Thomas&Betts

Thomas & Betts
Fastening & Wire Management

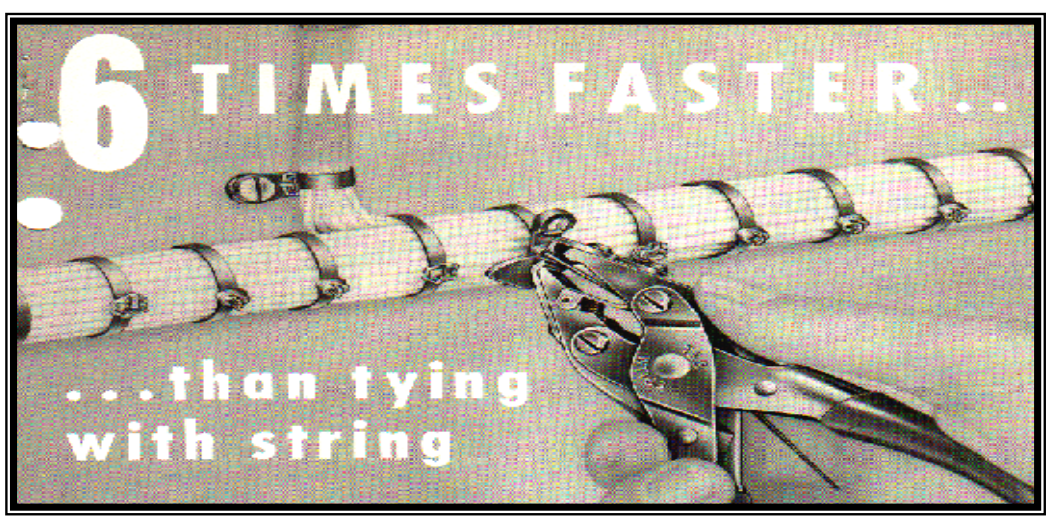
Fastening

In This Presentation

- How Did Ty-Raps Start?
- Who Buys Ties?
- Why Ty-Rap IS Best
- Selecting Cable Ties
  - Environments & Materials
- One-Piece Cable Ties – Catamount
- Cable Ties Support Tools

History

- Before 1958 cable installers used:
  * Tape * Lacing Cord * Nylon String
- 1958 - T&B invented Ty-Rap®
  - Initially a one piece twist version (no barb)



First developed to solve the problem of bundling the hundreds of feet of wiring found inside commercial aircraft, Ty-Rap cable ties can now be found virtually everywhere – from racing engines to backyard tool sheds. Self-fastening and basically indestructible, the ground-breaking design of the Ty-Rap cable tie demonstrates American ingenuity at its finest - solving a complex problem with a simple technology.

Maurus Logan
Ty-Rap Inventor

"My dad didn't have a lot of formal education, but he was the most ingenious person I have ever met," said Robert Logan, Maurus' son. "He never thought the customary way of doing things was good enough and when he looked at anything he thought about ways to improve it. The invention of the cable tie is an excellent example of how he worked."

For the cable tie, the proverbial light bulb came on over Logan's head while touring an aircraft manufacturing facility in 1956. Aircraft wiring was a cumbersome and detailed undertaking, involving thousands of feet of wire organized on sheets of 50-foot long plywood and held in place with knotted, wax coated, braided nylon cord. Each knot had to be pulled tight by wrapping the cord around one's finger which sometimes cut the operator's fingers until they developed thick calluses or "hamburger hands." Logan was convinced there had to be an easier, more forgiving, way to accomplish this critical task.

For the next couple of years, Logan experimented with various tools and materials. On June 24, 1958, a patent for the long-lasting, easy-to-use Ty-Rap cable tie was submitted. The rest, as they say, is history.

Ty-Rap® Cable Ties Story

- Thomas & Betts invented the Ty-Rap brand of cable ties in 1958 to replace more cumbersome fastening systems.
- It revolutionized the wire harnessing manufacturing process and installers have relied on its strength, durability, and many uses to save time and cost.
- Many others have copied it, but the Ty-Rap brand is synonymous with cable ties!

