PNLE – Chapter 11

Review

- labeling – 6 inches from end
- permanent labels – easier to read & looks better
- backbone don't have as many twists, leaves room for split pairs
- surface mount raceways are pretty, used on walls
- rip cord in 25 pair there so that sheath is easier to open
- in 4 pair, it's strength
- 600 pairs are proper – groups or super binders
- punch down on 110 block, tip comes first (white, red, black, yellow, violet)
- connecting two 110 blocks, needed is punchdown tool, IDC ((4 for four pairs or (5 for 25 pairs)
- alot of sheath is gone mean crosstalk
- leaves pairs twisted all the way to end
- can't be untwisted more than half an inch
- when opening sheath, a wire is stripped bare, cut it off & start over
- on jacks, the wire length that can be untwisted, almost no untwists should be there
- when terminating fiber optic, 1 m of cable should be left of outlet box
- 3-5 m of service loops should be left in the CMS
- F-connectors used for video
- snap & seal used for high bandwidth
- 1 meter should be left for fiber optic
-

Ch. 9 - PNIE

* Review
- conductivity, corrosion resistance, strength, bending, stretching
+ stranded is flexible
- cancellation only works if signal goes down the correct wires
-

* * [illegible]
* Safety Codes
- workplace, public,
* Safety Organizations
- OSHA - protect workers, inspects, applys laws
* Electrical Safety
- 110 - 120V - USA
- 220 - 240V - Eur.
- be aware of electrician job
- tags on panel - contact person who signed it
- proper grounding - 8 foot spike
- bonding - connecting to a known ground
- ground - protects against high voltage, shorts, ESD, & lightning
- check for ground by a megger
- allow 6 feet between data & electrical cables
- ESD - static electricity
* Fire
- A - paper & trash
- B - liquid
- C - electrical
- D - metal
* Ladder Safety
- can go, at or - by 2 rungs
- if leaned against a building, 4-1 ratio is used
- used fiberglass ladder around electricity (or wood)
-

* Injury
- safety goggles
- earplugs
- hardhats
- need goggles & tips when [redacted] for using fiber optic
* * 4 - Copper Media
* Solid vs. Stranded
- stranded - easily moved, harder to work with to punchdown
- solid - stiffer, easier to punchdown
* Insulation
- Thermoplastic - PVC
- Fluoropolymers - Halar & Teflon
- Elastomers - rubber like
* Plenum
- plenum area - air ducts, anything with air circulation is plenum
- must use plenum cable
* Twisted Pair
- UTP, STP, S/TP
- S/TP - industrial
- STP - alot of RFI, only token ring uses STP
* Coax
- 75 ohms - TV Type F
- 50 ohms - 10Base5 MAU
* Categories
- Cat 3 - POTS
- Cat 5e - most used

* Pairs
- Pair 1 - blue
- 2 - orange
- 3 - green
- 4 - brown
* Color codes
- binders - usage 25 pairs
- tip - white, red, black, yellow, violet
- ring - blue, orange, green, brown, slate
- talkers - balance/unbalance - matching resistances
* *

Ch. 13 - Pmie

Cabling or Special Situations

* Terms
- VPN
- V.IP
- CDN - video content delivery networks
- SAN
- WLAN
-

Price - Ch. 12

Review

- vision - as-built
- during installation, cable was rerouted - put in as-built drawings
- company upgrades to new building - had the original plans
- certification data stored - reference in future for troubleshooting
  baseline for what works
  warranty
- two reasons to give certification data to customer - warranty
  to make sure all specifications are met
- covered under installer warranty
- headroom is the difference for minimum & test results
- delay skew - signals end up later on different pairs
- tests for crosstalk - certifying meter
- during test, crosstalk at far end - FEXT
- fiber connectors are dirty - lens paper + alcohol
- picture has a wire fault (3)
- needs signal reading, -20.3 db -26.5 db worse +5 db
- wires touch - short
- crosstalk - mix of signals
- ½ inch can be left untwisted (≈1.5 cm)

