spray-on fireproofing
- transit walls, siding, ceilings
- insulating material on boilers, chillers, pipes, air plenums, ducts, piping, steam tunnels, mechanical rooms
- roofing materials
- telephone conduit

Information regarding friable asbestos-containing building materials can be found in the asbestos management plan posted at each facility.

12.9 Spills and Emergencies

In the event of spills or leaks of hazardous materials, the spill will be immediately contained and cleaned up in order to minimize impact. The contractor will follow all applicable laws, rules, and regulations regarding management of the spill. They will also follow their own company's existing safety and environmental procedures and practices to ensure the safety of their own personnel and others that may be present.

In the event of a spill, it should be reported to UNICALL at 1-800-654-2525. The state Environmental Managers can also be contacted through the UNICALL number.

12.10 Radiography/x-ray

12.10.1 Prior to starting work, the service supplier must visually survey the building and the proposed work area for personnel exposure, floor by floor, and notify all persons about the potential for exposure to radiation and to assure that the exposure area is clear of personnel for the duration of the work.

12.10.2 Prior to starting work, the service supplier must post warning signage on exterior doors or at safe perimeter distances from the exposure area to warn personnel.

12.10.3 During each radiographic operation the service supplier shall maintain continuous direct visual surveillance of the operation to protect against unauthorized entry into a high radiation area.

12.10.4 The service supplier shall make the above a part of the MOP and include the methodology to be employed.

12.10.5 The service supplier shall be aware of and adhere to the Code of Federal Regulations (CFR) covering the work operations and refer to them in the MOP.

Table 12-1: Quick Reference Guide for Hazardous Materials by Facility Type

	Analog ESS	Digital ESS	Power	Trans Equip.	Radio Sites	CEVs, Huts, Etc.	Customer Premise
MERCURY							
Relays	X		X	X	X	X	X
Mercury Vapor Tubes			X				
Ringing Machines			X				
Circuit Packs	X	X	X	X	X	X	X
PCBs							
Ballasts/ Transformer	X	X	X	X	X	X	X
RADIO-ACTIVE TUBES	X		X		X	X	X
ASBESTOS							
Resistors	X		X	X	X	X	X
Washers	X		X	X	X		
Floor Tiles	X	X	X	X	X		X
Sheet Heat Shield			X		X		
Black Fuse Panels			X		X		
BATTERIES							
Lead Acid/ Gel Cells			X		X	X	X
Other Types	X	X	X	X	X	X	X
LEAD							
Cable	X		X	X	X	X	X
Sleeves	X		X	X	X	X	X
Battery Straps			X		X	X	X
MISC. Solvents, Paints, CFCs, Etc.	X	X	X	X	X	X	X

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13. Documentation

Note: Only Qwest Forms shall be used.

13.1 General

The Service Supplier shall be responsible for the proper filling out of, and distribution of, all applicable forms and documents, including those specified in Chapter 12, "Hazardous Material Handling." The Qwest forms listed in this section shall be used, without any alteration, except where specifically noted in this and other sections.

13.2 Forms List

Form Number	Description
RG33-0043	Document and Material Disposition
RG37-0140	Summary of Continuity Test
RG37-0141	Summary of Test Other Than Routine
RG37-0142	Technical References
RG47-0001	Storage Battery Report
RG47-0002	Installation Revised / Completion Notice
RG47-0004	Job Information Memorandum
RG47-0005	Method of Procedure Page 1
RG47-0006	Method of Procedure page 2-n
RG47-0009	Report of Equipment Disconnected form Existing Plant
RG47-0010	Request for Disposition of U S WEST Communications
RG47-0013	Service Interruption / Degradation Report
RG47-0130*	Frame Upright Equipment Designation Label
RG47-0131*	Base Plate or Cover Equipment Designation Label
RG47-0132*	Cable Hole Open Label
RG47-0133*	Fire Stopped Cable Hole Label
RG47-0144*	Temporary Removal and Installation Tag
RG47-0145	Certified Local Exchange Carrier (CLEC) Report
RG47-0146	Supplier Assessment Report (SAR)
RG47-0151	Supplier Incident Notification (SIN)
RG47-0152	Test Record (Field Fabricated Coax Connections)
RG47-0154	Supplier Corrective Action Report
RG47-0155	Qwest Corrective Action Request
RG47-0156	Master Location List (Splice Connection)
RG47-0157	Test Record
RG47-0158	Job Start & Completion Checklist
RG47-0160	CLEC Provisioning Form
RG47-0161	Quality Checklist
RG47-0162	Method Of Procedure Switch Installation/Removal Modification
RG47-0163	Service Interruption Reporting

* Copy not included in Chapter 14 of this document.

Notes:

1. It is permissible to photocopy the forms in Chapter 14 for use.
2. These forms may be ordered through Forms Associates, Inc. 4417 South 89th Street, Omaha, NE 98127-0048, (402) 592-7888, Fax (402) 592-1961.

13.3 Packet Envelope

The Service Supplier shall be required to use the RG 51-0083 Job Packet Envelope for all installation or removal activities where documentation and job papers are to be turned over to Qwest. Central Office Operations (COO) shall designate a "Job Packet Storage Area" for each equipment facility. Job Packets shall be kept at the location of work, for a minimum of 180 days. Job Packets must be kept as turned over by the Service Supplier for a minimum of 180 days after job completion date. Larger offices may have one area per floor designated as the "Job Packet Storage Area". Job packet contents that have been stored longer than the final hold date, may be archived or shall be discarded by the COO representative, after essential documentation has been removed. It is recommended that the "Job Packet Storage Area" label be black lettering on a yellow background.

13.3.1 The Service Supplier shall complete all information required on the face of the envelope.

13.3.2 It is permissible for the Service Supplier to modify the back of the envelope to include their logo or any additional information. The front of the envelope shall not be modified.

13.3.3 The envelope shall be placed in a dedicated location in the office where the work was performed. The Local Network Operations personnel shall designate this area. The Job Packet shall not be left in or around the equipment or bays.

13.3.4 The Job Packet retention date shall be 180 days after the completion date. After this date, the COO shall file the documents contained in the Job Packet envelope.

13.4 Contents of Job Packet

The Job Packet shall contain, but is not necessarily limited to:

13.4.1 Design Work Package (DWP- Qwest Engineering)*

13.4.2 Detailed Engineering Specifications **

13.4.3 All Methods Of Procedure (MOPs) related to job RG 47-0005 and RG 47-0006*

13.4.4 Job Start/Completion Checklist (RG47-0158) and Completion Notice (RG47-0002). *

13.4.5 Job Log*

13.4.6 Test Records*: RG 47-0152, Test Record Field Fabricated Coax Connection, RG 47-0157 Test Record (COE) and Continuity Test Record.

13.4.7 Bills of Lading RG 33-0017

13.4.8 Job Information Memorandums RG 47-0004*

13.4.9 Drawings/Records ("installer marked" shall be identified)

13.4.10 Battery Charge Record RG 47-0001 (to be left as specified in Chapter 10).

13.4.11 Letters of Deviation (if issued).

13.4.12 Service Interruption report if problem occurred (RG47-0013).*

13.4.13 Installation Assignment and Capacity Fax Sheet.

* Required on every job.

** Required on job engineered by other than Qwest.

13.5 Job Log

A Job Log in the format of the suppliers choice shall be provided and will typically include, but not be limited to the following:

13.5.1 Deviations from the Specification or Standards approved by the Design Engineer.

13.5.2 Material shortages and impact on job progress.

13.5.3 Engineering changes.

13.5.4 Communications with Design or Detail Engineers, Quality, COO, and Service Assurance Personnel, etc.

13.5.5 NMA Confirmation Log Number.

13.5.6 Security or Safety Problems.

A copy of the Job Log shall be included in the Job Packet.

13.6 Job Completion or Extension Reporting RG 47-0002

The Service Supplier shall report the completion of a job on or before the day the job completes to Qwest on Form RG 47-0002, “Installation Revised/Completion Notice.”

13.6.1 The Service Supplier will contact the Installation Control Center (ICC) prior to actual job completion to schedule a completion walk through. The ICC will then schedule a Central Office Operations representative or Contract Liaison Manager (CLM) to do a walk through with the Service Supplier. During the walk though the supplier will complete the “Job Completion Checklist (RG47-0158)”. The job will not be considered complete for payment purposes, until after the walk through, and the checklist is complete and accepted by a Qwest representative. A copy of the “Job Completion Checklist (RG47-0158)” shall be given to the Service Supplier so that it can be filed in the Job Packet, and the original copy given to the Central Office Manager or designated representative that signs the Installation Completion Notice (RG47-0002). No payments to the Service Supplier will be made prior to the completion of this process. Not following this process will have serious consequences, which may result in the termination of the Service Supplier contract with Qwest. Service Suppliers shall then obtain Central Office Operations (COO) acceptance on RG47-0002 prior to sending a final Completion notice to the (ICC). Advanced or partial completion of the job shall also be reported on this form.

Mail: Qwest Installation Control Center (ICC)
6912 S. Quentin Street Room 201A
Englewood, Colorado 80112

FAX: (303) 792-6909

13.6.2 Service Supplier shall obtain "COO Representative" signature on RG47-0002 prior to distribution of copies. The COO Representative shall review the job and ensure that they have an accepted and complete "Job Completion Checklist (RG47-0158)". The COO Representative shall then mark and sign RG47-0002 as "Accepted" or "Not Accepted", with appropriate comments.

13.6.3 One copy of this form (RG47-0002) shall be forwarded to the Installation Control Center. The ICC will do all distribution required by Qwest.

Note: Engineer, Furnish, and Install (EF&I) Service Suppliers shall obtain the "Installation Revised / Completion Notice", RG47-0002 and "Job Completion Checklist" (RG47-0158). After they have been reviewed and accepted by the COO representative, the Services Supplier shall send approved RG47-0002 and RG47-0158 directly to the appropriate Design Engineer for processing.

13.7 Job Information Memorandum (JIM) RG 47-0004

A JIM, RG 47-0004 is a formal publication issued by the Service Supplier to explain differences between actual job conditions and the engineering information provided. It may be used to request authorization for additional effort, but is not authorization for that effort. Additional effort shall be authorized only through the issuance of an Amendment to the original Design Work Package (DWP), referencing the JIM.

13.7.1 A JIM must include a specific detailed description of each additional work effort associated with a central office installation job. The JIM must include the exact number of hours required to complete each specific work effort. The specific work effort and number of hours must be authorized in advance in writing by the ICC Contract Manager before the work may begin. In an emergency situation, the ICC Contract Manager may authorize the work to begin with verbal authorization to be followed up with written authorization within 24 hours. The same specific detailed description and number of hours must be agreed to verbally by both the ICC Contract Manager and Service supplier. The cost of the JIM will be determined by the number of hours times the contracted loaded hourly rate of the Service supplier.

13.7.2 If an identified problem requires issuing an Engineering Complaint, the installer shall issue a JIM stating the specifics and forward a copy to the ICC Contract Manager. The ICC Contract Manager will forward to Service Assurance Subject Matter Expert (SME) for investigation.