Why Buy Ty-Rap® Cable Ties?

- Most feature-laden and high performance designed cable tie made!
- #1 brand recognition and the “Original” cable tie
- Global agency listings (UL, CSA, CE, IEC, LR, DNV, Mil Spec, etc.) and manufacturing (Caribe, Hungary, & Japan)
- Made in USA and ARRA approved (Caribe, PR)
- Broad line of cable ties and accessories
- Good tooling package
- Wide customer specification base

Application - Who Buys Ties?

Wire Harness

- Pre-wiring done on Harness Board then installed
- Large OEM - Automotive, Computer, Copiers, etc.

Point-to-Point Wiring

- Done in Equipment
- Panel & Machine Tool Builders

Long Distance Wire Runs

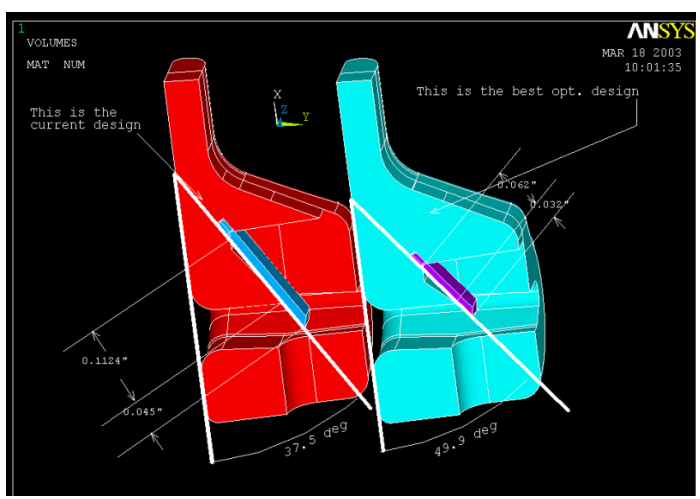
- Bundling & Fastening Cables Between Equipment
- Industrial & Commercial Markets, Refineries, Office Buildings

Non-Electrical

- HVAC, Home Improvement Centers

“Aren’t All Cable Ties the Same?”

NO!



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Why Ty-Rap is Best

Compare Ty-Rap to One Piece Tie

- Round vs. Square Head
  - Smaller with Lower profile, fewer snags
  - Won’t scratch installer’s hands
  - No sharp edges
  - Easier to pull through bulk heads
  - Looks better when installed

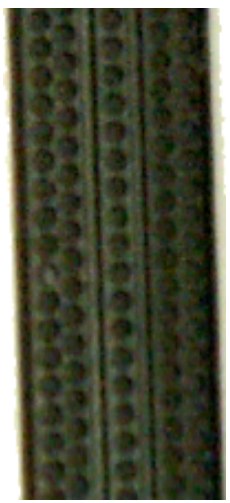
Why Ty-Rap is Best

Compare Ty-Rap to One Piece Tie

- Steel vs. Plastic Barb Locking Device
  - Infinitely adjustable
    - Protects insulation
  - “Grip of Steel”
    - Does not “relax”
  - 316 Stainless Steel
    - Resists corrosion

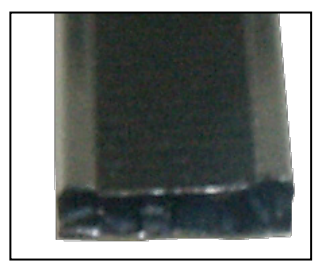
Why Ty-Rap is Best

Compare Ty-Rap to One Piece Tie



- Ribbed/Stippled Strap
  - Grips on bundle, remains in place
  - Rounded profile protects insulation
    - No sharp edges holding cables

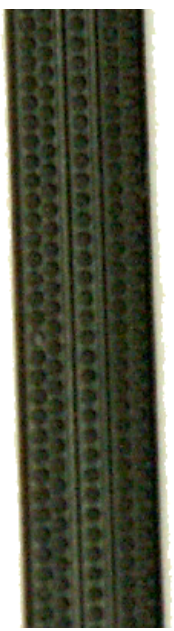
- One Piece only has rails
  - No center griping mechanism
  - Square instead of oval profile

