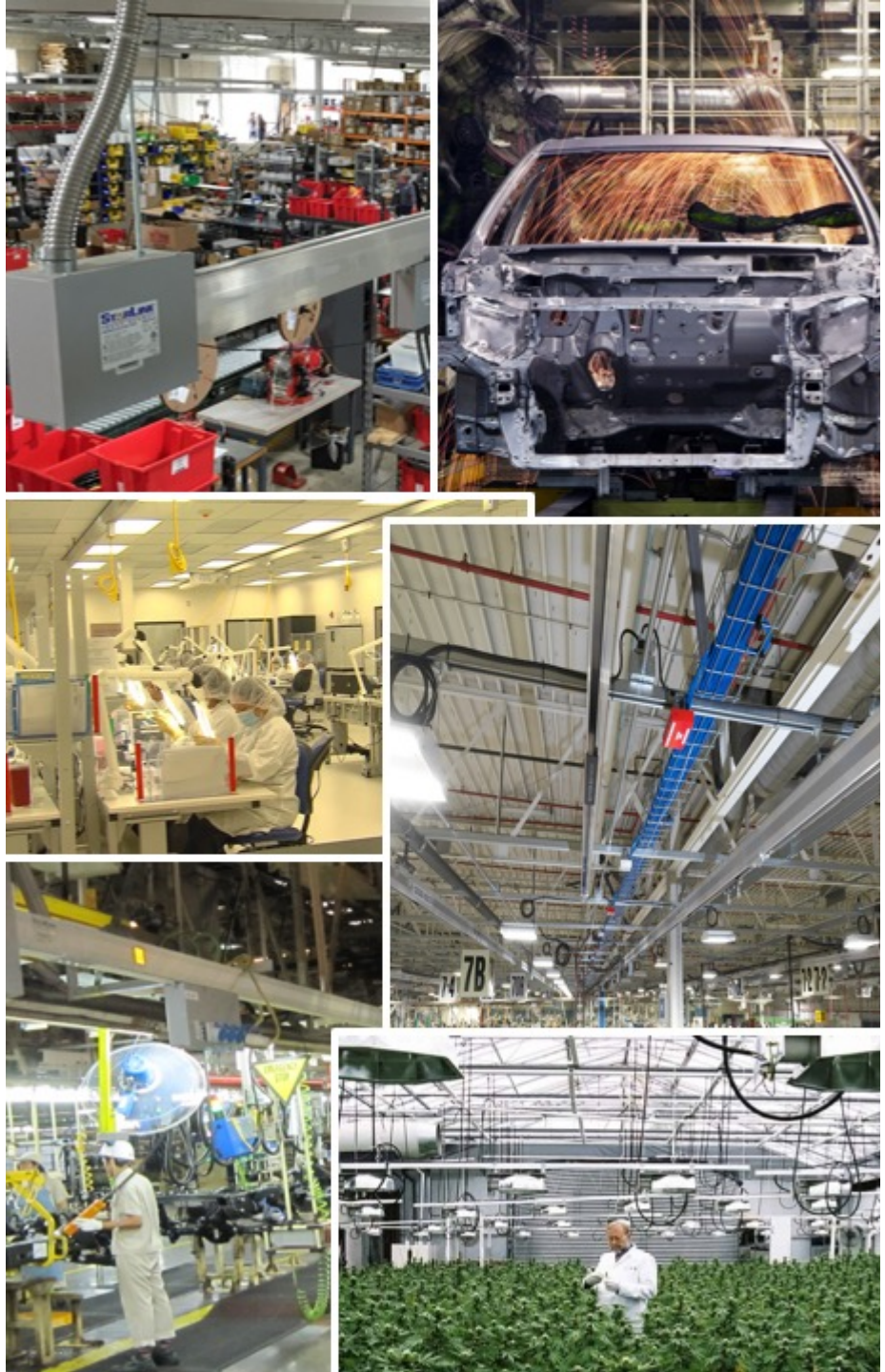


Starline®

A brand of legrand®

Flexibility for Change:

How Busway is Becoming a Skeleton Key for Industrial Operations

Data, Power & Control

AGENDA

Introduction to Starline

- A brand of **Legrand North & Central America**
- **85+ years** as an electrical contractor and electrical manufacturer
- Headquartered near **Pittsburgh, PA** with manufacturing sites also in the **UK** and **Singapore**
- **172,000 sq. ft.** state-of-the-art manufacturing facility

Legrand North America (restructured in 2020)

EWS

Electrical Wiring Systems

Cablofil
Wiremold
Luxul
NuVo
On-Q
Pass & Seymour

Channels: Electrical, Retail

DPC

DAT

Ortronics
Quiktron
Integra Optics

CCB

Legrand Cabinets & Containment

Channels: Datacom, IT, Integrator

PAC

Raritan
Server Technology

BUS

Universal Electric

Channels: Datacom, IT, Reseller

AV

Commercial A/V

Legrand AV
Middle Atlantic
C2G
RapidRun

Channels: AV Integrator

BCS

Building Controls

Qmotion
Solarfective
WattStopper
Vantage

Channels: Lighting, Custom

Lighting

Architectural Lighting

Pinnacle
OCL
Finelite
Kenall

Channels: Electrical

Flexibility for Change Introduction

- To survive today's fast-paced business world, flexibility, adaptability, and scalability are most important for manufacturing and industrial facilities
- A reliable and reconfigurable power distribution system is an essential element for these facilities

