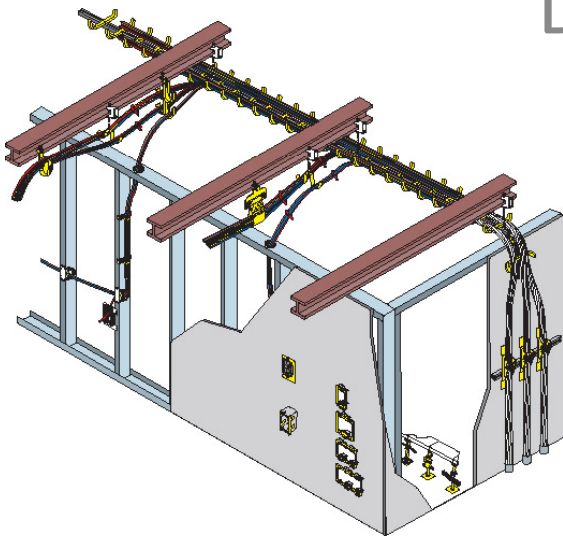




# Pathways for Cabling Infrastructure

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# Today's Content

*How to design and install the proper support systems for cost-effectiveness, code-compliance and long-term integrity of horizontal and vertical structured cabling.*

*Continuous pathway alternatives such as J-Hooks, bridle rings, cable pulleys, and other technologies will be discussed for overhead, wall, and under floor applications.*



# Industry Changes

- The industry has changed much since the 80's break up of AT&T and the RBOC's
- Cabling has changed with the times
  - station wire for telephones
  - IBM System 3270's, IBM System 34,36,38, RG62A/U coax, Twin-Ax, Wang-Net – Belden 9269, 9207, 9555
  - Nevada-Western, balun's for coax and twinax ...
  - CAT3, CAT4 (for a couple of weeks), CAT5, CAT5e, CAT5E, CAT6, Augmented CAT6, CAT6A, CAT7, CAT7A ... ?
  - Fiber has gone from 50/125 to 62.5/125 back to 50/125



# Pathway Changes

- From everything in conduit to ...
- Open Architecture
  - Cable Tray
  - Non-Continuous Supports
  - Combinations



# Infrastructure

- Cabling infrastructure is being pushed to its limits and the potential weakest link is not always the cable, connectivity, or patch cords but the pathways and how the cable is physically being installed
- This is true for both copper and fiber systems



# Wide Based vs. Narrow Based Supports

- Prior to the 90's, the primary non-continuous pathway was the bridle ring, cable tie, wire, string, ceiling grid supports, electrician's tape, etc. – narrow based products
- As cables increased in performance, a wide based non-continuous support was needed that would provide the necessary bend radius support and distributed load on the load bearing surfaces
  - The “J-hook” was introduced by ERICO CADDY in 1995 to meet the needs of the fast changing industry



# The Need For Wide Based Supports

- TIA 568-C
  - 5.3.2.1 Copper Cable - Cable bend radius may vary depending on the cable condition during installation (tensile load) and after installation when the cable is at rest (no-load). The minimum inside bend radius, under no-load or load, for 4-pair balanced twisted-pair cable shall be four-times the cable diameter. For example, a cable diameter of 9 mm (0.354 in) requires a minimum bend radius of 36 mm (1.5 in). The minimum bend radius, under no-load or load, for multi-pair cable shall follow the manufacturer's guidelines.



# The Need For Wide Based Supports

- **TIA 568-C**
  - **5.4.1 Fiber Cable**
    - **2-4 strand inside plant fiber 2"/1" – load/no load**
    - **Most other fiber is 20 times O.D under load and 10 times O.D. no load**
    - **New fiber designs have significantly decreased these requirements and the manufacturers guidelines for installation should be followed.**





# As Speeds Increase, Cable Designs Change

- CAT3 to CAT5 - .187 to .19
- CAT5 to CAT5E - .19 to .20
- CAT5E to CAT6 - .20 to .23
- When Augmented CAT6 was first introduced, the cable could be as large as .5”
- CAT6A is now .30-.32 or less due to the engineering efforts of the cable manufacturers
- What will be the requirements and diameters of the next types of cable – copper or fiber
- Weights of cable per 1000/ft are also changing from 20 lbs for CAT5e to 50 lbs for CAT6A



# Types of Wide Based Supports

- Various manufacturers of metal and plastic supports



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# Wide Based Support Issues

- Non-Continuous pathway supports need to be UL listed – Listed by part numbers
- Bend radius support – does the product really support the cable for sag between supports and for direction changes – vertical to horizontal or around corners
- Bend radius support for cable in all sizes of J-hooks – are the supports wide enough to support the bend radius requirement
- Does the J-Hook support the load of CAT6 & 6A?