- 802.11 - W.fi standard
- crossover cable - 2 & 3 are reversed pairs, A & B
- min. bend radius - 2 in for fiber optic (5 cm)
- TIA/EIA Standards
- Pathway & Spaces - 569A
- stop up firewall
- where you are now, box shows how much substant = number of feet left
- pull 3 cables, 3 needed marks, marked every 3 ft
- crosstalk, 1 & 4 wires get pinched or pull testing
- gauge of wire of TGB - min. of 6 gauge wire
- prefer method of grounding - copper rod in ground
- label with 104 in Room 104
- pull slack - find other end
- contact person who has name on back if tagged
- two types of ladders
- earmuffs or earplugs
- scraps in fiber optic - use tape
- break between two buildings, use TDR to find break
- fire extinguisher
- new material has to be bought - should have been detected during pre-bid
- blueprint symbols - backbone, ground
- features of different Cat - bandwidth, more twists
- STP - screen must be grounded
- labeling dot of cable & Entry-Room - tone & probe

* Stripping & Cabling Tool
- CABLAST - cable stripping cyclops
- electrician scissors
* Termination Tool
- punching term. tool - 110 block
- impact tool - 66 or 110
* Cable Tester
- Fluke 620
- looks for shorts, opens, reverse pairs
* Certification meter
- tells whether cable will work in application
* Multimeter
- checks voltage and current
- to see if electricity is running through it
* Voltage sensor
- if lights up, EM field
* Tone & Probe Set
- locates a wire through a tone
* Telephone Test Set
- used to talk on a wire
*

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Ch. 10 - Pipe

* Steps
- cable pulled from staging area (SA = TR)
- enough cable is pulled to terminate

* Projects
- new buildings
- older with rods

* Retrofit
- find live wires

* Safety Considerations
- only cable crew should be in area
- warn public
- secure equipment

* Rough-in Tools
- cable, reel, box jack

* Bullwheels & QB
- bullwheels used to change direction
- QB used to hold heavy cable (quadrant block)

* Horizontal
- TR to work area
- should run parallel to walls

* without Support Structures
- fasteners are mounted every meter & tape pulleys every 3 m

* cable through Conduit
- filled no more than 40%
- cable bundle - group together with a velcro fastener
- no more than 30m without pull box
- no more than 2 90° bends

* Pulling & fastening
- hook & loops - velcro ties
- not overtightened

* Vertical
- 10 cm in diameter (4 in)

* Vertical Pulls
- you want to use a cable break to slow it down
- pull up with its a winch

* Fiber Optics
- microbend - strain & impurities

* Cables & Fire
- plenum, general, risers
- plenum is fire rated (non-PVC)
- risers don't burn as fast

* Review
- want a cable break for upper floors
- plenum cable
- staging area (where it is)
- take wire off with removable shafts or pulleys
- fiber optic pulling swivel will break off with
- 2 conduit 90° angles
- alternative to fish tape - string, small chain
- locate studs - finder, tapping, observation, x-ray, small nails
- kevlar keeps fiber optic from breaking
- service loops are extra cables for later
- cut over is switching from old to new system, keep good records

2

Ch. 10 - PNIB

- 30 ft segment, 4 in conduit, what bend radius? (is 6x, so 24 in)
- running cable through a ceiling - parallel to walls
- how to get cable through conduit (fish tape, not string)
- - service loops
- - cable labeling

Ch. 9 - PNIE

* Customer Review & Negotiations
  - customer reviews the bids to determine the bid that best suits their needs
  - payment terms can be negotiated
  - daily penalty amount are discussed
* Contract Signing
  - way to make amendments
* Changing Orders & Punch Lists
  - punch list is list of everything that's not done
  - change order is used to change contract
* Reading Design Documents
  - provides narrative of project
  - have jargon & acronyms in that field
  - describes testing & labeling specification
* Blueprints
  - T - telephone
  - E - electrical
  - A - architectural
  - P - plumbing
* Rough Sketch & Floor Plans
  - created by contractor on site survey
  - notes problem areas, obstructions, and other situations
  - shows TRs and TR labeling
* Schematic Diagram
  - not to scale
  - shows scheme of things

* As-built Drawings
- shows cable routes, types, & termination points
- some cables are installed as diagrams show

Ch. 6

- 570 - residential
- 800.8 - fiber
- know EIA/TIA standards
- ANSI does voluntary standardization
- ANSI "approves"
- 607 - grounding
- NFPA - fire protection
-