13.7.3 The original copy of a JIM shall be forwarded to the ICC Contract Manager who will be responsible for all Qwest distribution, and a copy of the JIM shall be left in the Job Packet.

13.8 Service Interruption/Degradation Report

When a Service Interruption/Degradation Report is required the Service Supplier shall notify the COO site manager and Design Engineer. Copy of the report shall be sent to the COO manager, Design Engineer, Job Packet, and Route Cause and Analysis Center, 700 West Mineral Ave., Room NEF29.3, Littleton, Colorado 80120 (FAX 303-707-9330). The service supplier shall get the Abnormal Network Condition Report (ANCR) number from the Qwest representative that was notified and include it in the report (refer also to Chapter 2 paragraph 2.9.8).

13.9 Request For Disposition of Qwest Communications Material RG47-0010

13.9.1 When the Services Supplier needs to return excess Common Systems material to the warehouse, they shall complete RG47-0010, "Request For Disposition," form. Service Supplier shall note the return quantity on the appropriate line of the form (material must be a complete unit). To arrange for pick-up the Service Supplier shall call the NAVL Agency for their geographical area. The following information shall be provided to the NAVL Agency.

BVAPP #
Address ID
FRC
RC

The Service Supplier shall attach a copy of the completed form RG 47-0010 to each box before releasing excess material to the NAVL Agency at the point of pick-up.

NAVL Agencies shall warehouse all excess materials separate from inbound BVAPP materials. Upon receipt of the excess material, the NAVL Agency shall forward a copy of all RG 47-0010 forms to the On-Site Qwest / NAVL representatives.

Qwest / NAVL On-site representatives will provide direction for disposition of excess material to the NAVL Pack-and Hold Agency.

13.9.2 Warehouse or Transportation Claims Procedures

13.9.2.1 All claims will be processed by the pack-and-hold service center (303) 707-3108 or 3111.

13.9.2.2 Claims documentation

Clearly write any damage or shortage on the delivery receipt. This includes damage such as "boxes crushed, punctured, wet, or damaged".

Contact the pack-and-hold service center as soon as possible.

13.9.2.3 Documentation required:

- Copy of the delivery receipt
- Copy of the packing slip
- Statement concerning the circumstances
- Other documentation may be required

13.9.2.4 Damages, overages, and shortage may require material return process. You will be directed by the pack-and-hold service center.

13.9.3 To file a claim for common system material, complete the "Report of Unsatisfactory Shipment" on the back of the packing slip. Call the NPC expediter to reorder material and arrange for material return.

13.9.4 To release material from a warehouse or get a job status, call the NPC expediter.

13.9.5 To order common systems material, Service Supplier shall coordinate with the Design Engineer. Services Suppliers shall complete RG47-0010, and send a copy to the Design Engineer, and the NPC.

13.9.6 Qwest Design Engineering (Switch, IOF, and OSP) personnel will utilize NAVL pack-and-hold sites for non-Engineer, Furnish and Installed in each of the fourteen (14) states. The purpose of this is to aggregate and warehouse Qwest installation materials prior to final shipping to the Qwest installation sites. NAVL pack-and-hold sites will have a contractual 24-hour material receipt and / or release requirement.

13.10 Test Records

13.10.1 Test records shall include:

- Type of test performed
- Test equipment used
- Errors found, corrective action taken
- Person performing test
- Date(s) of test

CONTENTS

RG33-0043

(2/96)

DMD NUMBER	DATE

Document and Material Disposition

CITY, STATE	OFFICE	ORDER NUMBER

SHIPPED TO:	SHIPPED VIA:

QUANTITY	DESCRIPTION	ITEM NUMBER	SPEC NUMBER

REMARKS:

FORM COMPLETED BY:	MATERIAL /DOCUMENT RECEIVED BY:

SUMMARY OF CONTINUITY TEST

Type of Equipment	Town and State	Office	Order Number	Job Completion Date

Name of Equipment or Circuit	Errors (Short, Open ,Reversal) Found and Fixed.

Remarks:	Tested By:

SUMMARY OF TESTS OTHER THAN ROUTINE

Type of Equipment	Town and State	Office	Order Number	Job Completion Date

Name of Equipment or Circuit	Test Performed

Remarks:	Tested by:

Technical References									
Table A				DSX Jack & Cross Connection Panel					
Identification #	Line #	Pos #	Bay #	Cross Connect Information					
				Equip	Bay	DSX Bay	DSX Panel	DSX Pos	Note/Table

STORAGE BATTERY ACCEPTANCE REPORT

Note:Use one set of forms per string. (Reference: Tec.Pub 77350 Chapter 10)

RG47-0001

rev 9/2000

JOB INFORMATION

BATTERIES AS RECEIVED OPEN CELL DATA

BATTERIES AT TURNOVER (ON FLOAT)
(Note: Must be on float at least 24hrs)

String:_____ Plant ID: _____		Cell #	SERIAL#	MFG.Date	Voltage	Corr. Specific Gravity	Crystals Y or N	Acid Level		Cell #	Voltage	Temp. Deg. F	Corr. Specific Gravity	Within +/-0.05 Avg. Voltage Y or N
PHONE COMPANY		1								1				
CENTRAL OFFICE		2								2				
CITY & STATE		3								3				
ADDRESS		4								4				
		5								5				
SUPPLIER		6								6				
SUPP.ORDER #		7								7				
BVAPP #		8								8				
JOB ID #		9								9				
ADDRID		10								10				
CILLI CODE		11								11				
INSTALLERS NAME		12								12				
BATTERY MFG.		13								13				
BATTERY MODEL		14								14				
CATALOG #		15								15				
DATE RECEIVED		16								16				
CHARGE BY DATE		17								17				
TORQUE Value		18								18				
PLANT Float Voltage		19								19				
NOMINAL Float Voltage		20								20				
TEMP. REF. CELL #		21								21				
TURNOVER DATE		22								22				
Turnover Avg. Voltage		23								23				
ACCEPTED BY		24								24				

FOOTNOTES

1. Nominal float voltage is plant float voltage divided by 24 cells.
2. Turnover Avg. Voltage is total of all cell voltages divided by 24 cells.
(Note that all cells must be within +/-0.05 of the average voltage)
3. Accepted By must be a Power Tech. Or COT/Supv. In charge.
4. Temp.Ref.Cell will be selected as Defined in 77350 Par. 10.2.10.
5. Batteries must be on float 48 Hrs. before connecting to plant.
6. Acid Level: check to see if the acid level is acceptable; if so mark C

STORAGE BATTERY CHARGE RECORD AND END OF CHARGE REPORT
(Note: use one set of forms per string and ref. 77350 Chapter 10)

Plant ID:_____
String:____

	{Cell Voltage readings for first 100 hrs. of charge}						{Additional Hours of Charge as Needed}						{End of Charge Readings}		
DAY	1	2	3	4	5	6	7	8	9	10	11		Volts	Corr. Gravity	Temp
DATE															
TIME															
CELL #															
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
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14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
Charger AMPS															

FOOTNOTES

1. Battery charger must be able to supply enough current and voltage to bring the string up to charge level. The charger shall be at least 1/100th of the battery amp hr. rating. Example 4000 amp hr. batteries would require a min. 40 amp charger.
2. Charge level is when the (First) cell reaches 2.38 V to 2.50 V, per mfg. requirements (Do not exceed 2.50 V on any cells) during this charge process). When this level is reached the 100 hours (minimum) of charge is started to bring all the cells up to this level.
3. End of charge readings are taken when: Three consecutive hourly readings show all cells within (+/-0.05 V) of string average charge level, while still on charge. Average charge level is the total of all cell readings divided by 24.

Installation / Revised Completion Notice

☐ **Confirmation of Installation Completion** ☐ **Advance**

Marked Drawings ☐ **Partial**

Date Sent to Design Engineer_____ ☐ **Final**

Network Monitoring and Analysis
NMA Confirmation Number _____

☐ **Request for Revised Completion** ☐ **Reschedule**

City, State, and Zip	Office/Office Location	
Design Engineer's Name	Authority, Estimate No.	Order No.
Scheduled Dates:	Start	Complete
Actual or Rescheduled Dates	Start	Complete
Equipment Involved; Exception Items		
Reason for Reschedule		
Service Supplier Company Name and Signature	Date	

For QWEST Use Only

This is: ☐ **Accepted** ☐ **Not Accepted**

If Not Accepted, Reasons.	
Operations Representative	Date
Design Engineer	Date

Job Information Memorandum

City and State	Office	Order No.	JIM No.

Service Supplier Company Name

Subject

Spec. Item Number

Confirming Telephone Call
From _____ To _____ Date _____

Drawing Change Req ☐ Yes ☐ No

Job Cost Affected ☐ Yes ☐ No

Additional Material Req ☐ Yes ☐ No

Spec Appendix Req ☐ Yes ☐ No

Problem Description

Suggested Remedy

Effect on Job Completion Date

Originator	Telephone No.

Address

City	State	Zip Code

ride the light
Qwest.

Method Of Procedure
COE Installation / Removal / Modification

Service Assurance Contact No.: 1-800-830-0722 General ☐

Service Assurance Power Contact No: 1-800-713-3666 Page 1 of Detail ☐

City, State	Office	Office Location	Phone
Start Date	Start Time	Completion Date	Completion Time

QWEST	Supplier / Vendor	System Type
BVAPP: Job ID:	Name: Job #:	Switch [ ] Type: _____ Toll [ ] Power [ ] Radio [ ] Fiber [ ] Real Estate [ ] Other [ ]

Detail below all steps necessary to explain the work to be performed. Steps should be numbered, and appear in the order in which they will occur, with the work operation responsibility indicated by checking the appropriate box(es). Work should not begin until this form has been reviewed and signed by U S WEST and Supplier representatives. This form may be duplicated if additional space is required. All information must comply with QWEST Technical Publication 77350.

Have you Considered?	Step	Description	USWC	Supplier
* Equipment added (list **all** added equipment and work locations).				
* Equipment removed.				
* Equipment compatibility.				
* Affected working circuits.				
* Restricted work hours.				
* Work Area Protection.				
* Special tools / materials.				
* Tool insulation.				
* Safety considerations.				
* Emergency equipment & procedures available.				
* Fuse alarm operation.				
* Location of spare fuses.				
* Records correction.				
* Hazardous materials. Handling and disposal.				
* Personnel experience.				
* Before and after tests.				
* Back-out procedures.				
* Technical references.				
* Required U S WEST support.				
* Emergency restoration plans.				
* Fuses and leads tagged.				
* Office records / drawings available.				
* Supplier drawings available.				
* MOP Referenced documents on site and available.				

The undersigned approve the procedures herein described as complete, whether a general or detail procedure. No changes shall be made without approval of both the QWEST Central Office Operations representative and the Installation Supplier Representative or Contract agent.

Name (Print & Signature)	Title	Contact Numbers	Date
Person Performing/In-charge of Work (Required)		**(24) Hour Emergency Contact Number:**	__/__/__
Real Estate or Service Supplier Representative (Required)		Phone:	__/__/__
Central Office Operations Manager or (designated representative) (Required)		Phone	__/__/__
Central Office Operations Support Technician		Phone	__/__/__

ride the light
Qwest.