Current Situation

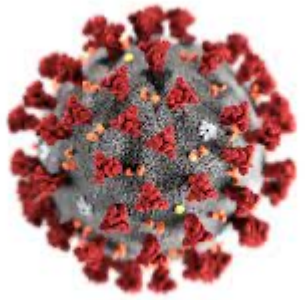
- Lack of flexibility in adapting to changes
- Increased downtime costs
- Lack of scalability
- Not environmentally friendly
- Total Cost of Ownership (TCO) increases over time

Current Challenges Faced by Manufacturing & Industrial Firms

- **New/Upgraded Equipment**: Old/obsolete must be replaced
- **Production Layout Changes**: Changes made to improve productivity or smooth out production problems
- **Facility Changes/Expansions**: Building an additional manufacturing facility for future growth

Current Challenges Faced by Manufacturing & Industrial Firms

- **Geographic Changes**: Relocation or opening of second facility
- **Market Changes**: New competitors entering the market
- **Unexpected Events**: COVID-19 / Social Distance requirements within a facility



Challenges of Reconfiguring Power Distribution Systems

- Challenges manufacturers face:
  - The installation window for these changes is often very tight, work must be done quickly and efficiently
  - Lost productivity from downtime
  - Future proofing

Disadvantages of Traditional Pipe & Wire Systems

A Starline survey found that 84% of manufacturers will make at least one significant change to their electrical power distribution system per year, often in accordance with changes on their factory floor.

- For Pipe & Wire, each change typically requires 2 weeks of labor
- Numerous disadvantages to traditional Pipe & Wire Systems

Disadvantages of Traditional Pipe & Wire

DISADVANTAGES OF PIPE & WIRE

- Lack of Flexibility and Scalability
- Total Cost of Ownership (TCO) increases over time
- Safety Issues: extension cords and OSHA violations
- Maintenance and Repair Issues for Machinery
- Lack of Future Proofing

DISADVANTAGES:
LACK OF FLEXIBILITY
AND SCALABILITY

Lack of Flexibility and Scalability

- These are the biggest drawbacks in traditional pipe & wire systems because:
  - Traditional pipe & wire systems often require complex layout planning and design
  - Electrical conduit and wiring are often hard-wired into the walls and ceiling of the facility
- Lack of flexibility and scalability for adding power loads, usually requiring rewiring of their system to handle new amperage loads
- Implementing changes reduces productivity

DISADVANTAGES: INCREASED TCO OVER TIME

Increased Total Cost of Ownership (TCO) Over Time

- Over the years, a traditional pipe & wire system must be reconfigured and rewired several times to keep up with machinery and layout changes
- TCO of the system increases dramatically over time, due to the ongoing labor costs of rewiring the system

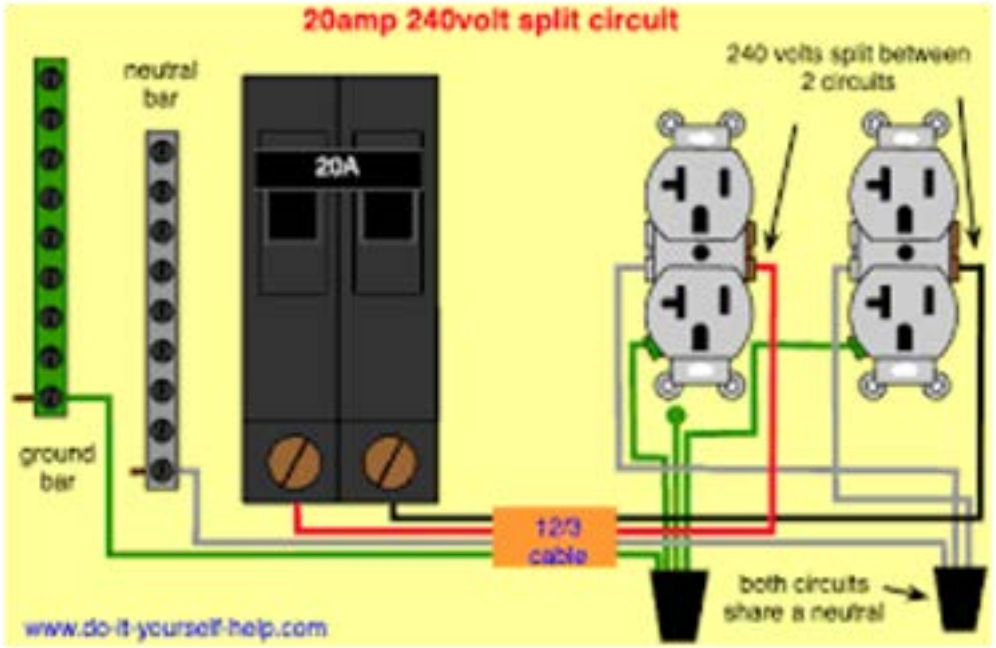
DISADVANTAGES:
SAFETY ISSUES

Safety Issues

- Potential overheating of extension cords
- Tripping hazards
- Potential OSHA violations