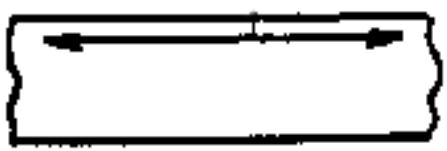


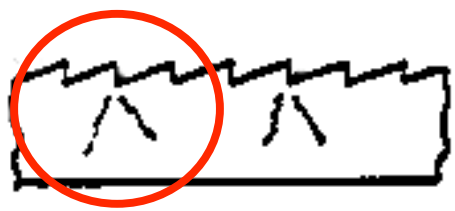
Why Ty-Rap is Best

Compare Ty-Rap to One Piece Tie

Smooth







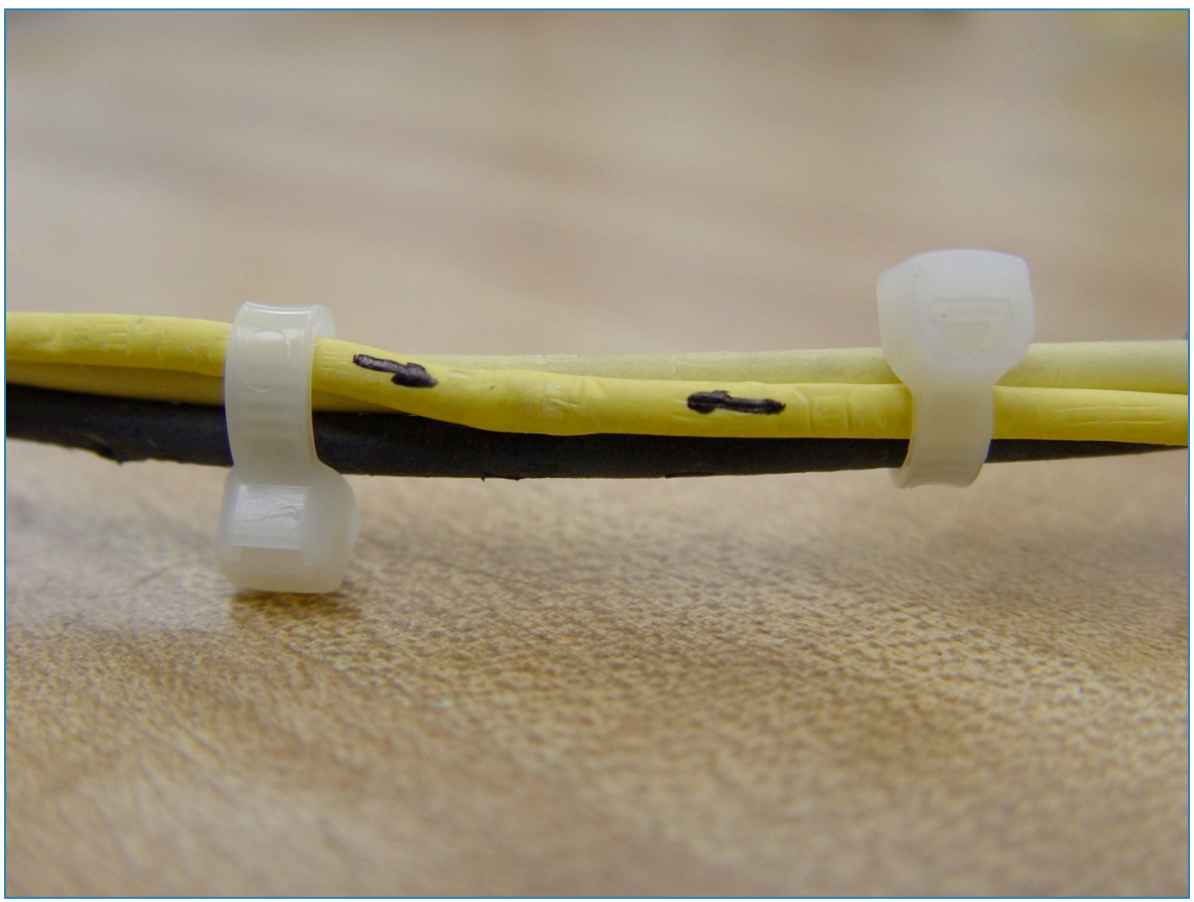
Notched

<u>Smooth Body</u> Reduces

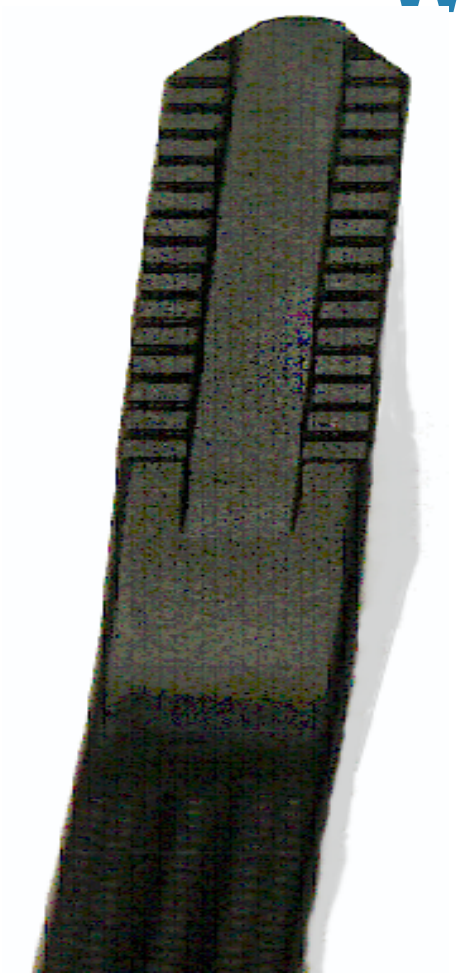
Stress Concentration Points

Under Tension

This Can Happen When Over-Tightening a Notched Tie!



Why Ty-Rap is Best



- Mechanics Grip
  - No slip tail for better grip while tensioning
- Turned Up Tail
  - Orients tail to head for easy assembly
  - Easier to pick up on flat surface

Selection

- Criteria for Selecting Ties
  - 1st = Environment ➡ Material
  - 2nd = Length
  - 3rd = Tensile Strength

Standard Nylon 6/6 Cable Ties

Cat. No.	Bulk Pkg. Cat. No.	Body Width (in.)	Length (in.)	Maximum Wire Bundle Dia. (in.)	Military Standard Part No.	Tensile Strength (lbs.)
TY523M	TY23M	.091	3.62	.625	MS3367-4	18
TY52315M	TYB2315M	.091	7.00	1.500	—	18
TY5232M	TY232M	.091	8.00	2.000	—	18
TY5234M	TY234M	.091	14.00	4.000	—	18

Selection
1st: Determine Environment

- 6 Selection Questions
  1. Indoor or Outdoor Use?
  2. Temperature Range?
  3. Flammability Requirements?
  4. Chemicals Present?
  5. Moisture Concerns?
  6. Radiation Present?

Match Environment to Suitable Material

Nylon 6/6 Products

- Standard 6/6
- Weather Resistant
- Heat Stabilized
- Extreme Temp
- Flame Retardant
- Detectable