Method Of Procedure
COE Installation / Removal / Modification

Service Assurance Contact No.: 1-800-830-0722 General ☐

Service Assurance Power Contact No: 1-800-713-3666 Page of Detail ☐

City, State	Office	Office Location	Phone
Start Date	Start Time	Completion Date	Completion Time

QWEST	Supplier / Vendor	System Type
BVAPP: Job ID:	Name: Job #:	Switch [ ] Type:_____ Toll [ ] Power [ ] Radio [ ] Fiber [ ] Real Estate [ ] Other [ ]

Step		USWC	Supplier

***** THIS FORM MAY NOT BE SUBMITTED WITHOUT RG47-0005 CONTAINING THE SIGNING AUTHORITY *****

RG47-0009
(1/01)

Report of Equipment Disconnected From Existing Plant

Date _____ **Sheet** _____ **Of** _____

Design Engineer 's Name	Address		☐ Partial ☐ Final
City, State, Zip	Office	USWC Spec.	Order

	Quantity	Code	Description	Name Of Circuit And Location From Which Disconnected	Date Disconnected
	A	B	C	D	E
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Service Supplier Representative

REQUEST FOR DISPOSITION
OF QWEST COMMUNICATIONS MATERIAL

RG47-0010
(1/01)

Ship To Location	Street Address		City	State	Zip
Design Engineer's Name	Job Site Address		City	State	Zip
Tel. No. Engineer	Office Name		Returned By:		Phone #
Address ID	FRC	Job ID	BVAPP #	RMA # (Provided By NPC For Vendor Claim)	
Name NPC Expediter			Date Notified NPC	Phone # of Expediter	

	Quantity	Part No.	Material Description (Include All Info)	Vendor	Reason For Return	# of Cartons	Keep	Junk
	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Material Returned To Vendor Name	**Address**	**City**	**State**	**Zip**
RMA #	**Ship Date**	**BOL # (Ship to vendor)**		

*Class column (D) - Use Letter Symbols As Follows:

A - Removed From Existing Plant
B - Furnished In Spec. - Not Installed
C - Furnished By USWC (New) - Not Installed
D - Excess Ordered In Spec. Or Req.
E - Furnished By USWC (Reused) - Not Installed
F - Defective - replaced
G - Wrong Material Ordered
H - Wrong Material Shipped - Correctly Ordered
J - Excess - More Shipped Than Ordered
K - Other Reasons (Explain On Reverse Side)
L - Vendor Claim (Must Notify NPC for Depot Orders)

To Be Completed By Warehouse

Name of Receiver	**BOL # (Return from Field)**	**Date Rec'd.**

ATTACH A COPY OF THIS FORM TO EACH BOX BEFORE RETURNING

Service Interruption / Service Degradation Report

To			**Location**
Office	**City**	**State**	**Order No.**
Time & Date Reported	**Time & Date Cleared**		
Type of Equipment	**Method of Procedure** ☐ **YES** ☐ **NO**		
Description of Service Interruption			
Corrective Action Taken			
Signature	Date		
Service Supplier Company Name		Telephone	

Competitive Local Exchange Carrier (CLEC) Report

This audit report covers requirements for a Certified Local Exchange Carriers (CLEC), physical location area(s). Defects noted on the list must be corrected prior to the CLEC taking possession. Please sign and return this report when items listed below have been corrected. Note any exceptions along with any authorized waiver from the responsible engineer. Assessed defects will hold up CLEC installation start, until all defects have been addressed.

Central Office:	
City:	
State:	
Job Number:	
CLEC:	
Requested Service Date:	

[ ] This facility is in conformance with QWEST standards, and has been approved for turn over to the CLEC. It is now permissible that the CLEC start installation. Upon completion of equipment installation in the physical collocated area, the CLEC or contracted agents shall send a completion notice RG47-0002 to the Installation Control Center ICC. All work done in the CLEC area shall conform to standards configurations, Federal and local requirements and standards outlined in QWEST Technical Publications. See TP 77350 Chapter 16.

[ ] This facility is not in compliance with QWEST standards, and is not approved for CLEC occupation. Defects need to be resolved before area can be turned over to the appropriate CLEC.

Non-Conformance Items: See Attachment(s).

All defects for this job have been corrected, or a letter of deviation from the QWEST Design Engineer has been attached.

State Interconnection Manager: _____

Please return this form or response to:

QWEST	
Name:	
Address:	
City, State Zip:	
FAX:	
E-mail:	

Supplier Assessment Report (SAR)

RG 47-0146
(1/01)

Dates:		**Locations:**		**Issue:**	
Audit:		**CLLI:**		**BVAPP:**	
Issue:		**City:**		**Supplier:**	
Job Complete:		**State:**		**SON:**	
Design Engineer:					
Supplier Contact:					
Office Manager:					

Note: **See *TP77369*, paragraph 3.4.1 on input data**

Description	Symbol	Actual Product Value
Electronic Switch Equipment in Inches:	ESE	
Transmission Equipment in Inches:	TEI	
Power Equipment Added in Inches:	PEI	
Empty Equipment Frames:	EEF	
Empty Frames Removed:	FRM	
Battery String (24) Cells and Stand:	BSS	
Partial Battery String (Input # Cells):	PBS	
Feet in Ironwork:	IWF	
COSMIC Modules:	COS	
Distribution Frame Verticals:	DFV	
DF Connecting Blocks:	CBL	
Grounding Connections:	GCA	
Solderless Wirewrap Connections:	SWC	
Bat/Bat Return Connections 350 kcmil & Larger:	BRN	
Fiber/Coax Connections:	FCC	
Defects Assessed :	DA	

77350 Issue "H" Chapter 01-16 Defects ***Sample Size: _____%***
CDOS = "Defect other than 77350", CDSA/CDSV = "Critical Defect (s) (Safety/Service"

C01:		**C02:**		**C03:**		**C04:**		**C05:**	
C06:		**C07:**		**C08:**		**C09:**		**C10:**	
C11:		**C12:**		**C13:**		**C14:**		**C15:**	
C16:		**CDOS:**		**CDSA:**		**CDSV:**			

Note: Return this feedback form to your Supplier Assessment Center (SAC). The SAC shall input information into the Supplier Assessment Database (SAP). The supplier shall e-mail the SAP data file to *QWEST Communications International Inc*. on the last working day of each month. The file shall be sent to: Quality Process Management Team (QPMT) at **rbieth@qwest.com** phone (602)-235-1390).

Remarks:

_____

_____

_____

Supplier Incident Notification (SIN)

RG47-0151
(1/01)

Date: _____ **Supplier:** _____ **State(s):** _____

Incident Rating (level): [ ]

The QWEST Quality Process Team has determined that the above primary supplier's assignment has area(s), which requires immediate improvement. This notification is to inform the primary supplier of a non-compliance situation based on a failure to feedback accurate information, or failure to comply with critical quality standards. The incident rating for this report may affect work assignment(s) in the state(s) listed above. Failure to implement effective corrective action within sixty (60) days, shall result in the escalation to the next incident level. The primary supplier's work assignments in the area(s) listed above shall be audited in the tightened level as described in TP 77369, by a QWEST Quality consultant(s), during the evaluation period.

Reason for Notification:
Supplier Comments/Corrective Action:

See Attachments: Yes [ ] , No [ ]

Note: See QWEST Technical Publication 77369 Chapter 3.1.3 " QWEST Validation Quality Process" for details.

Signature Levels:

QWEST Quality Consultant:	
QWEST Quality Manager:	
QWEST Director:	

Note: The Director's signature required only on levels 3, 4

Test Record (Field Fabricated Coax Connections)

City and State	Office	Order No.	Date: ___/___/___
Service Supplier Company Name			
Subject: Coax Connections	**Connector Equipment Locations (General)**		
Connector Manufacture:	**Connector Type**:	**Quantity of Connections**:	
Testing Procedure(s):	**Approved Tools**:		

Connector(s) Location	Connector Type	Defect	Corrective Action	Comment

Originator		Telephone No.
Address		

City	State	Zip Code

This form shall be used to comply with testing requirements of all field fabricated Coax connections, and shall be complete before receipt of frame expectancy compensation. Copy of this form shall be left in the job packet RG52-0083.

RG47-0154
(1/01)

Title:	Date:	Corrective Action Number:

SUPPLIER CORRECTIVE ACTION REPORT

Supplier Name:	Issue Date:	Complaint Type:	Return Date:
Supplier Contact:	**Department:**	**Phone:**	**Date:**

Description of Complaint:

Corrective Action:

QWEST Quality Process Manager Only **Comments:**	**Status of Complaint:** Reviewed: ( ) Date: Rejected: ( ) Date: Closed: ( ) Date:

Prepared by: **Department:** **Phone:** **Note:** email to: rbieth@qwest.com	**Date Signed:**

RG47-0155
(1/01)

Title:	Date: ___/___/___	CAR#

QWEST CORRECTIVE ACTION REQUEST

Supplier:	Location:	Region:
Complaint Type:	Issue Data: ___/___/___	Return Date: ___/___/___

Description of problem:

Cause:

CORRECTIVE ACTION

Prepared by: _____(Quality Process Management Team) Date: ___/___/___

CAR Closed out by: _____(Quality Process Management Team Date: ___/___/___

Master Location List (Splice Connections)

City and State	Office	Room	Page(s) ___ of ___

Reference Table (___)	Splice Location	Splice Type	Installed Date	Functionality
001				
002				
003				
004				
005				
006				
007				
008				
009				
010				
011				
012				
013				
014				
015				
016				
017				
018				
019				
020				
021				
022				
023				
024				
025				

Originator		Telephone No.
Address	Company	

City	State	Zip Code

Reference number shall consist of Table designation (AA-ZZ), and the reference number (001-025).

TEST RECORD (COE)

BVAPP	Estimate	CLLI	Date: ___/___/___
City and State	Office	Equipment Type	Complete Date: ___/___/___

Page ___ of ___	Test Type	Trouble Location	Trouble Type	Corrective Action/Status
001				
002				
003				
004				
005				
006				
007				
008				
009				
010				
011				
012				
013				
014				
015				
016				
017				
018				
019				
020				
021				
022				
023				
024				

Originator		Telephone No.
Address		Company

City	State	Zip Code

Reference number shall consist of Table designation (AA-ZZ), and the reference number (001-025).