Maintenance and Repair Issues for Machinery

- Upstream main or branch breakers may feed power to multiple machines in an assembly line or other production area
- Breakers must be turned off



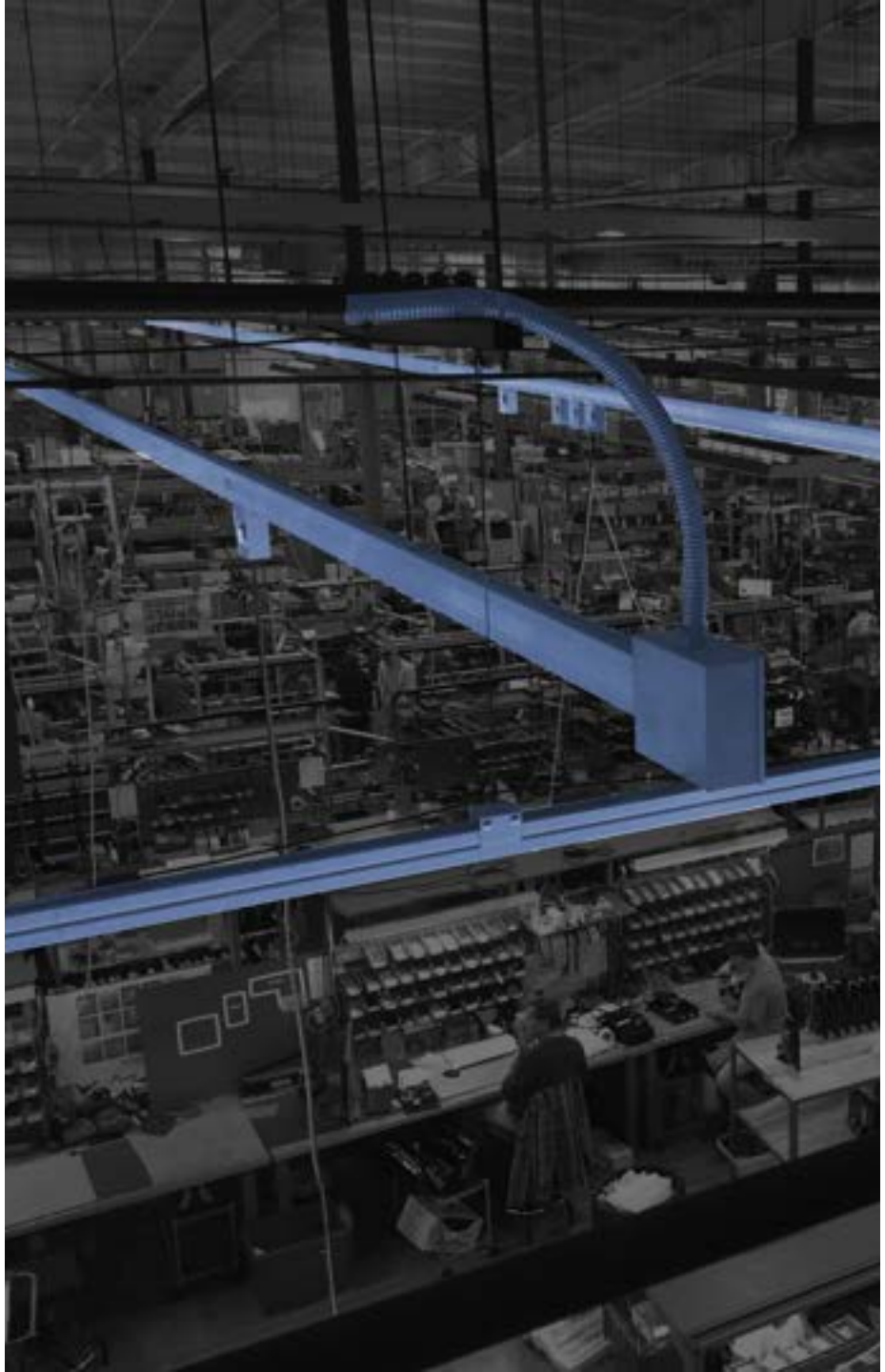
DISADVANTAGES: LACK OF FUTURE PROOFING

Lack of Future Proofing

- Changes in manufacturing facilities are never permanent
- Rewiring of pipe & wire systems are costly and time consuming, not conducive to scaling facilities

INTRODUCING...