Ch. 6 - PNIE

* IEEE
- 802.3 - CSMA/CD
- 802.5 - token ring
- 802.8 - fiber
- 802.11 - wireless
* Codes & Standards
- to make sure everything works together
- make it safer for work, workplace, workers, & employers
- works to performance level
- standard vs. best practice - standard is set, best practice is how it should work the best
- levels of standard - local takes precedence → state → national → intl
* Organizations
- IETF - internet engineering task force
- NFPA - national fire protection agency
- ANSI - American National Standard Institute
* TIA/EIA
- 568 B.1 - commercial building telecom cabling
  - 2
  - 3 - optical fiber
- 569 - commercial bldg standards for telecom
- 568 A - wiring & commercial bldg
- 607 - grounding & bonding
- 606 - infrastructure administrative standards

Ch. 4 - PNIE

* Review
- 1 - 4200 pairs
- binding is combining 25 pairs
- tip goes first
- tip - white, red, black, yellow, violet
- ring - blue, orange, green, brown, slate
- binder groups follow same color code
- usually wrapped in 5 25 pairs
- coaxial has braided shield or foil shield
- exterior cable must withstand water, sunlight, hot or cold, burial
- gel filled cables
- dense cables to remove pressure points
-

Ch. 9 - PWIE

Copper Wires

* Chart
- Bl. O G Br. Sl. x W R Bk. Y V
- blue orange green brown slate x white red black yellow violet
- ring & tip
* Copper
- doesn't rust, but oxides
- ductility - ability to stretch it
- malleability - able to bend
- strength - doesn't melt until around 700°F
* Copper Cable Components
- contains sheath or jacket for protection
- insulation to prevent shorts between wires
- spacers to preserve electrical properties of cable
* Solid vs. Stranded
- one wire of copper vs. one wire of many more wires
* Insulation
- thermoplastics - PVC, Polythylene
- Fluoropolymers
- elastomers
* Plenum
- fire rated cable
- if not rated, not able to use in ceilings
* Cable Plant
- collection of alot of cables
- used usually outside
- has more protection against nature

* Coaxial Cable
- cable - connector F
* UTP
- uses RJ-45
- 8 contacts
- reduces noise through cancellation
* Cable Categories
- Cat 3 - telephone (16 MHz)
- Cat 5 - Ethernet network (100 MHz)
* IBM Cable Types
- 1, 2, 6, 8, 9
*

Ch. 8 - Price

* Cable Cutter & Fish Tape
- pull string cutter is a spring loaded gun
* Labeling Systems
- cable must be labeled
- 606 - labeling
- must be done in permanent marker
* Cutting Tools
- cutters
- scissors
* Terminating Tools
- Terminators
- punch down - usually 66 or 110
* Crimping
- puts end on cable
* Testers
- Tests for shorts, open, split, and other problems
* Certification Meter
- alot of money
- make sure that cable completely works
* Multimeter
- checks power
* Voltage sensors
- shows max current
* Tone & Probe Set
- uses audible signals
- gets louder as it gets closer

* Material Safety Data Sheet
- contains info of hazardous material
* Professionalism
- appearance & conduct reflect on company
- good referral is valuable when competing
- coworkers
-

Ch. 7 - Price

* Cross Connect
- MC - main cross connect
- IC - Intermediate
- HC - horizontal
* Campus Distributor
- CD is the main concantration of tlc building
- in a room over all TRs
* Backbone
- TRs on same floor
- different floor
- TR & EF
* MUTOA
- multi user telecom outlet assembly
* Consolidation Point
- permanent
- flush wall-mounted
* Review
- 1 m marks of hashing
- interduct - fiber optic
- 3000 m - single mode fiber
- 30 - 50% humidity
- TGB - copper, as long as it needs to be, 2 in wide, 0.25 in
- MTGB - 4 in wide, 0.25 thick
- bonding TRs - green 6
- TR can be no more than 1000 m^2
- 569 - TRs

Ch. 7 - Price

* Rules
  - complete solution
  - future growth
  - total costs
  - no one vendor
* Subsystem
  - demarc
  - telecom room
  - backbone
  - distribution
  - work area
* 606
  - labeling
  - hardware termination
* Records
  - must keep
  - cables, # of cables, type, connections
* Test Data
  - type, manufacturer, number of conductors & pairs, location, earth & grounding
* Outlet Data
  - type, characteristics, available pair with cable, powered or not
* Distribution Data
  - used & available cables, pathways,
  - rack diagrams, power, back-up power
  - environmental controls