Job Start & Completion Checklist

Central Office Name	Central Office CLLI	BAN#	BVAPP#	Date:
Design Engineer	**Installation Company:**		**Installation Representative (Print Name)**	
U S WEST Representative (Approver - Print Name)			**Installation Representative Contact #:**	
Job Description				

Job Type	Collocation [ ]	XDSL/Megabit [ ]	IOF [ ]	Switch [ ]	Power [ ]	Radio [ ]	Other [ ]

Summary of Installed Equipment:

JOB START: (*All references in TP 77350 Issue H*)	**X = Condition met 0 = Deviation**
Job Start Date met? Scheduled: ___/___/___ Actual: ___/___/___	
Review U S WEST Supplier Expectations: Access & Security Chapter 2.2, Safety Chapter 2.4, Combustibles Chapter 2.6. TP 77350 on site and available. Job status (Start, Progress, Complete) updated in Installation Order Tracking (IOT) weekly including jeopardy codes. Method of Procedure authorized and complete – copy sent to the Installation Control Center.	
Design Work Package (Including drawings) latest issue, "Available" and Feasible as engineered?	
Cable racks sufficient, correct type, routes including entrances to job associated equipment frames available and unimpeded?	
Assignments and capacity sufficient for: AC and DC Power systems, Grounding, Signal, Synchronization, (DSO, DS1, DS3 Termination's)?	
Review all assignments listed in the Narrative and Connection sections of the DWP and inform the Design Engineer that either the assignments are correct as stated or assist the Design Engineer in resolving all assignment conflicts.	
Material: Ordered, Billing of Material (BOM) shortages identified, ordered, and delivery dates acceptable for job completion schedule?	
Ordered material correct quantity and type: Cables, fuses, bay mounted units, end guards, bases, and bay extensions?	
Equipment lighting and AC outlets correctly engineered and provisioned as required?	
Real Estate Items Complete: Collocation cages, cable holes, and other associated building changes?	
Escalation's: Material & Engineering Issue– ICC, Quality: Quality Auditor for area.	
JOB COMPLETE:	
STRUCTURE	
Frame/Bay/Cabinet top supports: Chapter 3.12.2./ 3.12.3	

Frame/Bay/Cabinet ground (#6 AWG green): Chapter 11.3.1				
Ironwork / Cable Rack: Chapter 3.4 – 3.6				
Fire stopping penetrations (Floor/ Wall) Label (RG47-0133) Chapter 4				
Illumination adequate: Chapter 2.4.7 / Table 2-2				
AC conduits and outlets located per specification: (Typically front & rear of every 3rd equipment frame)				
Clean up Combustibles and excess material Chapter 2.3 & 13.9				
Review, Reconcile and Communicate all assignments to the U S WEST Design Engineer.				
TERMINATIONS / DESIGNATIONS	**DESIGNATED**	**TERMINATED**		
		EQUIPMENT END	**FAR END**	
Bay / Baseplate Label				
BDFB / PBD				
DS0 MDF Vertical / Horizontal				
DSX-1 (LED's powered and working?)				
DSX3				
Fiber				
Timing: (Wired and designated properly?)				
Alarms				
JOB PACKET (*All references in TP 77350 Issue H*) Chapter 13.4				
MOP General / MOP Detail : (*Detailed MOP required for and work done in a powered frame*)				
Design Work Package (DWP)				
Test Records : DS3/COAX (RG47-0152), Continuity /streaker card (RG47-0157)				
Alarm Records: NMA Confirmation Number Included?				
Job Log				
Drawings updated, changes marked in accordance with standard: Chapter 8.17				
Job Completion Notice, Signed and exceptions noted? Chapter 13.4				
Service Degradation Report or JIM's (Chapter 13.7 / 13.8)				
JOB COMMENTS:				
ICN EXCEPTIONS:				
ITEMS TURNED OVER TO COT / CO MGR. (FUSES, TEST EQUIPMENT, CARDS ETC.).				

Total job has been verified and accepted as complete.	**Approver's Signature:**	**Approval Date:**

When complete, file in "Job Packet" (RG51-0083), and ensure Completion Notice – RG 47-0002 is complete and signed. Collect any temporary ID cards or keys that are property of your Central Office.

CLEC POWER ASSIGNMENTS

Office:	
BVAPP #:	
CLEC Company:	
CLEC Location ID:	

CLEC COMPANIES LOAD A

FROM-USWC				TO- CLEC	
BDFB/PBD Location	**Buss/ Load**	**Fuse/Brkr Position**	**Fuse/Brkr Amps**	**Relay Rack Location**	**Cable Designation**

CLEC COMPANIES LOAD B

FROM-USWC				TO- CLEC	
BDFB/PBD Location	**Buss/ Load**	**Fuse Position**	**Amps**	**Relay Rack Location**	**Cable Designation**

Contacts: Company and/or Name (24 Hour)		Telephone #
Installation Supplier:		
QWEST Operations:		
Fuses turned over to:		

CLEC SYNC ASSIGNMENTS

Office:	
BVAPP #:	
CLEC Company & Contact:	
CLEC Location ID:	

CLEC COMPANIES PRIMARY

FROM-USWC				TO- CLEC	
Relay Rack Location	Shelf	Slot Position	Port	Relay Rack Location	Cable Designation

CLEC COMPANIES SECONDARY

FROM-USWC				TO- CLEC	
Relay Rack Location	Shelf	Slot Position	Port	Relay Rack Location	Cable Designation

Contacts: Company and/or Name (24 Hour)		Telephone #
Installation Supplier:		
QWEST Operations:		
For Sync Leads: Termination/Unplugged:		

DS0 Circuits	
Office:	
BVAPP #:	
CLEC Company & Contact:	
CLEC Location ID:	

Cable Designation	DS0 Vertical Location MDF / ICDF	Pair Count	Comments
CLEC Relay Rack Location:			

DS1 Circuits

Office:	
BVAPP #:	
CLEC Company & Contact:	
CLEC Location ID:	

Cable Designation	Circuits	RR	Panel	Jacks

CLEC Relay Rack Location:

DS3 Circuits

Office:	
BVAPP #:	
CLEC Company & Contact:	
CLEC Location ID:	

Cable Designation	Circuits	RR	Panel	Jacks

CLEC Relay Rack Location:

CABLES FROM U S WEST FIBER BAY TO CLEC EQUIPMENT

Office:	
BVAPP #:	
CLEC Company & Contact:	
CLEC Location ID:	

Cable Designation	Circuits	FDF RR	Panel	Jacks

CLEC Relay Rack Location:

Qwest

ITEM TO CHECK	CHECKED BY (INITIAL)	CORRECT? Y/N	DEFECTS NOTED	REMARKS
BAY				
1. Top Support - center bay, single support - end of aisle or stand alone, 2 top supports				
2. Cable tied to bay correctly?				
3. All cable ties flush cut?				
4. Shelf labeling correct?				
5. Frame upright and/or baseplate labels?				
6. RR designation correct?				
7. Anchors torqued?				
8. Molding attached?				
9. End shield guards (if applicable)				
EQUIPMENT				
1. Location/Alignment correct?				
2. Cable Lacing secure?				
3. AC outlets per standard?				
4. Lighting in place?				
5. Bolts, Nuts, Screws tightened				
6. Correct Amount of Supports				
7. Power Connections				
8. Guardrails/Covers				
9. Grounding				
10. Other				

IRON

1. Stantion/Support correct?
2. Cut Flush and Filed Smooth
- cut ends painted?
3. Bolts secured?
5. Alignment correct?
6. Finish Clip/Cap in place?
7. Splices/Clamp correct?
8. Other

DESIGNATION/LABELING

1. End of Aisle labeled?
2. RR/Shelf labeled
3. Fuse Book recorded?
4. MDF and blocks labeled?
5. Cables tagged?
6. Cosmic frame labeled?
7. Cable Rack (power & fiber) labeled?
8. Cable Hole Covers & Closures Labeled?
9. Power/Ground (145C tags) labeled?
10. IFB Feed Terminal Exist?
11. Other

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CABLING

1. Routing/Segregation correct?
2. Protection per standard?
3. Supported and Secured correctly?
4. Bending Radius correct?
5. Other

WIRING

1. Type & Gauge correct?
2. Routing correct?
3. Protection of Wire?
4. Spliced to Standard?
5. Connections
   - wire wraps correct?
   - soldered correct?
   - slotted beam correct?
   - screw type correct?
6. Securing
   - nylon cable ties flush?
   - cable lacing secure?
7. Other

BDFB OR POWER BOARD

1. Fuse Location correct
2. Fuses size correct
3. Ground return tag in place?
4. Has no-ox been applied on connections and fuses?
5. H-taps covered and taped?
6. Other

MISC FUSE PANEL

1. Fuse Indicator
2. Connections
3. Verify Stud Stiffeners (if required)
4. Other

CABLE HOLES/FIRESTOPPING

1. Closure sealed properly?
2. Tagged and Signed?

MISC ENVIRONMENT

1. Trash removal completed?
2. Bill of Lading filled?
3. Hazardous Material disposal arranged?
4. Cable Reels tagged?
5. Work area protection
6. Verify Card Reader
7. Other

DOCUMENTATION

1. Marked Prints
- copy at Site
- copy sent to engineer
2. MOP's
3. JIM's

4. Continuity test form
5. All other test records
6. Material Disposition Form
7. Job log
8. Job Completion Checklist
9. ICN
10. Quality Checklist

COLLOCATION ONLY

1. CLEC Area
- floor taped (if cageless)?
- cage built?
- cage grounded?
- bays labeled?

2. CLEC Provisioning Forms?
3. Material Disposition Forms?
4. Cable Slack to required lengths?
5. CLEC CLLI code on cables and equipment?
6. Cables secured to rack or fence?
7. Lockout tagout on power source?
8. IFB Feed Terminal/NID exist?
9. Fiber jumpers placed for shared fiber entrance?
10. Bay Mounted Line Sharing Splitter Cards SEATED?

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THIS SECTION TO BE FILLED OUT BY STATE INTERCONNECT MANAGER (SICM) ONLY

CLEC FINAL HANDOFF

1. Verify final payment
2. Schedule handoff (SICM, ATR, RE, COM, & CLEC)
3. Review access policies
4. Verify card reader
5. Designate CLEC access location
6. Reinforce cell phone policy
7. Reinforce 77350 standards
   - MOP requirement
   - identify staging area/masonite policy
   - grounding requirements
8. Verify CLEC sign on cage
9. Provide keys/obtain receipt
10. Provide COM phone & pager
11. Provide emergency & maintenance phone numbers
12. Provide tech pub url location
13. Provide CLEC Provisioning Forms
    - provide all detailed data necessary
    - label cable ends
14. Obtain CLEC acceptance/completion form
15. Provide contact information for installation of AC outlets for Cageless Collocation

Method Of Procedure for Switch Only
COE Installation / Removal / Modification

RG 47-0162
(05-01)

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

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General ☐
Detail ☒

City, State ,	Office	Office Location (CLLI Code)	Phone
Start Date	Start Time	Completion Date	Completion Time

QWEST Order Number	Supplier Order Number	System Type

Detail below all steps necessary to explain the work to be performed. Steps should be numbered, and appear in the order in which they will occur, with the work operation responsibility indicated by checking the appropriate box(es). Work should not begin until this form has been reviewed and signed by QWEST and Supplier representatives. This form may be duplicated if additional space is required. All information must comply with QWEST Technical Publication 77350.

Have you Considered?

