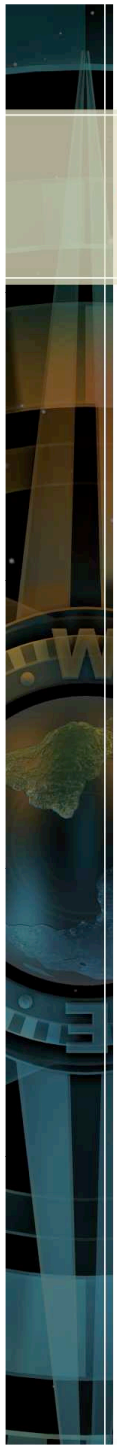


Fiber Optic LAN Section (FOLS)
LAN Standards, News & Trends Report

Herbert V. Congdon II, PE – Standards Committee Chairman
Tyco Electronics

February 2011

Fiber Optics LAN Section

- Overview:
- Part of the Telecommunications Industry Association (www.tiaonline.org)
- Formed 17 years ago
- Mission: to educate users about the benefits of deploying fiber in customer-owned networks
- FOLS provides vendor-neutral information

Fiber Optics LAN Section

- Current Members
  - ADC (ADC is now Tyco Electronics)
  - AFL/Noyes Fiber Systems
  - Berk-Tek, a Nexans Company
  - Corning Optical Fiber
  - CommScope
  - Draka Communications
  - Fluke Networks
  - OFS
  - Ortronics
  - Sumitomo Electric Lightwave
  - Tyco Electronics

Fiber Optics LAN Section

- Recent Webinars Available on Demand
  - Bend, bandwidth or both? Making the Right Choice for Enterprise Networks
  - OM4 Fiber for Next Generation Networks
  - Multimode Fiber Trends
  - LAN Standards, News & Trends: 2010 Update

- Visit www.fols.org or our channel on BrightTalk

Objectives

- Overview of Standards
- Recent events and activities of TIA TR-42 Subcommittees
  - Most recent meetings held in early February 2011
- Review the recent events and activities of some LAN application subcommittees