* Pathway Data
- nature of pathway (size of conduit, width, length)
- records of cable
- details of fire stopping materials
- grounding & earthing
* Removal of Old Cable
- source for fuel of fire
- could carry charges
* Demarc
- outdoor interfaces with indoor cabling
- point of presence
- EF - entrance facility
- $1 m^2$ of plywood = $20 m^2$ of floor space
* Work Area
- area serviced by a telecom room
- limit of 100 m
- workstation - phones, comp.
- patch cables
- adapters
* Management System
- used for routing cables
* Cross Connecting
- wires — d | meet
* Patching
- not cross-connecting
- not permanent (CC is)

Ch. 7 - Price

* Structured Cabling
- planned ahead
- covers everything
- manageable
- plan for future growth
- beware of cost of ownership - maintaining it
- maintain freedom of choice of vendors
* Subsystems
- entrance facility or demarc
- telecom room
- backbone cabling
- distribution cabling
- work area
* Telecom ID
- 606 is administrative
- use labels that are understood
* Records
- type & number of cables to each location
- work area outlets - type label info, location
- telecom room -
- floor plans -
* Test Data
- type of cable
- number of conductors
- grounding
- location of splices

- manufacturer
* Outlet Data
- available pairs in cable
- powered or not
- type of outlet
- cable characteristic
* Distribution Data
- # & type of cable
- in use & available cables
- pathways
- power, backup power
- rack diagrams
* Pathway Data
- what kind of conduit
- attributes
- grounding & earthing
- stopping materials
- how many cables in pathway
* Removal of Abandoned Cable
- cable not terminated or marked for future use must be removed
- fire
- takes up space
- more EM interference
-

Ch. 6 - Price

* Codes
  - they promote safety
  - codes protect workers
* Standards
  - a set of rules that are widely used
* Best Practice
  - assists users
  - not as big
  - violation - not getting job
* Organizations
  - state, local, national
* IEEE
  - 802.3 - CSMA/CD
  - 802.5 - Token Ring
  - 802.8 - fiber
  - 802.11 - wireless
  - 802.3 - Ethernet
* EIA/TIA
  - where grounds are, bonds, where repeaters go
  - 568.1 - CBTC - commercial building Telecom cabling
  - 568.2
* ISO
  - ECA
  - CEA
  - GEIA
  - JEDEC
  - NEMA

* Standards
  - they grow & change
  - SAN's
  - bandwidth
* Building Codes
  -

Ch. 5 - PNIE

* Fiber Optics
  - uses fiber glass
  - uses modulated light
  - more expensive to install
* Parts
  - core, cladding, buffer, strong material, jacket
* Cables
  - always two cables involved
* Data Transmission
  - converts electricity to light
* Transmission Types
  - single mode & multimode fibers
  - single - 1 path
  - mm - many paths
  - single has less dispersion
* Types
  - hard clad silica - SiO_2
  - plastic clad silica - SiO_2 surrounded by plastic
* Loose Tube Cable
  - doesn't have cladding, gel filled instead
  - fiber, metal strength member (Kevlar), gel,
  - used outside
* Tight Buffered
  - fiber, cladding, buffer, Kevlar, jacket
* Breakout
  - each wire has own jacket & Kevlar in bundle

* Distribution
- no jacket or buffer
* Subgroup
- group of tight buffers
* Zipcord
- like headphone cable
* Round Duplex
- strength, used building to building
* Ribbon
- in a ribbon
* Aerial
- tight buffer connected under a wire that supports it
* Armored
- rough applications
- steel armor around it
* Hybrid
- fiber and copper
* Submarine
- underground
* SC
- square connector
* OTDR
- optical time domain reflectometer
* Cubid Angle
-