Starline Track Busway

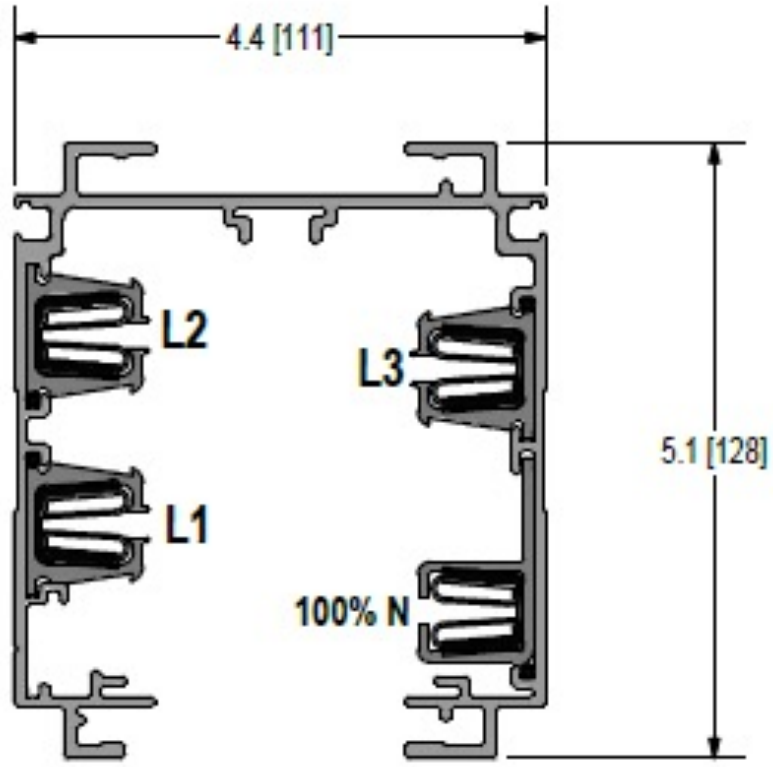


Track Busway System

A track busway system offers high-performance power distribution for machines and equipment with high power needs.

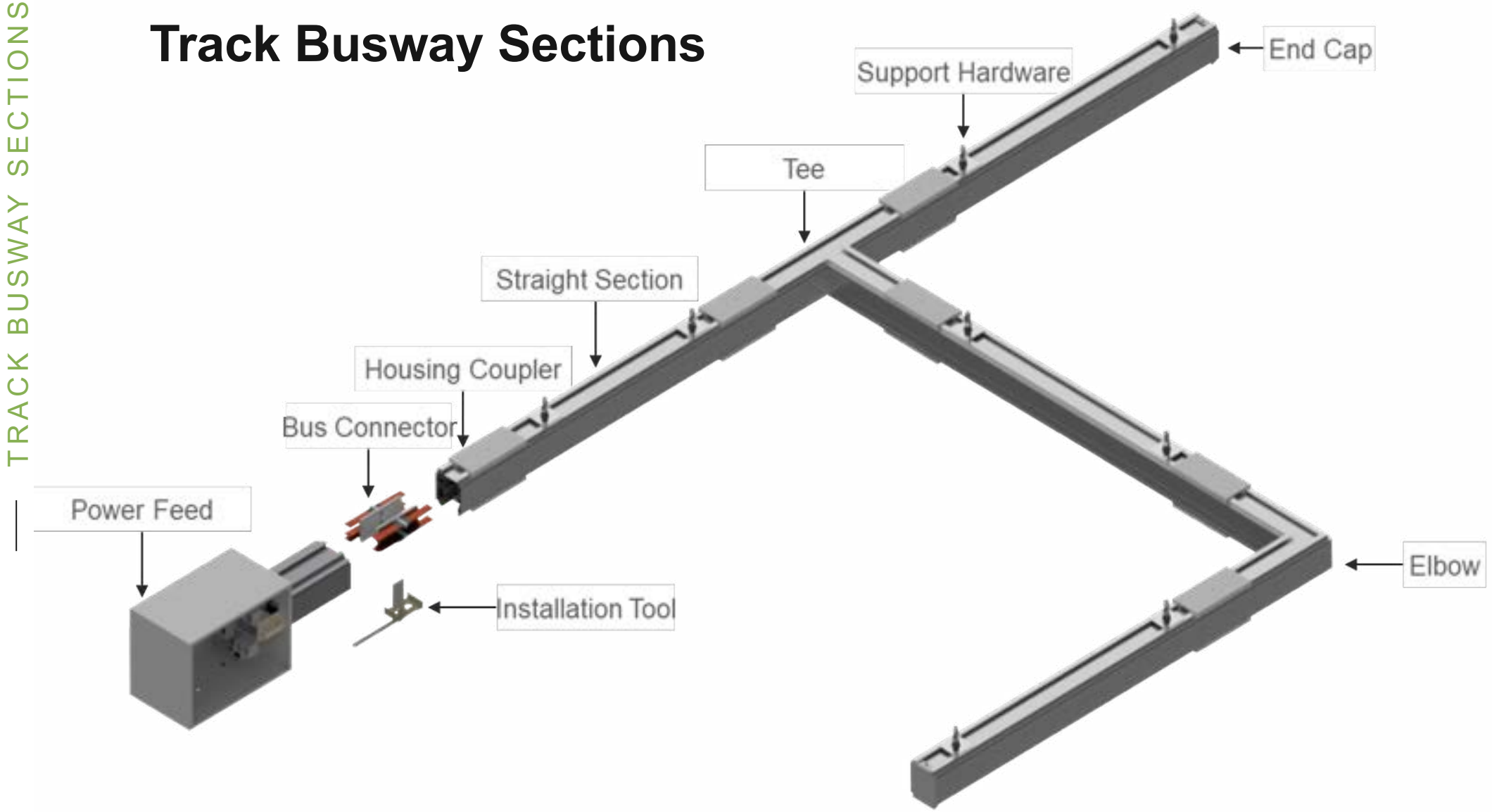
An open channel track busway consists of:

- U-shaped aluminum shell, with copper or aluminum busbars
- Continuous access slot (the "open channel")



A cross-section of a track busway, with the aluminum housing, busbars, and open channel

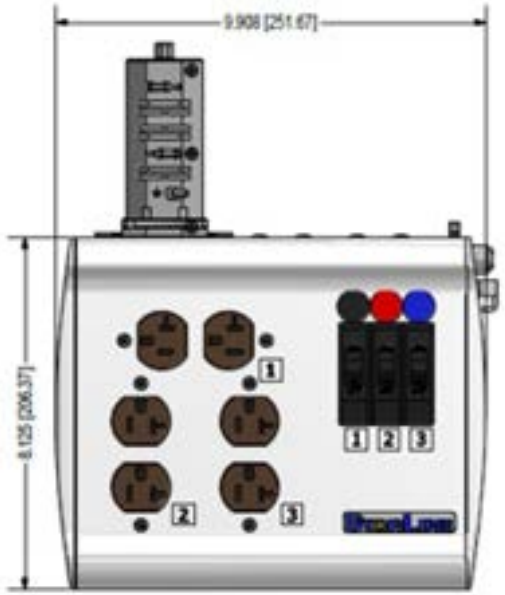
Track Busway Sections

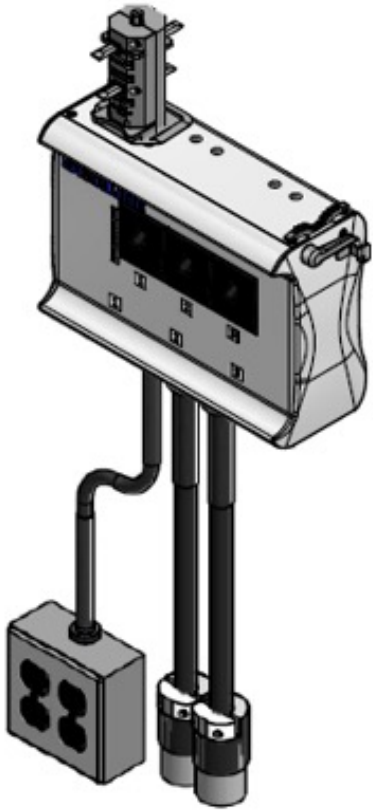


Plug-In Units

- Integrates both the circuit breakers and the electrical outlets that are used to supply power to machines on the factory floor
- Plug n' Play: Takes one minute to install it, no tools required
- Customizable

Plug-In Units





- Millions of combinations
- Plug n' Play, safe design
- Benefits: Maximum customization, factory installed, 100% testing rate, relocation in minutes, on-going savings, etc.

Busducts

- Permanently mounted enclosed metal ducts with limited ports
- Need to bring the machines to the power source
- Lack of flexibility
- Costly and troublesome

Busways (Open-channel)

- Bring the power to the machines
- Extremely flexible
- Compatible with plug-in units to supply power anywhere on the floor
- Cost efficient

Advantages of a Track Busway System

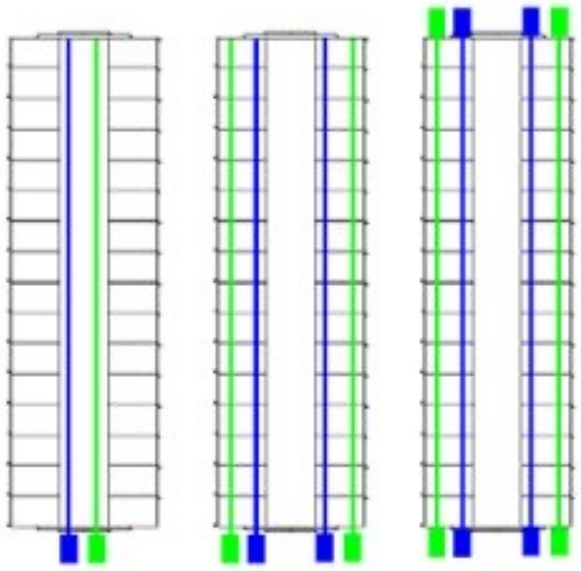
- Flexibility for Change
- Scalability
- Easy Installation
- Localized Power Delivery
- Linear Design
- Reusable Components
- Easier Maintenance and Repair for Machinery
- Safety
- Future Proofing

Advantages of a Track Busway System

- Flexibility for Change
  - Not hard-wired into the ceiling or walls
  - Flexible for quick changes in the layout of the power distribution system