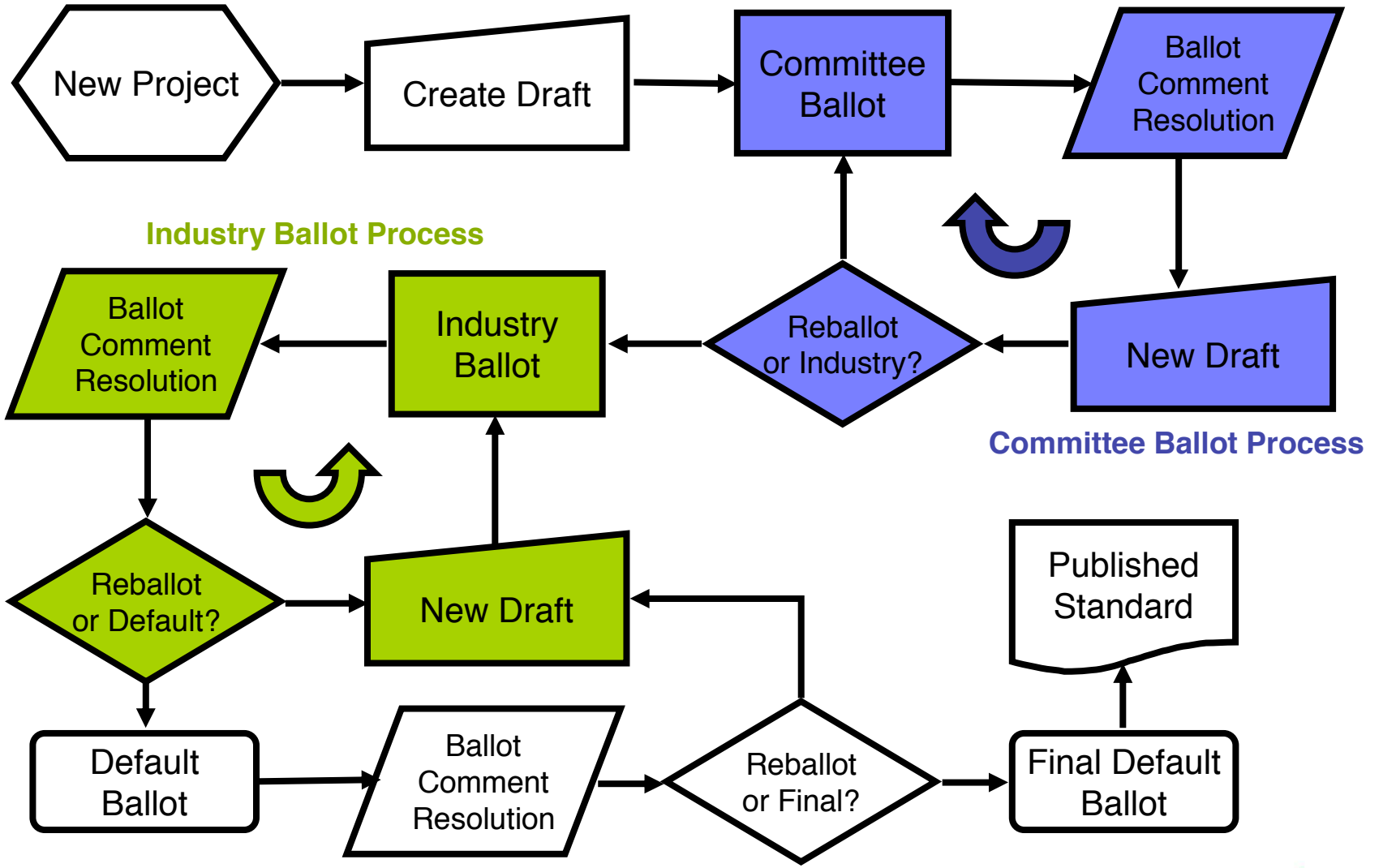
Standards Overview

- What is the process for developing a standard?
  - Projects are proposed and must be approved
  - Contributions are reviewed
  - Draft documents are created then balloted to remove or resolve contentious issues
  - With consensus, the document is released for publication
  - Can take a few months or many years

Standards Overview

- What is the process for revising a standard?
  - Maximum 5-year lifespan for standards
    - Must be revised, re-affirmed or withdrawn
  - Addenda may be added to keep the document growing with advances in technology
    - Addenda may then be incorporated into the new revision of the standard.