Other Material

- Polypropylene
- Halar
- Tefzel
- Nylon 12
- Deltec
- Hook & Loop

Each Material Has Unique Strengths

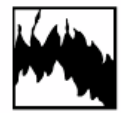
Standard Nylon 6/6

Most Versatile & Cost Effective

Nylon 6/6 Weather Resistant

ULTRAVIOLET RESISTANT

TEFZEL* Cable Ties



FLAMMABILITY

ULTRAVIOLET RESISTANT

RADIATION

Heat-Stabilized Ties

HIGH TEMPERATURE

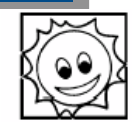
Nylon 12 Ties

WEATHER RESISTANT

ULTRAVIOLET RESISTANT

DELTEC®

WEATHER RESISTANT



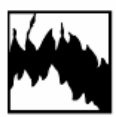
ULTRAVIOLET RESISTANT

Halar™* Cable Ties

LOW SMOKE

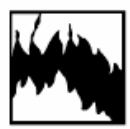
RADIATION

ULTRAVIOLET RESISTANT



FLAMMABILITY

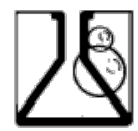
Flame Retardant Ties



FLAMMABILITY

Weather-Resistant Polypropylene

ULTRAVIOLET RESISTANT



CHEMICAL RESISTANT

Stainless Steel

FLAMMABILITY

ULTRAVIOLET RESISTANT

CHEMICAL RESISTANT

HIGH TEMPERATURE

RADIATION

Material Strengths

- **Nylon 6/6** - Natural
  - Lowest cost
  - High strength
  - Wide temperature range
  - Does not give off toxic or irritating by-products
  - Absorbs or releases moisture depending on environment
    - Moisture level does affect tensile strength & elongation

- **Nylon 6/6 Weather Resistant** (TY*M**X**) - Black
  - 2% Carbon black added to nylon resin
  - Increased resistance to ultraviolet light
  - NEW UV resistant colors

- **Nylon 6/6 Heat Stabilized** (TY**H,** TY**HT***) – Black, Tinted Green
  - Chemical stabilizers added to nylon resin
  - Provides 221° F (TYH) or 300° F (TYHT) continuous use

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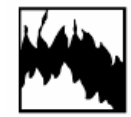
Material Strengths

- **Nylon 6/6 Flame Retardant** (TY*M**FR**) - White
  - Meets U.L. 94V-0 flammability requirements



- **Nylon 12** (TY**C***) - Black
  - Absorbs very little moisture, weather resistant
  - Better chemical resistance than nylon 6/6
  - Is weaker in tensile strength, but extremely flexible

- **Weather Resistant Polypropylene** (TY**P***) - Black
  - Greater chemical resistance than nylon
  - Lower tensile strength than nylon
  - Weather resistant against ultraviolet light
  - Absorbs little moisture, weather resistant

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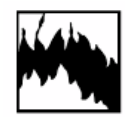
Material Strengths

Tefzel (TYZ*) - Aqua

- Resists wide range of chemicals
  - Including hydrochloric, sulfuric acids
- Radiation resistant up to 200 megarads
- Withstands high temperatures / ultraviolet light
- UL flammability 94 V-0

Halar (TYV*) - Maroon

- Low smoke density when burned
- 94 V-0 flammability rating
- Resists wide range of chemicals
- UV resistant



Delrin (DELTEC® TYD*) - Black

- Resists solvent, oil, gasoline & other petroleum products
- Also resists weak acids & ultraviolet light
- Is self-extinguishing per UL94 HB
- 250 pound tensile strength
- Extremely weather resistant (20 year life)

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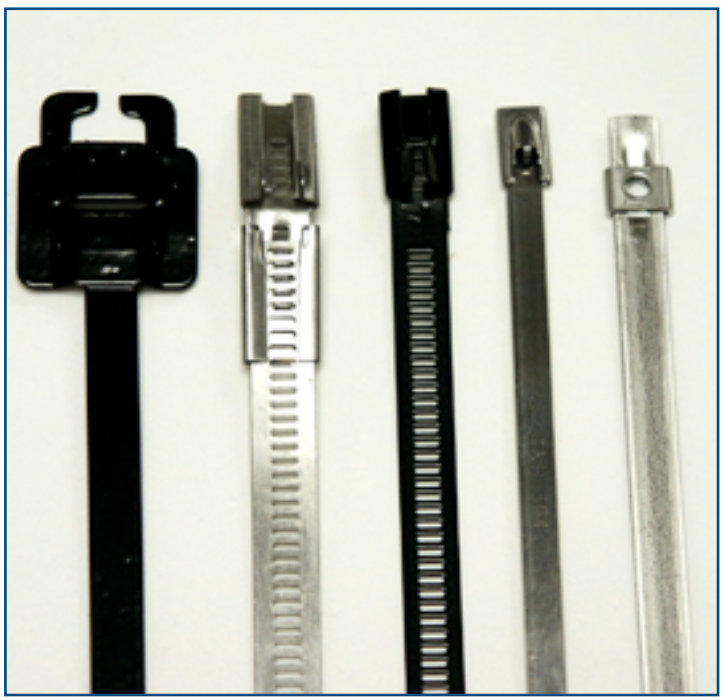
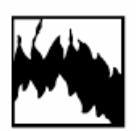
Material Strengths