Advantages of a Track Busway System

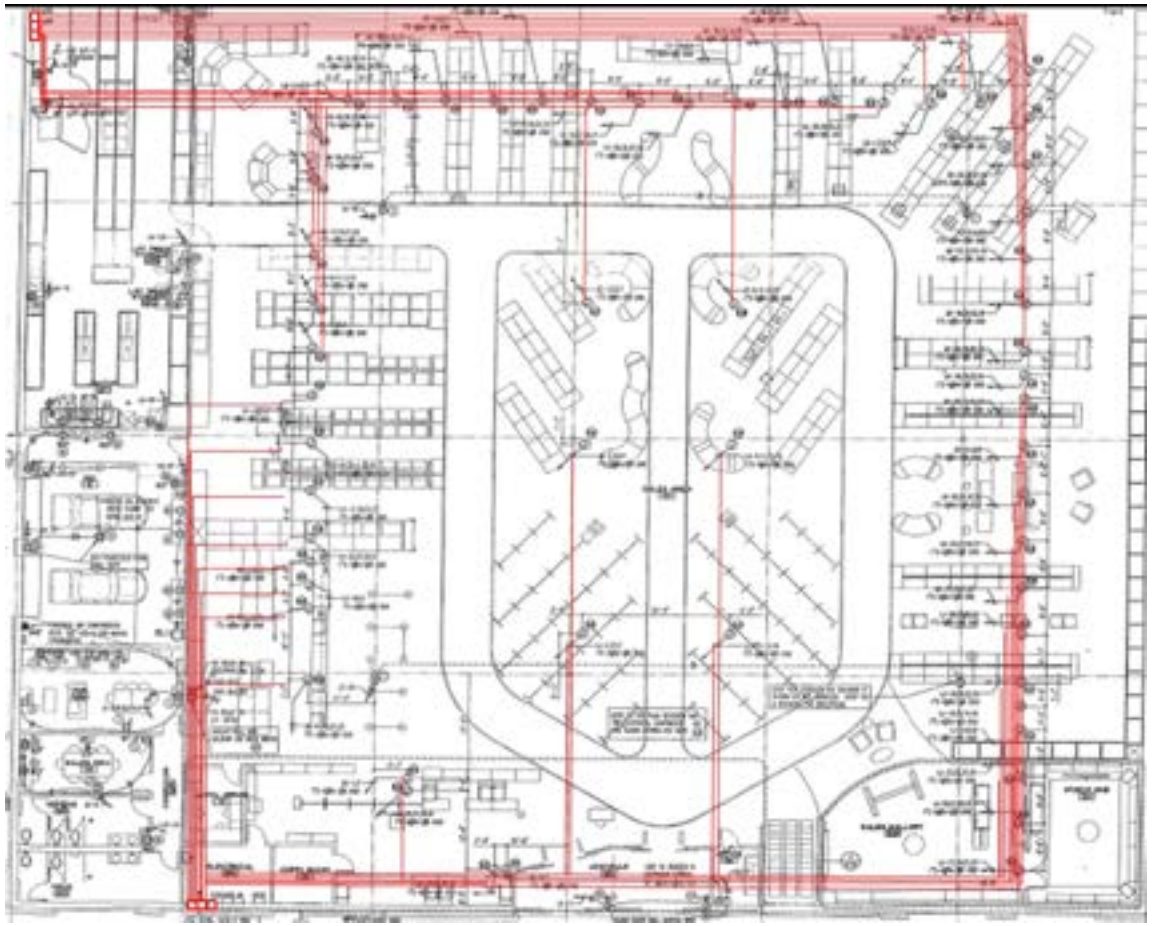
- Scalability
  - Track busways grow with you
  - Easily add additional busway sections to existing grid to distribute power to new machines