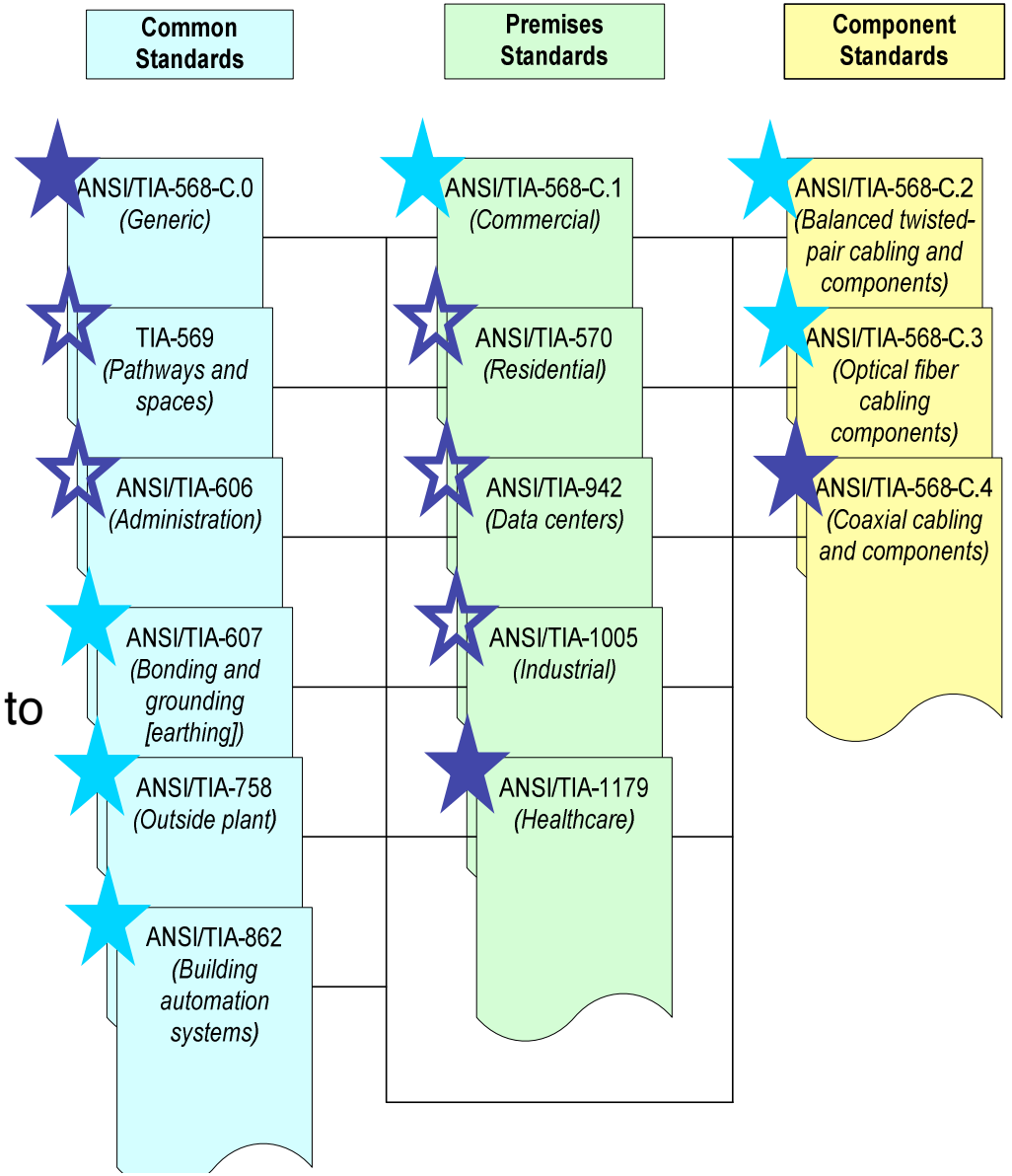
Ballot Process

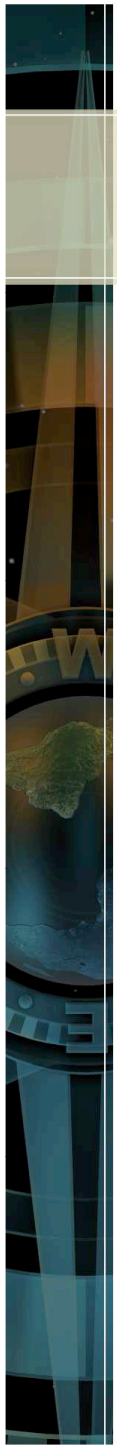


Engineering Committee TIA TR-42

- Telecommunications Cabling Systems
  - Develops and maintains voluntary telecom-munications standards for telecommunications cabling infrastructure in user-owned buildings
  - Covers requirements for copper and optical fiber cabling components (such as cables, connectors and cable assemblies), installation, and field testing
- Combination of several committees
  - TIA TR-41.8, FO-2, FO-6, FO-4

- TR-42 Documents
  - Common Standards
    - End-users
    - Broadly Applicable
  - Premises Standards
    - End-users
    - Narrow Focus
    - Exceptions/Allowances to Common Standards
  - Component Standards
    - Manufacturers
  - Related Standards
    - FOTPs
    - Fiber Specifications