# Let's Go Racing – NASCAR Style



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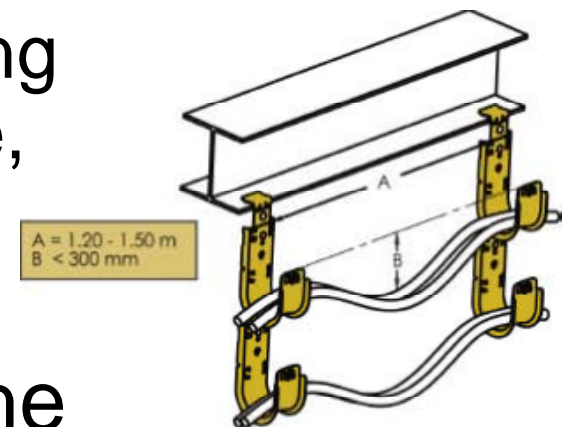
# Pathway Standard – TIA 569-C

- TIA 569-C.9.7
  - Non-continuous supports shall be located at intervals not to exceed 1.5 m (5 ft.). Non-continuous supports shall be selected to accommodate the immediate and anticipated quantity, weight, and performance requirements of cables.
- It is recommended not to make long runs exactly 5 ft apart due to “harmonics” issues per cable manufacturers
- Non-continuous pathways do not need to be bonded together or grounded (see 2011 NEC 250.92.A.1)



# Other Standards Based Issues

- TIA 568-C.5.3.1 – maximum pulling tension
  - The pulling tension for a 4-pair balanced twisted-pair cable shall not exceed 110 N (25 lbf) during installation. For multipair cable, manufacturer's pulling tension guidelines shall be followed.
- It is a best practice to keep the sag between supports at a maximum of 300 mm (12")