- Stainless Steel Cable Ties (SS*, LS*, TS*, TYS*)
  - Resistant to wide range of chemicals
  - High tensile strength
  - Withstands high temperatures to 1000°
  - Not affected by UV rays
  - 302/304 stainless steel (standard)
  - 316 stainless for high corrosive areas
  - Highest cost


FLAMMABILITY


ULTRAVIOLET RESISTANT


CHEMICAL RESISTANT


HIGH TEMPERATURE


RADIATION


Type LS
Heavy-Duty Stainless Steel
Ball-Lock Cable Ties — Uncoated


Type LS
Heavy-Duty Stainless Steel
Ball-Lock Cable Ties — Coated

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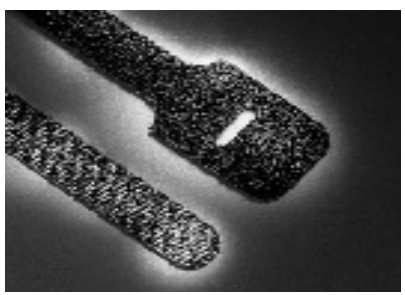
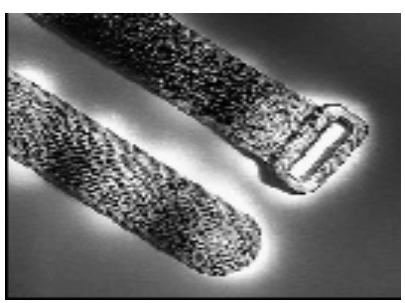
Ty-Grip® Hook & Loop Fasteners





- Releaseable, Re-Useable
  - Temporary bundling
  - Where access is frequent
  - Wide bearing surface for Datacom cables
- Durable Material
  - 40/50 lb tensile strength
- Multiple Styles
  - FO, FOL, FOR, FOS Series
- Multiple Colors
  - Aesthetics or Identification

Detectable Ty-Rap Cable Ties

- Objective & Problem Solved
  - Provide a Ty-Rap cable tie that reduces contamination problems during customers' manufacturing processes, who use detection equipment
- Markets Served (Industrial MRO)
  - Food processing (bakeries, beverages, candies, etc.) - SIC 20
  - Pulp & paper (lumber, etc.) - SIC 26
  - Pharmaceutical (drugs, etc.) - SIC 28
  - Chemical (paint, etc.) - SIC 28
  - Automotive (air bags, tires, etc.) - SIC 37/42
- Detection Equipment Types
  - Metal detectors - measures metal concentration (ferrous)
  - X-ray machines - measures density changes
  - Vision detection – camera compares vs. good product picture (polypropylene, colored)
- Material Types
  - Nylon (standard) and polypropylene (floating) materials

Selection
2nd: Determine Length/Bundle Diameter

- Max size of wire bundle determines length of tie
- 15 popular lengths from 4 inches to 4 feet
  - 18 lb: 4”, 6”, 8”
  - 40 lb: 6”, 8”, 11”, 14”, 24”
  - 50 lb: 5”, 7”, 11”, 14”
  - 120 lb: 8”, 11”,14”, 18”, 24”, 28”, 30’
  - 175 lb: 24”, 34”, 36”, 41”, 45”, 48”

Natural, Black, or Colors
Bulk or Distributor Packs

Cable Ties

Body Width (in.)	Length (in.)	Maximum Wire Bundle Dia. (in.)	Military Standard Part No.	Tensile Strength (lbs.)
.091	3.62	.625	MS3367-4	18
.091	7.00	1.500	—	18
.091	8.00	2.000	—	18
.091	14.00	4.000	—	18