• Equipment Added	• Emergency equipment & procedures available	• Required Telco support
• Equipment Removed	• Fuse alarm operation	• Emergency restoration plans
• Equipment Compatibility	• Location of spare fuses	• Fuses and leads tagged
• Affected Working Circuits	• Records correction	• Office records / drawings available
• Restricted work hours	• Hazardous materials handling and disposal	• Supplier drawings available
• Work area protection	• Personnel experience	• MOP referenced documents on site and available
• Special tools / materials	• Before and after tests	
• Tool insulation	• Back out procedures	
• Safety consideration	• Technical reference	

RESPONSIBILITY				DESCRIPTION OF WORK OPERATION	STEPS COMPLETED		
						INITIALS	
STEP #	SUPL	QWEST	SSP *		DATE & TIME	SUPL	QWEST

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

RESPONSIBILITY				DESCRIPTION OF WORK OPERATION	STEPS COMPLETED		
						INITIALS	
STEP #	SUPL	QWEST	SSP *		DT A&I TE	SUPL	QWEST

*** (SSP) Safe Stop Point**

The undersigned approved the procedures herein described as complete. No changes shall be made without approval of both the QWEST and Installation Supplier Representatives.

Service Supplier Representative	Title	Phone	Date
Service Supplier Personnel Performing work	Title	Phone	Date
QWEST Representative	Title	Phone	Date
QWEST LNO Technician	Title	Phone	Date

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

	Documentation to be used on Job	QWEST	Regular
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

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DETAILED METHOD OF PROCEDURE - CHECK LIST OF PERTINENT ITEMS

Place a check in the boxes as each of the following items are discussed and agreed upon:

☐ 1. Identify the equipment to be installed, modified, or removed (Copy of TEO / Spec, etc.).

☐ 2. Compatibility of the proposed equipment with existing equipment.

☐ 3. Identify the working telecommunications equipment that may be affected.
Is a detailed MOP required for (Complete Step-by-Step procedures, Page 1) DATE

Transition of working circuits per page 4, item 9	YES ☐	NO ☐	_____
Proximity to working equipment	YES ☐	NO ☐	_____
Modifications to a working system	YES ☐	NO ☐	_____
Additions to a working system	YES ☐	NO ☐	_____

☐ 4. When working equipment will be removed from out of service.
Is a detailed MOP required for: (Complete Step-by-Step procedures, Page 1) DATE

Removal of working equipment/circuits per page 4, item 9	YES ☐	NO ☐	_____

☐ 5. Proximity of power plants distributing systems and location of office power down procedures.

☐ 6. Where spare fuses are located.

☐ 7. List the steps requiring the presence of a QWEST representative

☐ 8. Alarms to be disconnected and schedule of disconnect. DATE

Establish a power/switch alarm transition plan	YES ☐	NO ☐	_____
Daily visual inspection of power/switch plant alarms	YES ☐	NO ☐	_____
Joint power/switch alarm integrity tests	YES ☐	NO ☐	_____

☐ 9. Records and Drawings to be corrected.

☐ 10. Protection of floors, walls, etc.

☐ 11. Storage of tools and materials.

☐ 12. Safety precautions.

☐ 13. Service restoration procedure and responsibilities in the event of service impairment.

☐ 14. Identify the locations of essential and government circuits such as 911/FAA ckts.

☐ 15. Normal work shift. Time to be stipulated: Start of shift _____ End of shift _____
Maintenance Window Waiver: YES ☐ NO ☐ If yes, requires Qwest Technical Support Authorization.

☐ 15a. A green ANCR will be issued by QWEST/Vendor representatives: YES ☐ NO ☐

☐ 16. Disposition of removed equipment. Does equipment need to be RGM to QWEST? YES ☐ NO ☐

☐ 17. List of office and emergency contact numbers for Vendor and QWEST representatives.
(This list must be posted in the office as well as attached to the MOP)

☐ 18. Action to be taken in the event that unusual conditions occur. If service affecting call NROC and follow your Service Interruption process.

☐ 19. Is a planned Outage Report required? (QWEST representative responsibility) Green ANCR

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

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DETAILED METHOD OF PROCEDURE - CHECK LIST OF PERTINENT ITEMS CONT'D

☐ 20. Approvals required for additions or changes to an approved MOP.

☐ 21. Verify FX line is working properly before start of maintenance work.

☐ 22. Is there sufficient storage space available at the site? YES ☐ NO ☐
If YES, show location, if NO, indicate solution: _____

☐ 23. Is there a dedicated unpacking room at this site? YES ☐ NO ☐
If YES, show location, if NO, indicate solution: _____
NOTE: Room should not contain recirculating Air Return Vents. If so, contact Customer
Customer Response: _____

☐ 24. Verify ROP, MCC and TLWS are on and in working condition prior to start of installation activity.

☐ 25. Notify QWEST NROC before start of shift.

☐ 26. Verify that no alarm conditions are present before beginning work.

☐ 27. Call NROC with End-of-Shift report.

☐ 29. Is building ready for installation? ☐ Yes ☐ No
If no contact, C.O. Manager and Building Engineer (CP).

☐ 30. Work assessment walk-through _____ _____
Completed by Date

SUPPLEMENTAL CHECKLIST

The following checklist is to be reviewed before the start of each shift and the In-charge or Lead Installer shall date and initial as appropriate.

#	ITEM	Date and Initial	Date and Initial	Date and Initial	Date and Initial	Date and Initial
1	Walk through performed by installer prior to each tour.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
2	General mop written/approved.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
3	Detailed mop written/approved.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
4	Emergency contact list available to all installers.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
5	Alarms verified for all associated equipment.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
6	Protective material kit on job.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
7	Is work area insulated with proper material?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
8	Sharp edges covered in work area.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
9	Cable ends covered with tape or tubing.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
10	Fuses properly identified and sized.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
11	Have cables been traced.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
12	Cables are metered and tagged.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
13	Are temporary cables properly secured and supported.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
14	Are tools properly insulated?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
15	Are guards in place on tools?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
16	Is personal protective equipment available & being used?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
17	TP 77350 procedures being followed.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
18	Are customer standards understood and being followed?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
19	Approved battery spill kit on site.	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

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ASK YOURSELF QUESTIONS

#	ITEM	Date and Initial	Date and Initial	Date and Initial	Date and Initial	Date and Initial
1	Do I know why I am doing this work?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
2	Have I identified and notified everybody (customers and internal groups) who will be directly affected by this work?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
3	Can I prevent or control service interruptions?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
4	Is this the right time to do this work?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
5	Am I trained and qualified to do this work?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
6	Are the work orders, MOPs and supporting documentation current and error free?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
7	Do I have everything I need to quickly restore service if something goes wrong?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
8	Have I walked through the procedures?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA
9	Using the right tools to perform this work?	Y N NA	Y N NA	Y N NA	Y N NA	Y N NA

- **IF YOU ANSWERED "NO" TO ANY OF THE ABOVE -- CALL YOUR SUPERVISOR PRIOR TO JOB START**

Duplicate test records will be mailed to:
Qwest Technical Support switching.
9700 Schmidt Lk. Rd., Room 290, Plymouth, MN, 55442

The original MOP will be signed locally by the Qwest C.O. Manager or designated personnel.
The MOP must be verified by Qwest Technical Support switching for completeness before the C.O. can sign the MOP.

Contact list for Qwest:		**Contact list for Vendor:**	
C.O. Manager:		Installation Director:	
Office Technician:		Installation OAM:	
C.O. Director:		Installation Supervisor:	
Tech support:			
Tech support:			
Tech Support Mgr.:			
Tech Support Director:			
Project Manager:			
Project Director:			

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

END OF SHIFT REPORT

(FAX & POST AT MCC)

DAY:_____DATE:_____

OFFICE: _____

VENDOR ORDER NO: _____
QWEST ANCR NO: _____

WORKED ON: _____
_____
_____

ITEMS COMPLETED: _____
_____
_____

ITEMS IN TROUBLE: _____
_____
_____

ITEMS IN PROGRESS: _
_____
_____

PLANS FOR TOMORROW: _____
_____
_____

TOMORROW WE WILL BE HERE: YES___NO___
NO, I WILL BE AT:_____

INSTALLER NAME:_____
MY __PAGER OR __CONTACT NUMBER IS:_____

COVERAGE PERSON:_____On-Site___
VENDOR SUPV NAME:_____
VENDOR SUPV FAX:_____

Please FAX or call if no FAX machine:
Qwest NROC (WA, OR, MN, SD, ND, NE, IA) 1-800-341-8188
Qwest NROC (NM, AZ, CO, ID, MT, WY, UT) 1-800-830-0722

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

Job Start & Completion Checklist

Central Office Name	Central Office CLLI	BAN#	BVAPP#	Date:
Design Engineer	Installation Company:		Installation Representative (Print Name)	
QWEST Representative (Approver - Print Name)			Installation Representative Contact #:	
Job Description:				

Job Type	**Collocation** ☐	**XDSL/Megabit** ☐	**IOF** ☐	**Switch** ☐	**Power** ☐	**Radio** ☐	**Other** ☐

Summary of Installed Equipment:

JOB START: **(*All references in TP 77350 Issue H*)**	**X = Condition met** **0 = Deviation**
Job Start Date met? Scheduled: ___/___/___ Actual: ___/___/___	
Review QWEST Supplier Expectations: Access & Security Chapter 2.2, Safety Chapter 2.4, Combustibles Chapter 2.6. TP 77350 on site and available. Job status (Start, Progress, Complete) updated in Installation Order Tracking (IOT) weekly including jeopardy codes. Method of Procedure authorized and complete – copy sent to the Installation Control Center.	
Design Work Package (Including drawings) latest issue, "Available" and Feasible as engineered?	
Cable racks sufficient, correct type, routes including entrances to job associated equipment frames available and unimpeded?	
Assignments and capacity sufficient for: AC and DC Power systems, Grounding, Signal, Synchronization, (DSO, DS1, DS3 Termination's)?	
Review all assignments listed in the Narrative and Connection sections of the DWP and inform the Design Engineer that either the assignments are correct as stated or assist the Design Engineer in resolving all assignment conflicts.	
Material: Ordered, Billing of Material (BOM) shortages identified, ordered, and delivery dates acceptable for job completion schedule?	
Ordered material correct quantity and type: Cables, fuses, bay mounted units, end guards, bases, and bay extensions?	
Equipment lighting and AC outlets correctly engineered and provisioned as required?	
Real Estate Items Complete: Collocation cages, cable holes, and other associated building changes?	
Escalation's: Material & Engineering Issue– ICC, Quality: Quality Auditor for area.	