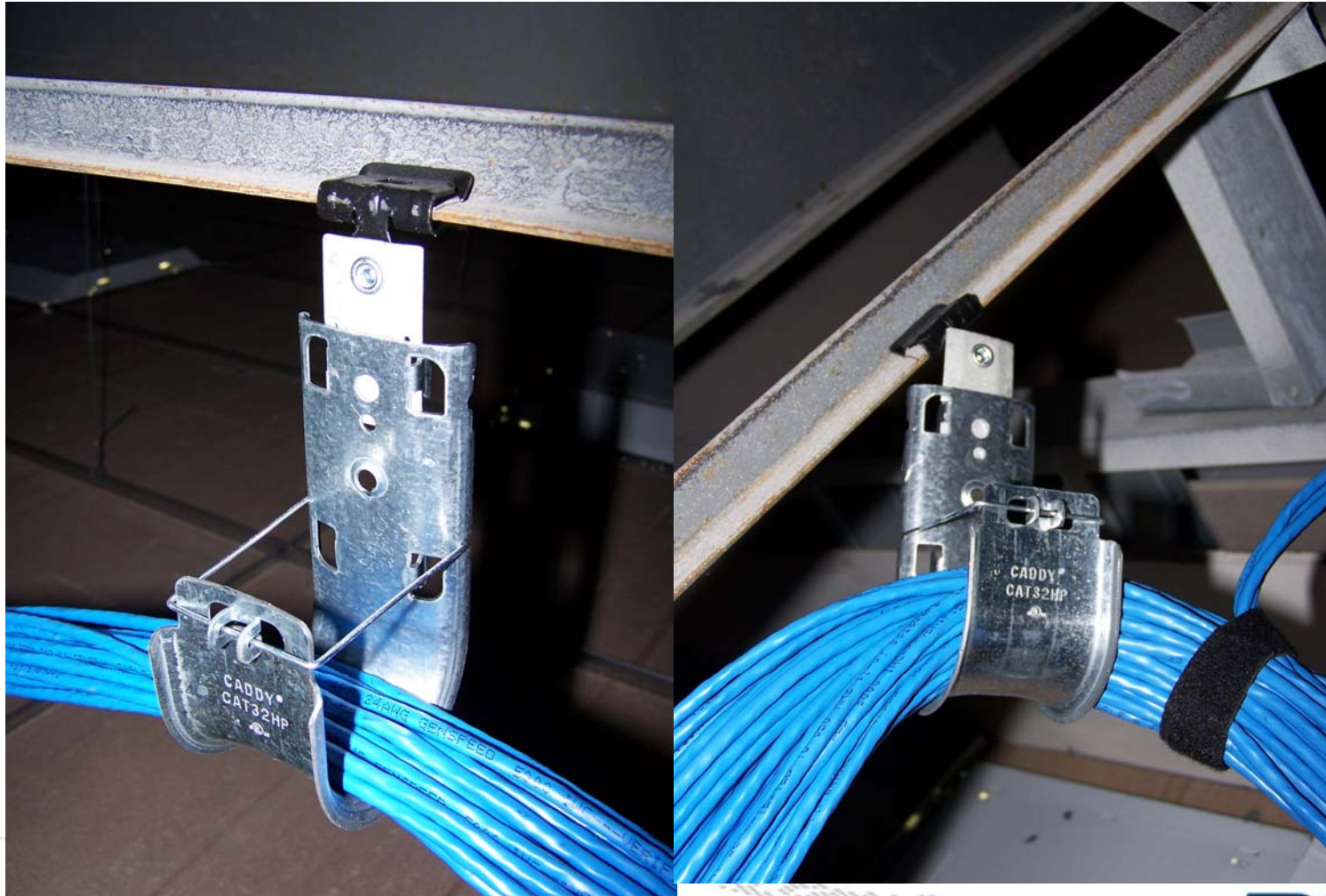


# Other Standards Based Issues

- Use cost effective cable pulleys manufactured by several companies to minimize the pulling tension on cables and maintain the maximum 25 lbf tension
- Reusable pulleys available from less than \$20 to more than \$100



# Pictures of Quality Installations



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# Pathway Standard – TIA 569-C

- TIA 569-C.9.4.2.2
  - A minimum clearance of 75mm (3 in) clear vertical space shall be available above the ceiling tiles for the cabling and pathway
- Critical to use approved pathways and supports for the safety of fireman and employees in case of an event
  - Recent articles in reference to a fire in London April 6, 2010 have been circulating which stated that two firemen died due in part to being tangled in cabling that had fallen from the ceiling – Shirley Towers event



# Other Standards Based Issues

- Non-continuous pathways must conform to the requirements of NEC 300.11 above the ceiling grid
  - Electrical/communication/security wiring methods in a suspended ceiling must be installed on independent support wires/rods
  - Per the 2011 NEC, all suspended ceilings applications **must have visually distinguishable independent support wires**
  - Wire must be affixed at both ends to minimize movement



# Performance Questions

- J-hooks can provide equal or better performance characteristics vs. basket tray
  - BICSI Vegas 2007 presentation by ERICO stated that **CAT6** cable in a 6 around 1 worst case scenario installed in a 90 meter run at transmission speeds up to 10Gb and frequencies up to 500 MHz performed slightly better than basket tray and ladder
  - The cable separation between supports provides the space between cables necessary to minimize Alien Cross-Talk issues