Selection
3rd: Required Tensile Strength

- Measurement of strength of cable tie
  - Established under Mil Spec. MIL-S-23190
  - Directly related to width, thickness, material, locking design
- Stated in pounds

LBS.	
18	Miniature
30 - 40	Intermediate
50	Standard
120	Heavy Duty
175	Extra Heavy Duty

- All T&B ties meet or exceed rated values

Cable Ties

	Body Width (in.)	Length (in.)	Maximum Wire Bundle Dia. (in.)	Military Standard Part No.	Tensile Strength (lbs.)
	.091	3.62	.625	MS3367-4	18
M	.091	7.00	1.500	—	18
	.091	8.00	2.000	—	18
M	.091	14.00	4.000	—	18

Ty-Rap® Numbering System

- 1958 - Started with 7 sizes:
  - TY3 thru TY9
  - TY**2**3-TY**2**9 signified addition of “Ribs & Stipples”
  - Ty-Rap® identifier - TY23**M** suffix for Metal Barb
  - Expanded variations adding to original #’s
  - “TY**5**” means Distributor Pack

TY523M

100

Dist. Pack

TY23M

1,000

Bulk Pack

Ty-Rap® Accessories & Specialty Products

- Mounting Bases
- Identification Ties
- Clamps and Straps
- Reusable Cable Ties
- Plug-Ty™, Drive-Ty™
- Buttonhead Tie
- Lashing Ties
- Messenger Hanger Straps
- Stainless Steel Cable Ties
- Deltec™ Cable Ties
- Ty-Grip Hook & Loop
- Spiral Wrap & Grommeting

Ty-Fast®

- 1970 Competitor Introduction of Nylon Tie
  - 1993 T&B Develops the Ty-Fast® Brand
  - 1995 T&B purchases Catamount®

T&B®
The ALL NYLON TIE

- Primary Use: High Volume OEM
- Obsoleted in 2005 in US in lieu of Catamount
- Ty-Fast Brand still used in Europe

Catamount® Cable Ties

- Acquired in 1995
- Added to 1-piece cable tie offering
- Low cost market supplier
- Primary Customer base
  - Retail
  - HVAC
  - Special markets

Catamount® Cable Ties Story

- Catamount cable ties fit the needs of general-purpose fastening applications
- They offer durability with an economical price for bundling a variety of commercial and residential market applications

Why Buy Catamount® Cable Ties?

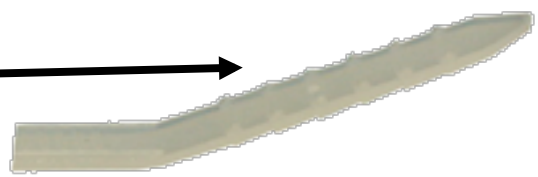
- Provides value priced cable tie offering
- Made In Portland, TN, USA (ARRA approved)!
- Leader in HVAC market
- UL Recognized, CSA Certified, and CE Declaration

UL Approvals

- Ty-Rap Packaging
  - UL Listed:
    - All sizes and colors in TY23 - TY29 offering
  - UL Recognized:
    - Specialty Ties
    - Accessories
- Catamount Packaging
  - UL Recognized

Catamount Ties

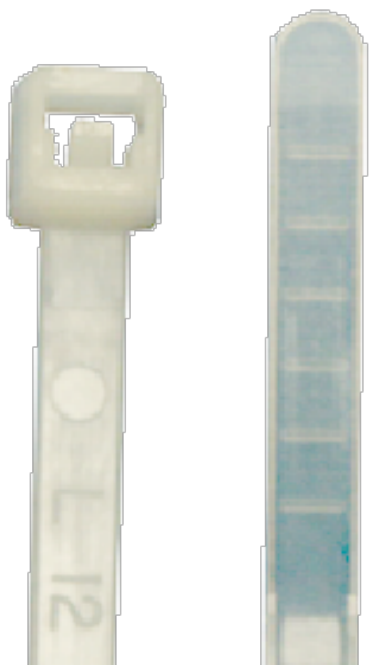
- Integrally formed nylon pawl
  - Low insertion force
- Tail has:
  - Mechanic's grip
  - Sure grip tab
  - Turned-up tail design



- More economical to manufacture than two piece cable ties

Catamount Product Designs - How Can You Tell the Difference?