Chapter 1

* Analog Telephone
- each telephone needs a cable to it
- telephones started cabling
* Voice Cabling
- telephones uses two wires
- uses twisted pair
* Structured Cabling
- using wire scheme to handle all communication
- includes devices, equipment, and electronics
* Emerging Video Tech
- fiber optic uses glass threads
- wireless used radio or microwave
* Costs of Poor Cabling
- it's better to pay more to get cable done right
- net admins waste time troubleshooting poor cabling
* Jobs
- entry level installer
- installation supervisor
- project manager
- cabling design engineer
- making representations
* Education
- offers tutition
- most tech school hire help
* Safety Codes
- employee, workplace, public

* Electrical Safety
- coffee usually uses low voltage
- one hand rule
* Voltage Safety
- use multimeter
* Grounding
- safe proper path for lightning
- GFCI - breaker that has ground
* Bonding
- making sure ground work
*

Ch. 10 - PWIE

Rough in

* Rough-in Steps
- pull from staging area to where it goes
* Types of Installs
- older buildings that are vacant
* Retrofit
- when working with older buildings, the cable installer should
- identify active circuits so as to not remove them
- remove abandoned cable
- plan out over process & notify building owner
* Safety
- only calling team should be in area
- warn the public
- keep equip. secure
* Tools
- cable reels
- cable trees
- bullwheels
* Horizontal cabling
- distro to work area
- over ceiling or conduit
- run parallel to wall
- shouldn't lie on ceiling tiles
* Install Without Support Structures
- where pulling go
* Pull cable through conduit
- not be filled over 40%

* Blown System
- blow cable through conduit
* Vertical Walls
- round holes, possibly with conduit
* Fishing Vert Cables
- while supported, it lowers cable into grip
* Pull Cable from floor floor
- winch or cable puller
* Tips for Pulling
- may be lube
* Aerial Cable
- has steel wire that holds & supports cable
* Ratings
- OFC - general conductive
- OFN, OFNP, OFCP, OFNR, OFCR
* Fire Walls
- firestop must be added when going through a fire rated wall
* FW Traits
- Ablative -
- endothermic - gets hot
- Intumescent - expands when gets hot
*

Ch. 9 - Price review

- know different phases
* Phases
- trim out
- rough in
- finishing
- customer support
* Customer support
- customer walkthrough - punch list, what's needed or not needed
- test system
- formal sign off when job is completed
* RFP
- request for proposal
- bids are taken based on RFP
- look at it, gather data on history & feature, changes, employees
- pre-sale - gathering data
- sale - making the bid
* Change Order
- masons aren't here, you have to wait
- do a change order to change contract
* Floor Plans
- C drawing are civil
- civil is for utilities, roadways
- M drawing are mechanical
- mechanical is for heating / AC
- E is for electrical
- electrical is for lighting, wiring

- A is for architectural
- A is actual layout of building
- T is telecom
- P is plumbing

* Site Survey
- looking at building to make bid

* As-Built Drawing
- blueprints that reflect how to put it together
- keep a copy & give customer copy

* Waste
-

* Rain
- bid, contract, design document
- contract - what you have to do based on bid
- design doc - narrative of what you did

* Cut Sheet
- list of what is connected where

* Schmeatic
- layout of stuff, not to scale
- how parts are connected

*

Ch. 9 - PWIE

* learning
  - calculate labor costs
  - requests for proposal
  - installation
  - software tools
  - material & labor issues
* Project Phases
  - pre-sale / sale
  - rough-in - installing cable
  - trim out - covering wire
  - finish
  - customer support
* Pre-sales
  - request for proposals
  - pre-bid meeting
  - labor cost
* Request for Proposal
  - formal document that defines in detail
  - contractual work, requirement to be met
* Responding to RFP
  - must understand RFP
  - must meet all requirement
* Pre-Bid Meeting
  - companies time to hear overview of project
  - allows view of project

* Site Survey
- see impact of installation
* Requirement Documents
- blueprints help determine length of runs
- may not always show available path
* Calculating Labor Costs
- many factors involved
* Business Costs
- non billable labor is included in business costs
- upper management, secretaries, estimators, and salespeople
- not directly related are still billing costs
* Material Shortages
- customer must give permission before substitution is made
- should be in writing
* Labor Situation
- unions
* Winning a contract
- written agreement
- specific expectations
- when project ends
* Contract Elements
- labor cost
- detail description
- roles & responsibilities
- subcontractors
- time frame
- bonds