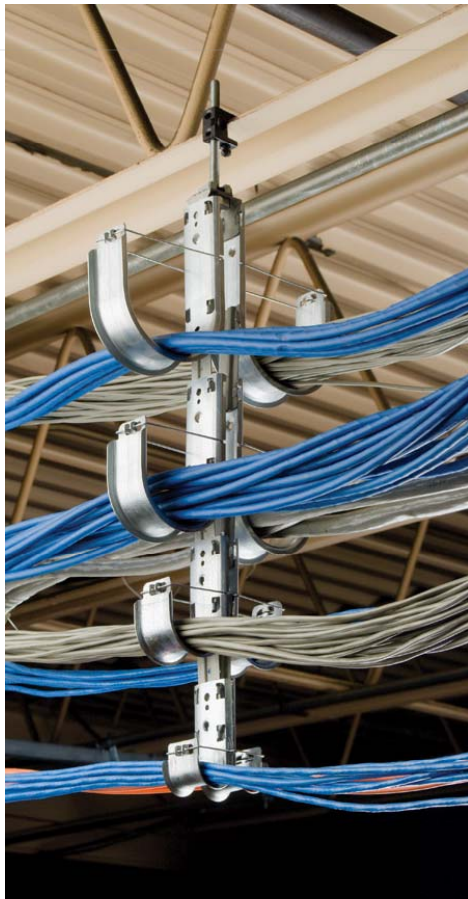


# Large Capacity Options

- J-hook “trees” offer capacity and cable management
  - Many J-hook size options
  - Cable segmentation for data, security/fire, fiber, nurse call, A/V – colored J-hook options
  - Flexibility
  - Smaller cable bundles – less chance for overloading pathways
  - Ease of removing “abandoned” cable per the NEC



# Large Capacity Options



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# Other Considerations

- Compared to conventional wire basket tray
  - Up to 88% less steel used
  - Up to 75% labor installation cost savings
  - Performance is comparable to tray systems
  - Grounding & bonding are not required for non-continuous metal pathways
  - Easier to reconfigure for MAC work



# BICSI Approved White Paper

- Evolution of J-Hook Systems – April 2011
  - By Ray Keden, RCDD & ITS Technician
    - Electrical Engineer with 45+ years of experience in the datacom industry in Europe and the U.S.
    - Principal member of the NEC Panel 3, expert member of ISO/IEC JTC SC25 WG3, member of the BICSI Codes & Standards committees and the TIA-TR42 Engineering committee
    - 2006 recipient of the Harry Pfister award for Excellence in the Telecommunications Industry

– [www.bicsi.org/pdf/whitepapers](http://www.bicsi.org/pdf/whitepapers)



# Wall Installation Issues

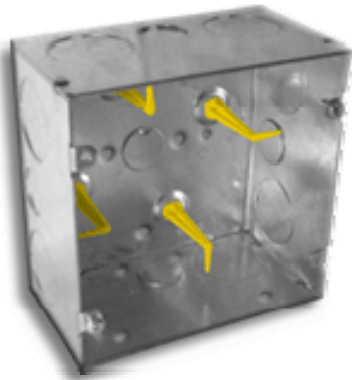
- Many facilities are being designed with conduit stubs in the walls
  - The problem being with multiple CAT6/6A or a combination of copper and fiber, the standard 4 square & 4-11/16 boxes are not large enough to maintain the minimum bend radius and separation of the cables
  - Traditional **low voltage** new construction mounting brackets do not allow for attaching the conduit stub to the bracket
  - Consideration needs to be given to determine if the location is a fire-rated wall or not





# New Products Introduced

- Multiple manufacturers have developed closed box and open bracket systems that now meet the bend requirements



5" Box from  
Randl Industries, Inc.