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

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JOB COMPLETE:				**X = Condition met 0 = Deviation**
STRUCTURE				
Frame/Bay/Cabinet top supports: Chapter 3.12.2./ 3.12.3				
Frame/Bay/Cabinet ground (#6 AWG green): Chapter 11.3.1				
Ironwork / Cable Rack: Chapter 3.4 – 3.6				
Fire stopping penetrations (Floor/ Wall) Label (RG47-0133) Chapter 4				
Illumination adequate: Chapter 2.4.7 / Table 2-2				
AC conduits and outlets located per specification: (Typically front & rear of every 3rd equipment frame)				
Clean up Combustibles and excess material Chapter 2.3 & 13.9				
Review, Reconcile and Communicate all assignments to the QWEST Design Engineer.				
TERMINATIONS / DESIGNATIONS	**DESIGNATED**	**TERMINATED**		
		EQUIPMENT END	**FAR END**	
Bay / Baseplate Label				
BDFB / PBD				
DS0 MDF Vertical / Horizontal				
DSX-1 (LED's powered and working?)				
DSX3				
Fiber				
Timing: (Wired and designated properly?)				
Alarms				
JOB PACKET (*All references in TP 77350 Issue H*) Chapter 13.4				
MOP General / MOP Detail : (*Detailed MOP required for and work done in a powered frame*)				
Design Work Package (DWP)				
Test Records : DS3/COAX (RG47-0152), Continuity /streaker card (RG47-0157)				
Alarm Records: NMA Confirmation Number Included?				
Job Log				
Drawings updated, changes marked in accordance with standard: Chapter 8.17				
Job Completion Notice, Signed and exceptions noted? Chapter 13.4				
Service Degradation Report or JIM's (Chapter 13.7 / 13.8)				

JOB COMMENTS:
ICN EXCEPTIONS:
ITEMS TURNED OVER TO COT / CO MGR. (FUSES, TEST EQUIPMENT, CARDS ETC.).

Service Assurance Contact No:
1-800-830-0722 Littleton NROC
1-800-341-8188 Plymouth NROC

Total job has been verified and accepted as complete.	**Approver's Signature:**	**Approval Date:**

When complete, file in "Job Packet" (RG51-0083), and ensure Completion Notice – RG 47-0002 is complete and signed. Collect any temporary ID cards or keys that are property of your Central Office.

SERVICE INTERRUPTION REPORTING

This document is to be posted next to the MOP.

If there is not a COO manager or Qwest representative on site (after MOP has been approved), then call the following 800 numbers identified in the procedures below prior to start of job. When you call, please provide your company's name and the type of work you will be doing. If there is a Qwest representative on site, notify them to make the appropriate contacts if there is a service-interrupting event. **Review the "Question Your Work Checklist" prior to beginning any work (Page 2).**

SWITCH OR POWER EQUIPMENT

Before beginning work on switch/power equipment and if you suspect you've caused a service interruption for the states of AZ, CO, ID, MT, NM, UT, WY please call: 800-830-0722, option 1.
Secondary options are:

Opt 1 - Power
Opt 2 - 5ESS
Opt 3 - 1AESS
Opt 4 - DMS100
Opt 5 - DMS10
Opt 6 - Ericcson

Before beginning work on switch/power equipment and if you suspect you've caused a service interruption for the states of IA, MN, NE, OR, ND, SD, WA please call: 800-341-8188, option 1.

TRANSPORT/FRAMES/SYNCHRONIZATION EQUIPMENT

Before beginning work on transport/frames/sync equipment and if you suspect you've caused a service interruption for any of the 14 states please call: 800-258-8144.

Opt 1 - AZ
Opt 2 - CO
Opt 3 - NM
Opt 4 - UT
Opt 5- ID/MT
Opt 6 - WY
Opt 9 - All Other States (IA, MN, NE, OR, ND, SD, WA)

BE PREPARED TO ANSWER THE FOLLOWING QUESTIONS:

What company do you represent?
Are you a subcontractor or employee?
What is out of service?
Why?
Can you restore it?
What is the ETR (estimated time of restoral?
What is the name of the CO Supervisor that approved the MOP?
Have you notified the Qwest Central Office Supervisor?

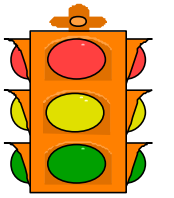
*If in doubt about causing a service interruption, call it in!

Question Your Work Checklist:

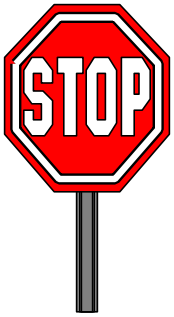
Before beginning any work, ask yourself each of these questions...

1. Do you have clear and complete job instructions?
2. Do you have the training, qualifications and resources required for this work?
3. Are the supporting documents for this work complete, error free and logical?
4. Has everyone who needs to know about the impact of this work been notified?
5. Is the right time of day chosen for this activity?
6. Is a backup or restoral plan in place?
7. Have you minimized all risks associated with the task?
8. Do you understand what constitutes successful completion of the job?

Yes to these questions - Continue



No to these questions - Stop and Resolve



Upon completion of the job...

1. Have you tested to ensure customer circuits are active and working correctly?
2. Has the appropriate paperwork been completed and submitted?

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15. Methods Of Procedure (MOPs)

Note: If for any reason, a Service Supplier or contract agent is found to be working at a Qwest location without an accurate approved, signed and posted MOP, the job may be stopped immediately by any Qwest representative.

Contract agents that have been authorized by Qwest real estate to do general facility maintenance on existing systems do not require an MOP, unless that maintenance posses a risk to the existing plant . When work operations share common equipment such as a power distribution panel or is located near or over existing plant, the contract agent should consult with the Central Office representative before proceeding. Exempt work operations would normally include (janitorial services, light bulb / ballast replacements, and servicing of existing environmental or safety systems).

Any expenses incurred by the Service Supplier, due to this stoppage, are the responsibility of that Service Supplier.

Service Supplier shall use the General MOP as a replacement for the discontinued "Installation Start Notification."

MOPs issued for the installation, modification, or removal of power equipment, batteries, power cabling, main grounding systems, and SPG systems shall be reviewed by the personnel responsible for the power at that location. Contact Service Assurance (800) 713-3666 or (800) 341-8188 for the name of the power representative for that location. The Qwest power representative will issue an Abnormal Network Condition Report (ANCR) to be used for tracking purposes in the event of a network service interruption (refer also to Chapter 13 paragraph 13.8). Contacts for other Switch and Common systems can be found at (800-830-0722).

The RG47-0162 (05-01) shall be used for all SPC system type work. All other type work shall use the RG47-0005 for both the General and the Detail MOP.

15.1 General Information

15.1.1 This section details the minimum requirements for the preparation of a Method Of Procedure (MOP) required for all work operations performed on equipment being added, removed or modified in any manner, in Qwest equipment facilities. All Service Suppliers performing any work in Qwest equipment facilities shall use the MOP form (RG47-0005) identified in this document. The MOP is a written agreement between a Service Supplier and Qwest which details either General or Detail procedures and operations which shall be followed in their entirety.

15.1.2 The Service Supplier shall be responsible for the writing of the MOP PRIOR TO THE START OF ANY INSTALLATION ACTIVITY. The Qwest Representative, a designated member of the Central Office Operations organization (COO), is required to review and concur in its content. That individual may or may not have specific work related activities detailed on the MOP. Responsibility for work functions and operations are indicated on the MOP through a check off system.

15.1.3 The Service Supplier Representative responsible for the preparation of the MOP shall be knowledgeable in the proper use and completion of the MOP form and in the case of DETAIL MOPs, shall be experienced in the specific work operations involved and familiar with Qwest Standards.

15.1.4 A properly written MOP is intended to prevent the occurrence of costly service interruptions and to assure that work is performed in a safe and secure manner. It is the responsibility of the supplier preparing the MOP to clearly and accurately represent all work to be performed and to detail all required steps, procedures and locations where work is to be performed. Every effort shall be made by the Service Supplier and Qwest Representative to work in a cooperative manner to assure that no degradation of equipment or service will occur.

15.1.5 All completed MOP forms shall be retained by the Service Supplier at the site where the work operation will take place. During installation process, a copy of the MOP shall be posted in a convenient location, preferably near the actual equipment being installed, modified, or removed. Completed MOP forms shall be included with job documentation which is required to be turned over to Central Office Operations upon completion of any order number.

15.1.6 It shall be understood by all parties that the content of individual MOPs shall be used to help affix responsibility for work operations, procedural errors, service outages and accidents which occur during the exercise of the detailed procedures. It is in the interest of all involved parties to assure that each and every MOP is complete and accurate.

15.1.7 Entries on MOP form RG 47-0005 and RG 47-0006 are to appear in their proper respective fields and be legible and understandable. The form is designed to be utilized in computer/word processor type systems. Where these systems are not employed, a Service Supplier may make entries in permanent ink. One exception is in the Work Description Details Section where hand written entries may be too small to provide clarity. In those instances, entries several lines high may be used for the hand written characters as long as they remain associated with their respective numbered steps.

15.1.8 Any overtime, night shift or change of shift bonus associated with MOP work activity must be approved by the Design Engineer responsible for the order number under which the work activity is being performed.

15.1.9 The MOP form may be used to combine both the General and Detail process where the job complexity is such that separate forms are not justified. However, this does not allow for the short cutting of any of the required information as detailed in this section. When the MOP is intended to serve as a combined MOP, both the General and Detail boxes shall be checked.

15.2 General Method of Procedures

15.2.1 A General MOP, written to install, remove or modify equipment, shall be prepared for each BVAPP order number and location. This also includes such activities as software loads, Product Change Notices (PCNs) and AC or DC power activities. MOP form RG 47-0005 provides a check off box to indicate that this form is being used as a General MOP.

15.2.2 The Work Description section of a General MOP defines the activity to be performed as well as the quantity, locations and equipment involved (i.e., all far end locations involved). Administrative or storage areas approved by the COO shall be documented showing type and amount of materials allowed and the duration of area use. Extended breaks (greater than 30 days) in use of these areas for any reason will require cleanup and abandonment of the area and a new authorized General MOP upon restart of the activity.

15.3 Detail Method of Procedures

15.3.1 A separate Detail MOP shall be required for all work to be performed on live equipment, whether presently in service or not. This includes any work on equipment which is in an area where potential hazards to equipment or personnel exist. A job order number may have a number of Detail MOPs, one or more for each major work task (i.e., power, switch, transmission, CNs, PCNs etc.). MOP form RG 47-0005 is provided with a check off box to indicate that this form is being used as a Detail MOP.

15.3.2 The work description section of a Detail MOP defines each step of the process and, in effect, is the step-by-step procedure under which the activity shall be performed. This includes all precautionary steps before, during and after each work effort. The MOP shall not be deviated from under any circumstances, unless approved and signed off by the Central Office Operations Representative responsible for the activity being performed. Success of the particular activity depends highly on the accuracy and completeness of this form.

15.3.3 Any document, referenced in the step-by-step procedure, shall be on site and readily available for use.

15.4 Method of Procedure Preparation

15.4.1 The MOP header portion shall be filled out in its entirety.

15.4.2 The header information provides a location to indicate individual page numbers as well as the total pages in the entire MOP. A statement below the header information includes the authorization to duplicate this blank form when additional entry space is required. An expansion sheet is also available if desired. In either case, multiple sheets of either type shall be consecutively numbered as appropriate, (i.e., 1 of 3, 2 of 3, 3 of 3).

15.4.3 The header also contains check off boxes to indicate whether this document is intended to be a General or a Detail MOP. This information is important as it will determine the degree of detail required in the Work Description Details.

15.5 Work Description Details

15.5.1 The purpose of this section is to define, in specific terms, either the generic equipment types and work activity covered under a General MOP or to provide specific step-by-step procedures to be followed for a Detail MOP. The header information on the form indicates the intended application of the MOP.