TR-42.1

Subcommittee on Generic Cabling and Commercial Building Cabling

Document Summary

- 568-C.0 – Generic Structured Cabling
  - Addendum 1 - Updated References for Balanced Twisted-Pair (PUBLISHED)
  - Addendum 2 – General Updates (project approved)
- 568-C.1 – Commercial Building Cabling
  - Addendum 1 – Pathways and Spaces (default ballot – will be held until 569-C publishes)
    - Work is taking place in TR-42.3
  - Addendum 2 – General Updates (project approved)

TR-42.1 Open Projects

- Addendum 2 to 568-C.0 – General Updates
  - Why?
    - Proposed additions to 568-C.0
  - When?
    - Still collecting information – not out for ballot

TR-42.1 Open Projects

- Addendum 2 to 568-C.0 – General Updates
  - What do you need to know (proposals)?
    - CPs/MUTOAs debate (generic or not?)
    - PON applications support
      - May require a few modifications in order to support
    - MPO (array connector) polarity
      - Type C for parallel and 24-fiber
    - Updating application tables
      - OM4 fiber and 10GBASE-ER

Document Summary

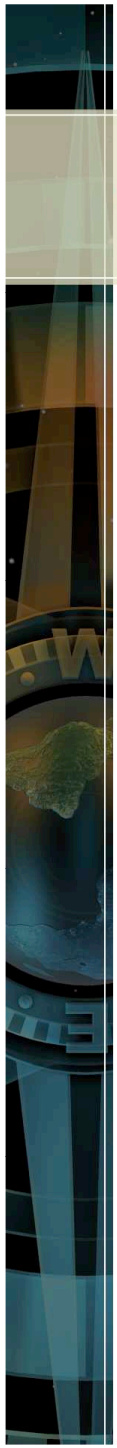
- 862-A Building Automation Systems Revision (PUBLISHED)
- 1179 Healthcare Facility Cabling (PUBLISHED)
- 942-A Data Centers (Industry Ballot)

TR-42.1 Open Projects

- 1st Revision to TIA-942 (Data Center)
  - Why?
    - Make it a premises standard based on 568-C.0
    - Enhance environmental/green guidance
  - When?
    - Ballot comment resolution in February
    - Issued for industry ballot

TR-42.1 Open Projects

- 1st Revision to TIA-942 (Data Center)
  - What do you need to know (in draft)?
    - Adds IDA - intermediate distribution area
    - LC (duplex) and MPO (array) are recommended for new fiber installations
  - Also (debates)
    - OM4 and recommendations
    - Removing Annex G (reliability tiers)

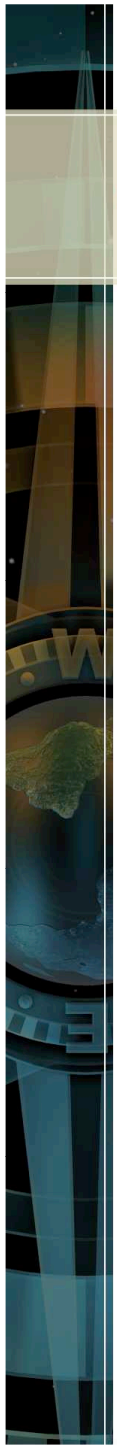


TR-42.4

Subcommittee on Outside Plant Cabling

TR-42.4 Open Projects

- 2nd Revision to TIA-758 (Outside Plant)
  - Why?
    - Make it a common standard
  - Status?
    - Released for publication
    - Editor finalizing document
  - What do you need to know?
    - Added content from the TIA-790 standard on installing optical fiber cables in outdoor locations
    - TIA-790 has been withdrawn