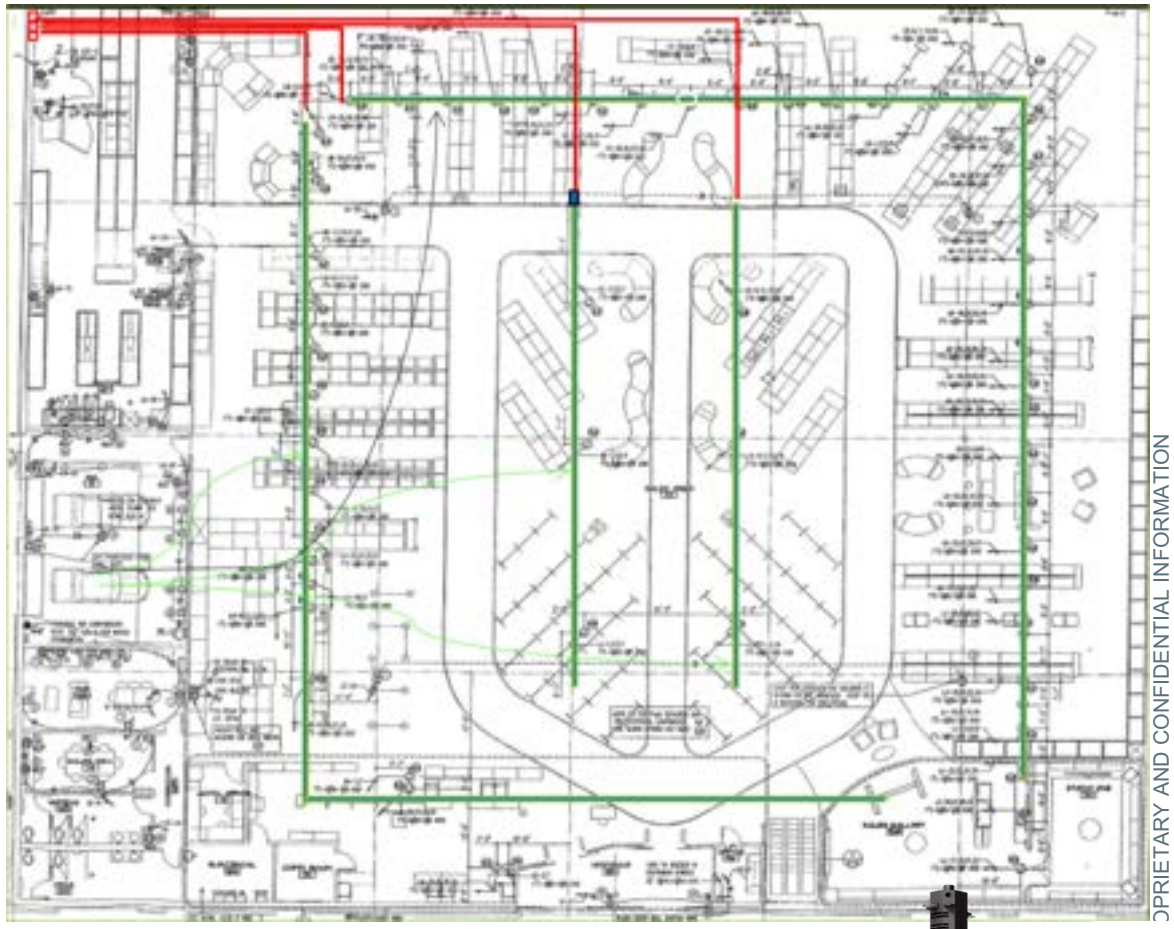
Advantages of a Track Busway System

- Easy Installation
  - Track busway systems can be installed up to 90% faster than traditional pipe & wire systems with less labor
  - Takes just a few hours or overnight

Layout Reconfigurations



VS



Electrical
conduit & wire

Starline®
A brand of legrand®

Advantages of a Track Busway System

- Localized Power Delivery
  - Circuit breakers can be engaged at the point of use near assembly lines and workstations
  - Bring the power source to the machines instead of the other way around

Advantages of a Track Busway System

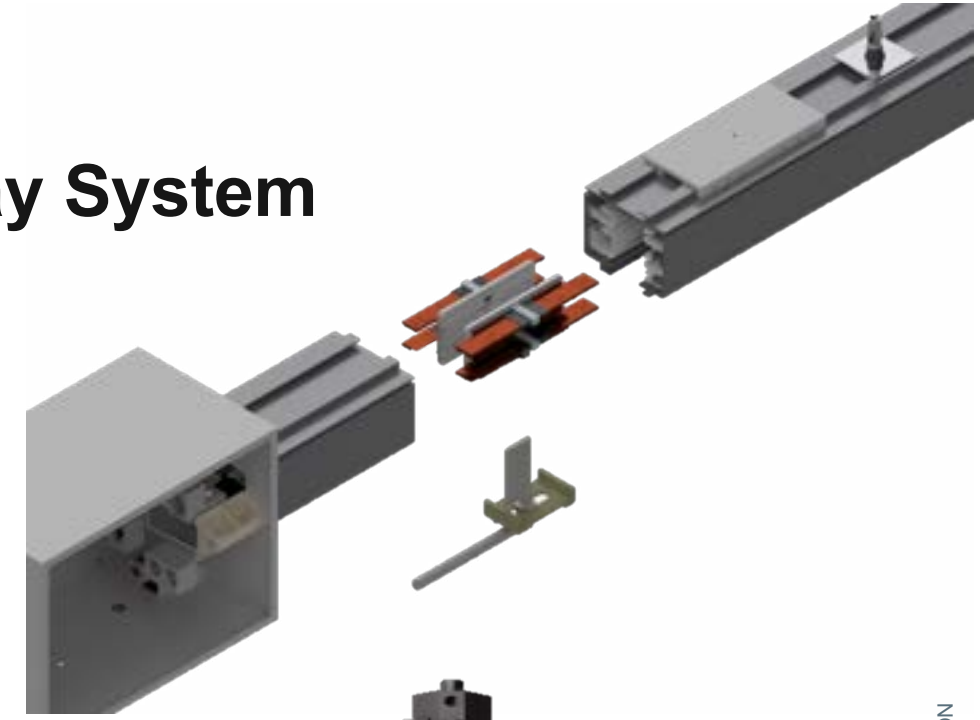
- Linear Design
  - Track busway is much more organized than a traditional pipe & wire system
  - Makes it easier to design, install, maintain, and make changes to the system layout

Advantages of a Track Busway System

- Reusable Components
  - Track busway sections and plug-in units are reusable and can be moved from one location to another