Open bracket  
design from  
CADDY

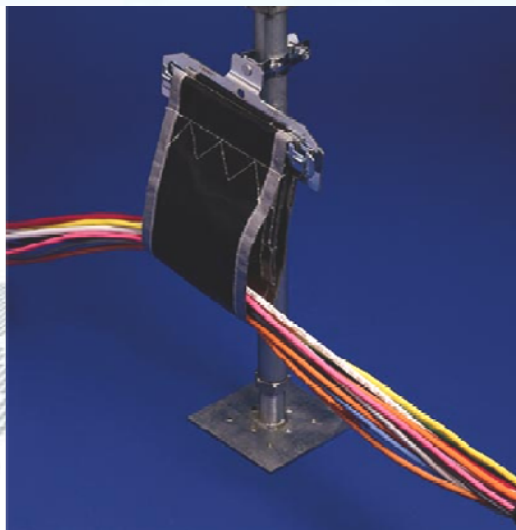
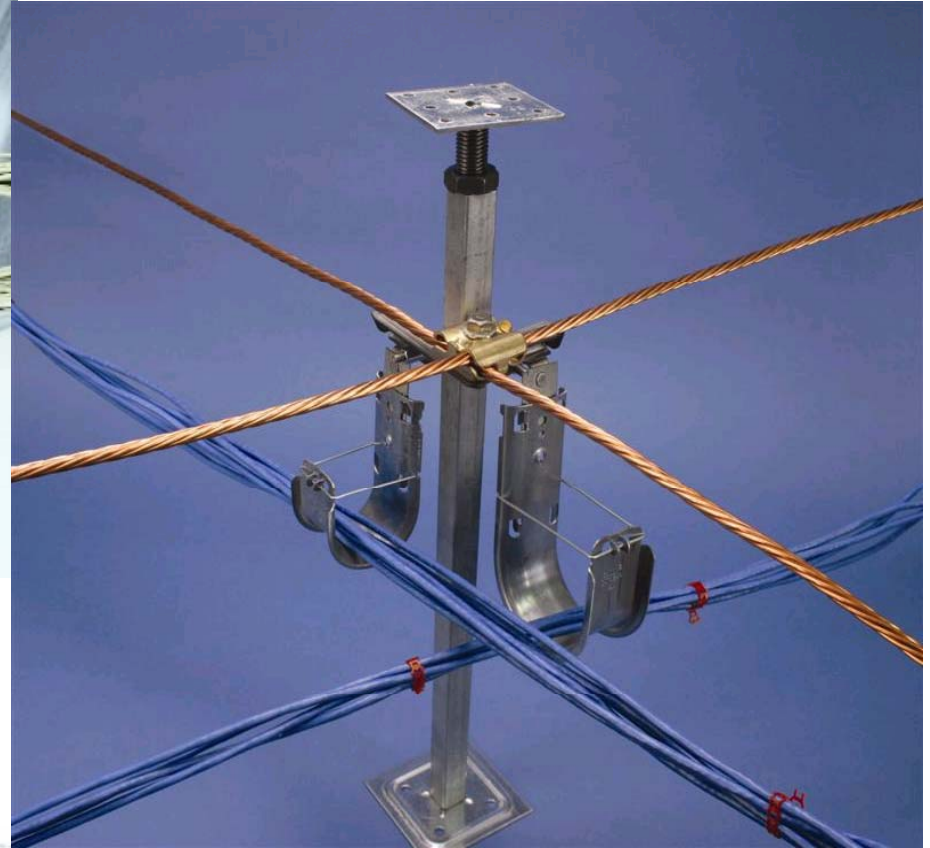


# Raised Floor Applications

- History – Cabling over time has gone from above the cabinets to below the raised floors and are now going back to above the cabinets
- Reason – Better air flow through the raised floor plenum
- Large capacity cable pathways were creating air dams which affected the HVAC performance by as much as 30%
- Are there options for small cable supports for below the floor?



# Raised Floor Solutions



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# Cable Tray Support Options

- Traditional threaded rod, beam clamps, strut for trapeze supports, standard “nuts”
- “Aircraft type cable” UL rated systems that several manufacturers offer in different configurations for time savings installations
- New threaded beam clamps, strut/channel nuts, ceiling anchors available in the market for time saving installations



# Cable Support Systems

- Load ratings of 44 to 100 to 200 lbs.
- 5:1 safety factor – UL 2239 has 3:1 rating required
- UL Fire & Plenum rated
- Various lengths available typically from 1 – 10 m length (3 – 33ft)



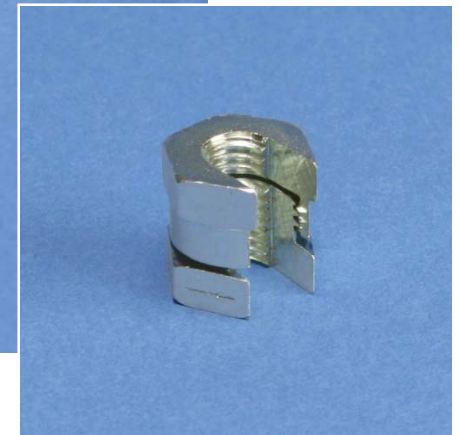
# New Threaded Rod Systems

- ROD LOCK – push in system vs. threading into the following parts
  - Beam Clamp
  - Strut/Channel Nut
  - Ceiling Anchor
  - SN Series Nut – ¼”, 3/8”, ½”



# New Threaded Rod Systems

- Beam Clamp –  
500 lb
- Strut/Channel Nut –  
750 lb
- Ceiling Anchor –  
660 lb
- SN Series Nut –  
1/4", 3/8", 1/2"



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# Questions?







**THANK YOU!**