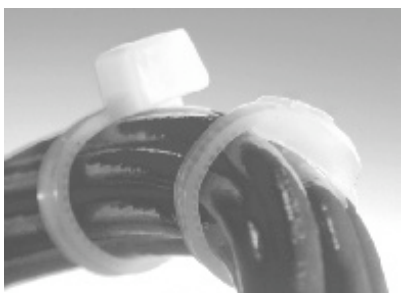
- Rounded Head
- Pointed Tail
- “TF” or “TB” Stamp
- No Slip Tail



- Square Head
- Blunt Tail
- “L” Stamp

Design Consolidation to Rounded Head

New Products
Safe-Ty Cable System



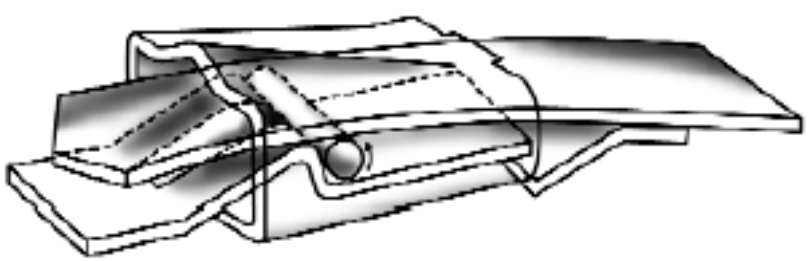
- Low profile head
  - Reduces bundle clearance
- Safeguard wall
  - Eliminates sharp edges
- Saddle back
  - Fits snug on bundle contour
- Nylon 6/6 construction
  - Various sizes, colors

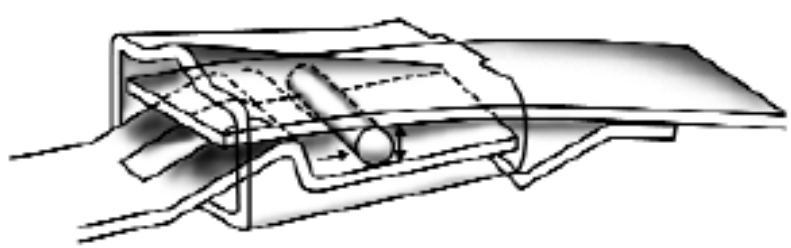
TS Series Roller Lock Stainless Steel Ties

- Roller Lock (TS Series) vs. Ball Lock (LS Series)
  - Less slippage
  - Higher tensile values
  - Lower profile
- Spring back feature for bundle tightness
- Flush cut with the DAS-250 Self Lock Tool
- Higher insertion force

Type LS
Heavy-Duty Stainless Steel
Ball-Lock Cable Ties — Uncoated

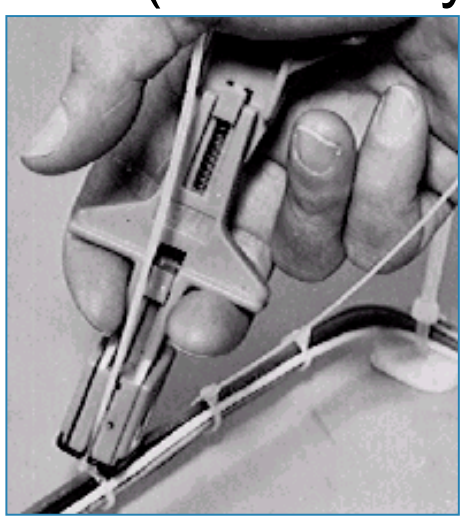
Type LS
Heavy-Duty Stainless Steel
Ball-Lock Cable Ties — Coated





T&B Offers All Types of Fastening Tooling

- Manual - Cinches/Twists Off Tail (1-100/Day)
- Ergonomic Manual - Tensions/Cuts Off Tail (100-1,000/ Day)
- Semi-Automatic (Pneumatic) - Tensions/Cuts Off Tail (1000+/Day)



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