TR-42.7

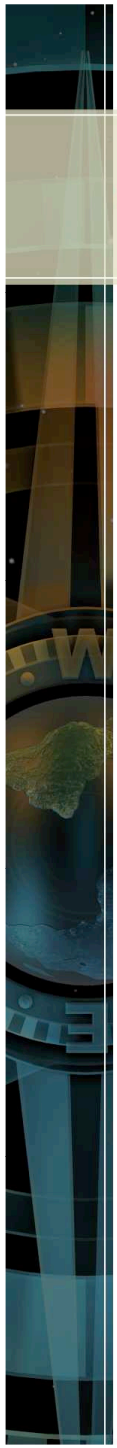
Subcommittee on Copper Cabling Components

TR-42.7 Open Projects

- New Standard to be TIA-1183 (Test Methods and Fixtures to 1000 MHz)
  - Why?
    - Extension of the bandwidth testing
    - Testing with both differential mode stimulus or response, or common mode stimulus or response
    - Task added to investigate extension to 2000 MHz
  - Status?
    - Issued for second industry ballot

TR-42.7 New Proposals

- Project to Add Category 7A Cabling to the 568-C.2 Standard
  - Recognized in ISO 11801 and IEEE 802.3an (10GBASE-T)
  - Proposed specifications to 1 GHz
  - Proposal "failed" in June and in February
    - One vote short of "greater than 2/3rd majority"
- Project approved to develop "next generation cabling for data transmission higher than 10GBps"
  - Not necessarily Category 7A

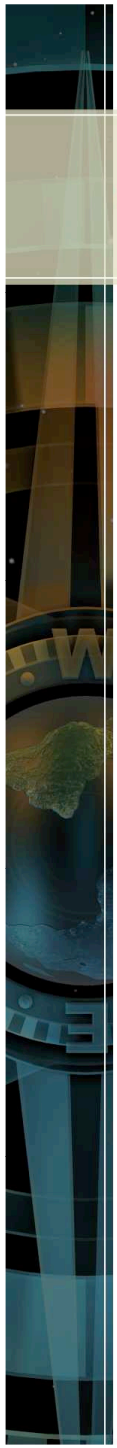


TR-42.9

Subcommittee on Industrial Premises Cabling

TR-42.9

- 1st Revision to TIA-1005
  - Why?
    - Make it a premises standard built on 568-C.0
  - When?
    - Issued for industry ballot
  - What do you need to know (draft)?
    - Power separation and noise issues deferred to 569-C
    - No contributions to include plastic optical fiber



TR-42.11

Subcommittee on Optical Fiber Systems

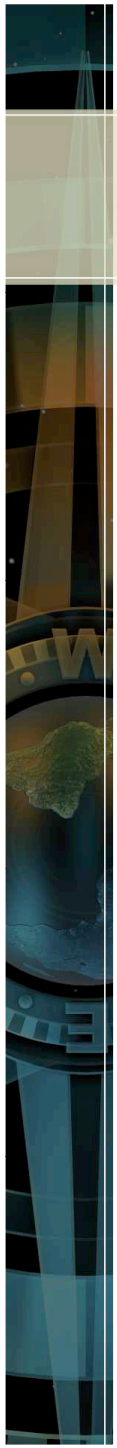
(Note: TR-42.8 Rolled into TR-42.11)

TR-42.11 Open Projects

- 568-C.3 - 1st Addendum
  - Why?
    - Add OM4 to tables
    - More on array connectors (40G and 100G support)
  - Status?
    - Issued for committee ballot
  - What you need to know:
    - OM4 already allowed, just not specifically called out
    - No new proposed color (aqua applies)

TR-42.11 Open Projects

- New TSB Project
  - Looking at loss budgets – design and connector loss limits
    - "Worst Case" may be too limiting and not indicative of real world performance of loss in a link
    - How can statistical tools and connector loss performance be used to provide a more accurate expectation of link loss?
  - Project will be submitted for approval in June