15.5.2 To assist the Service Supplier in completing the Work Description Details, the left side of MOP form RG 47-0005 provides a subject matter checklist which may be helpful in the planning phase. The list is not intended to be all inclusive and simply asks, “Have You Considered” the following items.

15.5.3 The Service Supplier shall collect all essential information available for the job and confer with the Qwest Representative regarding the proposed sequence of work operations. An initial MOP walk-through, if needed or requested, shall be conducted at the work site, attended by appropriate COO/Qwest representative, for the purpose of identifying potential hazards and special conditions which may effect work operations. Those items shall include such considerations as building and equipment conditions, customer service, safety issues, corrective measures and security procedures.

15.5.4 The work description portion of a Detail MOP shall be completed by the representative who will be responsible for the work operation. The Service Supplier representative shall be familiar with MOP procedures, Qwest Installation Standards as defined in various applicable publications and be qualified to perform the work operations detailed within the MOP, regardless of whether they will actually perform each step of the procedure themselves. An exception would be a manufacturer's Product Change Notice (PCN) where the process has been predetermined and has common application to a number of like order numbers. In those instances, the supplier shall be responsible for reviewing the unique building, safety and service considerations at each site.

15.5.5 An installer’s qualifications for involvement in the MOP writing process and work procedures shall be the responsibility of the Service Supplier. Each Supplier shall accept the responsibility for the work performed by their employees and their subcontractors.

15.5.6 The work description portion of a General MOP may be prepared by a representative of the Service Supplier provided that person is familiar with the generic equipment type and activity represented in the job detail specification.

15.5.7 All work detailed in the MOP shall conform to standards specified in Qwest Technical Publication 77350, “Telecommunications Equipment Engineering, Installation, and Removal Guidelines,” and other publications referenced in that document.

15.5.8 The work description in the MOP shall include all steps necessary to perform the work. Each step shall be numbered in the space provided and appear in the order in which they will occur in the work operation.

15.5.9 The Work Description Details portion of the MOP shall contain narrative references to all applicable steps. The check list entitled “Have You Considered” is intended purely to enhance the completeness of the narrative write-up and may not be use to indicate the subjects application to this MOP. Some examples would be if tools need to be insulated, the narrative should say “All required tools have been properly insulated.” If fuses are to be involved a statement such as “30A fuses and spares are available for BDFB 0101.01 and alarms have been tested” etc.

15.5.10 Examples of entries in the "Have you considered?" portion of the MOP are:

NOTE: This List is not All Inclusive!

- **Equipment Added** including all frames, bays, units and apparatus.
- **Equipment Removed** including all frames, bays, units and apparatus tagged or identified.
- **Equipment Compatibility** with existing units and circuits.
- **Affected Working Circuits** not listed as added or removed on this work specification.
- **Restricted Work Hours** to be listed in the MOP header information.
- **Work Area Protection** to adjacent equipment and building.
- **Special Tools/Materials** such as circuit pack pullers, hoists, ungrounded drills, HEPA vacuum, etc.
- **Tool Insulation** including taping and inspection of all insulated tools.
- **Safety Considerations** including goggles, floor clutter, rubber gloves and aprons, insulated power blankets, etc.
- **Emergency Equipment and Procedures Available** including first aid, hazardous material, fire, etc.
- **Procedures Available** which are manufacturer or product specific.
- **Fuse Alarm Operation** checked for added and affected circuits.
- **Location of Spare Fuses** have been checked for availability.
- **Records Correction** where existing information has been altered.
- **Hazardous Material Handling and Storage** policies, labeling, storage supplies and required paperwork available.
- **Personnel Experience** considered for both work effort and MOP responsibility.
- **Before and After Tests** to be performed on applicable circuits.
- **Backout Procedures** covered in the eventuality that hardware, software errors or time restrictions preclude service restoration by the designated COMPLETION TIME.
- **Referenced Documents** shall be on site and readily available for use.
- **Technical References** are available and understood.
- **Required Qwest Support** has been discussed and is available.
- **Emergency Restoration Plans** have been discussed and are in place for any eventuality.
- **Fuses and Leads Tagged** for identification purposes including any AC circuits under LOCKOUT condition.
- **Office Records/Drawings Available** on site when necessary.

- **Supplier Drawings Available** on site when necessary as well as installation instructions and manuals.
- **MOP Referenced Documents** on site and available for use.

15.5.11 For each numbered procedure or step listed, a check off box has been included to indicate whether the step is the responsibility of the Central Office Operations Technician providing coverage or the responsibility of the Service Supplier.

15.6 Method Of Procedure Write-Up Review

15.6.1 Following the preliminary MOP write-up, the Service Supplier Personnel who will be performing the work operations and the Central Office Operations Personnel who will be responsible for coverage, along with appropriate Qwest representatives, shall conduct a dry run of the detailed procedures. At this time, any shortcomings or omissions in the write-up shall be addressed.

15.6.2 Any necessary changes shall be incorporated into the MOP write-up and a final copy shall be prepared for approval and COO representative signature.

15.7 Approval/Signing Authorities

15.7.1 No work shall be performed on any equipment, whether involving additions, removals, modification or any other activity, without proper approval and authorization.

15.7.2 The signing authority for each MOP appears at the bottom of the RG 47-0005 form. This authorization extends to all sheets in each MOP regardless of the number of sheets employed. If the MOP extension form RG 47-0006 is utilized, that form has no signing authority and has the notation "THIS FORM MAY NOT BE SUBMITTED WITHOUT RG 47-0005 CONTAINING THE SIGNING AUTHORITY." The total number of sheets is indicated in the header information of the form. The Service Supplier and all signing parties are responsible for verification that their particular copy of the MOP is complete in all its pages. The MOP shall have a minimum of two signatures to be considered valid. First the Service Supplier employee or contract agent performing the work, and has been given that authority by the service supplier. Second the Qwest representative signature shall be the Central Office Operation manager responsible for that facility. He may delegate that authority to a Qwest Central Office technician or other authorized and qualified Qwest Employee.

15.7.3 On a General MOP, the Service Supplier Representative may be the person performing the actual work activity. This person may be a Service Supplier's supervisor or any duly appointed personnel in the suppliers analysis center. The Qwest Representative field shall be signed by the Central Office Operations Supervisor and/or any duly appointed COO Technician. All signing parties shall fill in their proper title, daytime / 24 Hour emergency phone number and date of signature in the appropriate field

15.7.4 On a Detail MOP, the Service Supplier Representatives [field] may be signed by the Service Supplier Supervisor and shall be signed by the Supplier Personnel performing the work. The Qwest Representative [field] may be signed by the COO Supervisor or, with the COO Supervisor's consent, a COO Technician. It is recommended that the COO Technician who will cover the office during the work activity be one of the signatures. All signing parties shall fill in their proper title, daytime phone number and date of signature in the appropriate [field].

15.7.5 After the MOP has been adapted and approved by the COO representative, no deviations from the procedures shall occur without approval from the COO representative.

15.8 Service Interruptions

15.8.1 All service interruptions which occur during the exercise of work operations shall be processed per the procedure outlined in Chapter 13, paragraph 8, "Service Interruption and Degradation Report."

15.8.2 Service must be restored as quickly as possible. The COO personnel and the Service Supplier personnel shall work cooperatively to ensure that actual outage time is kept to a minimum.

15.8.3 The **UNICALL** number **1-800-654-2525** and **Service Assurance** monitoring organization number **1-800-830-0722** shall be called immediately and informed of the outage and of the actual or expected term of the outage.

15.8.4 All particulars which lead to the service outage shall be documented on Qwest Service Interruption Form RG 47-0013 and presented to the Qwest Representative within 24 hours of the outage.

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Table

16. Competitive Local Exchange Carrier

16.1 General Requirements

Notes:

It shall be the responsibility of the Competitive Local Exchange Carrier (CLEC) or contracted agents to understand that it is required that all installation activities are done in such a manner not to jeopardize safety to persons or the service of the network. In addition all CLEC installations shall comply with Network Equipment Building System (NEBS) Level 1 safety standards. Qwest complies with all standards and requirements according to NEBS Level 1 and Qwest Technical Publications. Qwest shall not impose safety and engineering requirements on CLECs that are more stringent than the safety or engineering requirements Qwest imposes on its own equipment located on the premises. No work that could potentially affect the Qwest network shall be performed in any Qwest facility without a properly signed Method Of Procedure (MOP). This includes but is not limited to power changes to CLEC equipment. The MOP shall be posted in the area the work is being performed.

Competitive Local Exchange Carrier or Contract agents doing work within a Qwest facility, shall comply with all environmental, security, safety and health standards outlined in this and other Qwest standards. The CLEC shall comply with all national, state and local codes and requirements. The CLEC is responsible for training its employees or agents on these standards and will be accountable for any violations.

16.1.1 Work done to CLEC Cageless collocation enclosures shall comply with all standards outlined in this and other Qwest Technical Publications and Standard Configuration documents. CLEC equipment within the physical collocation enclosure shall comply with the workmanship requirements defined in this chapter.

16.1.2 The CLEC physical collocation enclosure(s) shall be provided by Qwest in accordance with the Qwest Standard Configuration. Cabling will be properly secured in the cable rack and at the breakoff point by Qwest and dropped into the enclosure from a height of 10 to 11 feet. The CLEC shall ensure that no cable drops over 3 feet without a support. The CLEC owner should identify all cabling that has connection points external to their enclosure.

16.1.3 Qwest reserves the right to review any installation in total or part for adherence to Qwest standards. Qwest may refuse to provide network and power connections and revoke the CLEC ‘s access and halt jobs in progress if Qwest requirements are not followed. Questions relating to Qwest requirements shall be directed through the State Interconnect Manager.

16.1.4 Fence chain link matting used for enclosure shall be the knuckle (smooth edge) type. Personnel safety requires that exposed cut ends not be used.

16.1.5 In accordance with NEC Article 240-8, CLEC fuse panels which are A and B fed from the nearest usable Qwest Power source (BDFB or PBD), shall only have one load panel per feeding fuse or breaker. CLEC feeders protected at 100 AMPs or greater shall be equipped with a means to monitor the load. Parallel fusing is prohibited.

16.1.6 A key to each CLEC enclosure shall be provided to the Qwest State Interconnection Manager by the CLEC on the date the CLEC takes possession of the completed cage. The key must be promptly replaced if the CLEC changes the locks. The key shall be used for emergency access to the CLEC enclosure, such as fire. It may also be used if work is required in the Qwest space above the cage.

16.1.7 All combustible materials used or generated by the CLEC shall be removed from the Qwest Central Office areas at job completion or stored in metal cabinets provided by the CLEC and kept within the CLEC physical collocation space. During work activities, combustible materials shall be kept to the minimum required to perform the work. Combustible materials no longer needed shall be removed from Qwest Central Office areas daily.

16.1.8 The CLEC shall top support all equipment and anchor it to the floor. Equipment contained in cages, rooms or other structural enclosures may be anchored either to CLEC or Qwest standards. Equipment located within the Qwest equipment area must be top supported and anchored to Qwest standards contained in this and other publications. In no case may an anchor penetrate the floor more than 2 1/2 inches.