LAN Applications Update

40G and 100G Ethernet

- Approved for publication (802.3ba) in June
  - Multimode
    - 40GBASE-SR4 – eight fibers
      - 100/150m on OM3/OM4
    - 100GBASE-SR10 – twenty fibers
      - 100/150m on OM3/OM4
  - Single-mode
    - 40GBASE-LR4 - duplex
    - 100GBASE-LR4 - duplex
    - 100GBASE-ER4 - duplex

IEEE 802.3 Projects

- 802.3az – Energy Efficient Ethernet
  - Released for publication
  - Reduced power consumption during idle periods
- 802.3bg – 40GBASE-LR (serial 40G)
  - No disapprove votes on first ballot
  - Document will “fast-track” to publication
  - Lower cost option than current 40GBASE-LR4

40G and 100G

- Call for Interest for a new 100G solution
  - Maybe a 4x25G based solution
  - Could mean an 8-fiber variant for multimode 100GbE

Fiber “Hot Topics”

- OM4 Fiber Specs
- PONs
- Bend-insensitive MMF
- Loss budgets and connector loss

OM-4 Fiber Specs

- OM4 Fiber Specification is published
  - TIA-492AAAD
- OM4 is not (yet) called out in the cabling standards
  - Addenda and revisions in progress
- OM4 meets minimum requirements of OM3 fiber and cabled fiber
  - Thus OM4 is allowed for use

PONs

- Passive Optical Networks
  - Application Standards
    - IEEE 802.3ah (EPON)
    - IEEE 802.3av (10G EPON)
    - ITU-T G.984
  - Concept
    - Point to Multipoint (like CATV)
    - Simplex Single-mode
    - Central Enterprise Switch & Terminal Units
    - Passive Splitters

PONs

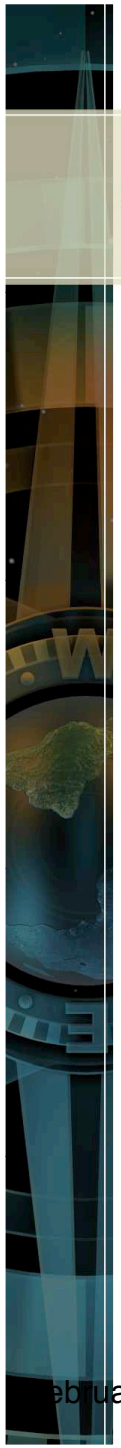
- Passive Optical Networks
  - Cabling Standards
    - Not specifically addressed
    - Discussion
      - Modify standards to allow it without compromising support of other (duplex, copper) applications?
      - Produce an application-specific standard?

Bend-insensitive Fibers

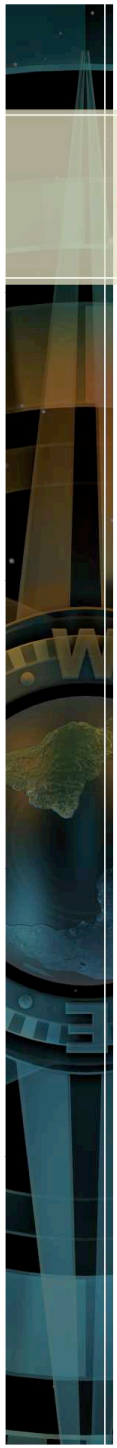
- Key Issue
  - How, exactly, is “bend-insensitive” defined?
- Related Issues
  - Compatibility between vendors
  - Compatibility with legacy (non-BI) fibers
  - How is testing conducted (what size mandrel)?
  - Different mode distributions have influence on bandwidth, connector loss and system performance
  - Reliability of BI fibers

Loss budgets and connector loss

- Key Issue
  - Design to worst case model (0.75db maximum connector loss per mated pair)
  - Design to a more realistic, statistical model
- Related Issues
  - Application loss budgets getting tighter
  - “Real World” case rarely sees even one “worst case” connector
    - 1.35dB for 2 mated pairs; 2.18dB for 4 mated pairs



Question Review



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