16.1.9 CLEC equipment located within a cage, room or other structural enclosure exclusive to that CLEC, such as equipment in a virtual or cageless common collocation, shall be tested to meet a minimum of Network Equipment Building Standards (NEBS) level 1 requirements as specified in Telcordia documents SR-3580, GR-63-CORE and GR-1089-CORE. The equipment in these areas may be top-supported in accordance with the CLEC standards.

16.1.10 CLEC equipment not located within a cage, room or other structural enclosure exclusive to that CLEC shall be tested to meet all of NEBS level 1 requirements as well as the structural requirements of NEBS level 3 that relate to earthquake resistance as specified in Telcordia documents SR-3580, GR-63-CORE and GR-1089-CORE. Welded ferrous frameworks shall be used in all cases. The CLEC shall anchor and top-support all equipment in these areas in accordance with Qwest standards. CLEC equipment not meeting Qwest standards will be removed by the CLEC within 90 days of notification by Qwest. If the CLEC does not remove this equipment with the 90 day time period, it may be removed by Qwest at the expense of the CLEC.

16.1.11 The CLEC shall be responsible for placing convenience outlets in its frameworks for its own use, such as test sets. If permanent AC power is required for any CLEC equipment, the outlets and all associated cordage shall be completely located within the footprint of the bay. All required AC will be provided by Qwest to the vicinity of the CLEC equipment. The CLEC shall not access Qwest AC panels or run AC except to this access point. The use of outlets located in Qwest or other CLEC frameworks shall be prohibited without the express written permission of the other CLEC or Qwest.

16.2 Cable Holes, Penetrations, and Fire/Smoke Protection

16.2.1 Qwest shall open and close all cable holes as necessary for CLEC cabling. The CLEC shall not open or close cable holes.

16.3 Equipment Designations

16.3.1 The Caged collocation equipment enclosure or area shall be designated with a placard showing: Company Name, Floor, enclosure designation, 24-hour emergency contact. Typical designation would be “ABC, 01A – John Doe 303-707-XXXX”. RG47-00K1 shall be attached to

the gate or door of the enclosed Caged area. RG47-00K1 shall be completed to include all the appropriate following locations; Power location, Timing location, DSX-1 location, DSX-3 location and Fiber location. No signs shall be permitted on or within the enclosure area, that advertise the CLEC or any companies products or services. The CLEC shall keep its emergency phone number current. All Placards shall meet Qwest combustible policy. See section 2.11.

16.3.2 Equipment frames in a virtual or common cageless physical collocation shall be designated with a label or stencil. The label shall show the CLEC name, and 24-hour emergency contact number. The CLEC shall keep its emergency phone number current.

16.3.3 Cables that are passed off to a CLEC owner shall be labeled to show their far end location. CLEC owners shall transfer these designations to their equipment using tags or labels. Designation tags or labels shall be required on power feeders prior to being powered up. CLEC owner shall designate cables to show far end termination Frame/Bay/Cabinet, Shelf/Plate/unit, and fuse. An example of this could be (BDFB 101.01 Panel/Load A, Fuse A15).

16.3.4 The Cageless collocation equipment area (relay racks) shall be labeled as defined in chapter 8 of this publication.

16.3.5 AC Feeders shall be designated at the distribution panel with CLEC Company Name and the floor the cage is located on. At the CLEC cage the AC circuits shall be designated with far end location.

16.4 Local Exchange Carrier (CLEC) Grounding

16.4.1 The CLEC shall ground all equipment frames, bays and cabinets with a minimum #6 AWG grounding cable to the CO ground provided by Qwest. See Qwest Technical Publication 77355 for additional information and requirements.

Table 16-1: Grounding Conductor Size Requirements

Serving Single CLEC Enclosures		
Collocation Enclosure Size	**Distance from COGB**	**Conductor Size**
100 Sq Ft or less	Within 75’	1/0 AWG
100 Sq Ft to 499 Sq Ft	More than 75’	4/0 AWG
500 Sq Ft or more	any	750 kcmil
Serving Multiple CLEC Enclosures with a single feed		
Feeder size (from COGB)	**Route**	**Remarks**
750 kcmil	Perimeter	.01 ohm or less (COGB to CLGB)
Taps to enclosures must follow rules for Single CLEC Enclosures		

16.4.2 Enclosures using Chain Link fabric shall be bonded to the CLGB from two opposite corners. Each shall use a minimum #6 AWG stranded "green-wire" copper conductor and connected with a properly sized two-hole crimp-type copper lug which is properly sized for the connection point. All bonding connections shall be treated with an anti-corrosion compound. All conductors shall be permanently designated with the far end termination location.

16.4.2.1 Bonding continuity shall be maintained through all fence sections. Deliberate bonding is not required; however, fence hardware used for this purpose shall be tested for compliance. It shall be designated as the grounding path bonding point. Metallic doors or gates shall be bonded to the adjacent metallic wall or fence with a flexible-bonding conductor.

16.4.2.2 Deliberate bond points made through surface contact shall be designated "GRD" in 3/16 inch or 18-point font.

16.4.3 CLEC equipment requiring "Isolated Ground Plane" grounding must be physically separated from equipment using "Integrated Ground Plane" grounding. Qwest will not allow direct connection of CLEC "Isolated Ground Plane" feeders to its ground windows.

16.4.4 CLEC design of an "Isolated Ground Plane" for its equipment may be aided by information contained in TEC PUB 77355 Chapters 5 and 8. While Qwest does not make any recommendations regarding the design, this publication may assist the CLEC. The CLEC may set up a separate ground window following the general principles of Figures 8-6 through 8-9 in TEC PUB 77355, or use the return bar of its BDFB. Where the CLEC chooses to install its own ground window, the bar becomes a Collocator's Main Ground Bus (CMGB).

16.4.5 CLEC equipment using the integrated ground plane within six feet of an isolated ground plane should be foreign-object grounded back to the integrated side of the CLEC ground window. In addition, the CLEC should insure the isolated ground plane equipment is spaced at least six feet from any enclosure metal to prevent accidental human contact with both ground planes at the same time.

16.5 Co-Location Cancel, Expire, Decommission or Change of Responsibility

16.5.1 Refer to current policies and the Standard Configurations.

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17. Definitions

17.1 Acronyms

AA	Analytical Associate
AC	Alternating Current
ACEG	AC Equipment Ground
AMC	Architectures Models Configurations
AMP	Ampere
APCL	Approved Product Classification List
AWG	American Wire Gauge
BDFB	Battery Distribution Fuse Bay
BRI	Business Resources Incorporated
BVAPP	Billing Verification Authorization Payment Process
CAR	Corrective Action Report
CEC	Controlled Environment Cabinet
CEF	Cable Entrance Facility
CEV	Controlled Environment Vault
CFC	Chlorofloro Hydrocarbon
CFR	Code of Federal Regulations
CLEC	Competitive Local Exchange Carrier
CLGB	Collocated Local Ground Bar
CM	Contract Manager
CMGB	Collocator’s Main Ground Bus
CN	Change Notice
CO	Central Office
CO GRD	Central Office Ground
COE	Central Office Equipment
COEFM	Central Office Equipment Facility Management
COGB	Central Office Ground Bar
COO	Central Office Operations

CP	Capacity Provisioning
CSA	Canadian Standards Association
CQM	Corporate Quality Manager
DC	Direct Current
DCS	Digital Cross-Connection System
DF	Distributing Frame
DNA	Do Not Assign
DOT	Department Of Transportation
DSX	Digital System Cross Connect
DWP	Design Work Package
EMT	Electrical Metallic Tubing
ESD	Electrostatic Discharge
EF&I	Engineer, Furnish, and Install
EPA	Environmental Protection Agency
ESOT	Engineering Services and Order Tracking
ESS	Electronic Switching System (See SPCS)
FB	Fuse Bay
FDX	Fiber Distribution Cross Connect
FMT	Flexible Metallic Tubing
FOG	Foreign Object Ground(ing)
FRC	Field Recording Code
GRD	Ground
HEPA	High Efficiency Particulate Arrester
HVAC	Heating, Ventilation and Air Conditioning
ICC	Installation Control Center
JIM	Job Information Memorandum
kcmil	Thousand Circular Mills
LNO	Local Network Operations
MDF	Main Distributing Frame

MGB	Main Ground Bus
MOP	Method Of Procedure
MRC	Material Reclamation Center
MT	Miscellaneous Trunk
NAVL	North American Van Line (Trademark)
NEBS	Network Equipment Building Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NMA	Network Monitoring and Analysis
NPC	Network Procurement Center
NROC	Network Reliability Operations Center
NTC	Network Traffic Center
OPGP	Office Principle Ground Point
OPGPB	Office Principle Ground Point Bus
OSHA	Occupational Safety and Health Administration
OSP	Outside Plant
PDB	Power Distribution Board
PDF	Power Distribution Frame
PID	Part Identification
PPE	Personal Protective Equipment
PRBS	Pseudo Random Binary Sequence
RR	Relay Rack
SAE	Society of Automotive Engineers
SAR	Supplier Assessment Report
SIM	State Interconnection Manager
SIN	Supplier Incident Notification
TEIG	Telecommunications Equipment Installation Guidelines

PB	Power Board/Bay
PBD	Power Board/Bay Distribution
PCB	Polychlorinated Biphenyl's
PCN	Product Change Notice
PVC	Polyvinyl Chloride
RC	Recording Code
RCRA	Resource Conservation Recovery Act
SA	Service Assurance
SME	Subject Matter Expert
SPCS	Stored Program Control System
SPG	Single Point Ground
SPGB	Signal Point Ground Bus Bay
TEO	Telephone Equipment Order
UE	Universal Enclosure
UL	Underwriters Laboratory
V	Volt
VRLA	Valve Regulated Lead Acid Battery

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18. References

18.1 Qwest Technical Publications

77351	Qwest *Central Office Telecommunications Equipment Engineering Standards*, Module 1, Issue F, June 2001
77351	Qwest *Central Office Telecommunications Equipment Engineering Standards*, Module 2, Issue C, January 1993
77351	Qwest *Central Office Telecommunications Equipment Engineering Standards*, Module 3, Issue C, January 1993
77353	Qwest *Central Office Drawing Standards*, Issue C, September 1990
77354	*Guidelines For Product Change Notices*, Issue G, September 2001
77355	*Grounding Central Office and Remote Equipment Environments*, Issue D, September 2001
77360	Specification Standards for Antenna and Waveguide Installation, Issue E, September 2001
77361	*Common Language Equipment Classification and Equipment Codes*, Issue C, September 2001
77362	*Documentation Requirements for Suppliers*, Issue F, September 2001
77369	*Supplier Process Engineering, Installation Guidelines*, Issue D, June 2001
77385	*Power Equipment and Engineering Standards*, Issue F, January 2001

18.2 Telcordia Publication CURRENT ISSUE

GR-230-CORE	*General Requirements for Engineering Complaints*, Issue 2, December, 1997.

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