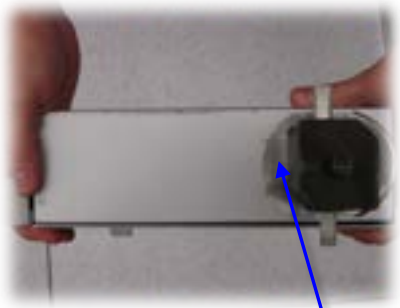
Advantages of a Track Busway System

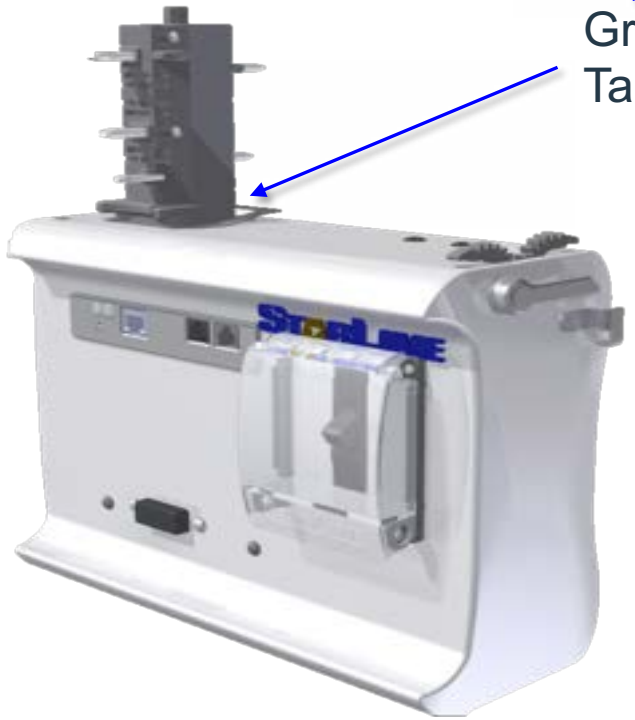
- Easier Maintenance and Repair for Machinery
  - Easier to do maintenance and repair on individual machines on the factory floor
  - Can switch out plug-in units while the track busway is live, without cutting power to other machines powered by the busway



Advantages of a Track Busway System

- Safety
  - All track busway systems have built-in safety features
  - Includes a ground path (earthing) system throughout its enclosure and plug-in units
  - Don’t need unnecessary power cables and extension cords since plug-in units supply localized power to machines overhead, eliminating potential fire/OSHA violations





Advantages of a Track Busway System

Safety – Electrical Characteristics

- All major components in system are labeled, including:
  - Busway pieces, plug-in modules, and end feeds
- Labels will contain important voltage and current characteristics as it pertains to that item.
  - Examples: Maximum Amps, System Voltage, Load Volts

Advantages of a Track Busway System

- Future Proofing
  - In March 2020, a major Detroit-based auto maker was assigned by the federal government to manufacture medical equipment for the COVID-19 pandemic
  - In less than 2 weeks, the company converted an Indiana auto facility to produce critical care ventilators to be used in hospital treatment of COVID-19 patients

Cost Comparison of Pipe & Wire VS Track Busway Systems

- Two types of costs to look at when comparing pipe & wire vs track busway systems:
  - Cost of installation
  - Total Cost of Ownership (TCO) over the life of the system

Cost Comparison

Compare the cost of installation for both types of systems.

PIPE & WIRE - CONVENTIONAL APPROACH

DESCRIPTION

Qty. 15—20amp Circuits:
- Install 5 ¾ conduit runs with 3 20amp circuits per run no shared neutrals, runs spaced 20' over 100' span beginning 150' from panel board. 120amp receptacle with RS covers per circuit.
- All conduit run on strut rack to location.
- Provide pipe support every 6' over 250' span (43 supports)
- Support provided at each box location (15 supports)

LABOR

Description	*Man Hours*
Install ¾ pipe, boxes, and fittings (Est. 1100', 15 box locations)	43.2
Install supports 10min per x 40	6.6
Pull wire (5runs, 7conductors per)	12.0
Install devices 15min per	3.8
Total Man Hours:	***65.6***
$	97.50
TOTAL LABOR COST:	**$ 6,989.08**

BILL OF MATERIAL

Qty	*Description*	*Cost*
15	15—20amp breakers	$ 98.99
1	¾ EMT estimate 1100'	$ 418.00
30	Box connectors, 110 Couplings	$ 40.00
3	Wire 1000' per roll red, black, blue, green. 3000' white rolls	$ 509.00
15	Boxes, R/S covers, 20amp receptacle	$ 56.00
6	Sticks strut, box ¾ strut straps, misc.	$ 120.00
	TOTAL MATERIAL COST:	**$ 1,357.16**

TOTAL COST (Material + Labor): *$ 8,346.24*

OPEN-CHANNEL BUSWAY

DESCRIPTION

100amp Feeder and Busway Install:
- Install 100' 100A 3-phase feeder to end feed.
- Utilize three breaker spares within main panel.
- Mount/hang 100A end feed and 100' busway (20'x 5, 10' rod spacing with end support).
- Run 1 ½ EMT with fittings and support hangers to end feed.
- Install deck anchors for busway, hang busway, and splice with tool provided.

LABOR

Description	*Man Hours*
150' 1 ½ EMT with fittings	9.5
Pull wire and terminate	4.0
Hang busway with anchors (1hr. per 10' 15min. per end feed	12.3
Total Man Hours:	***25.8***
Rate per hour:	$ 97.50
TOTAL LABOR COST:	**$ 2,743.43**

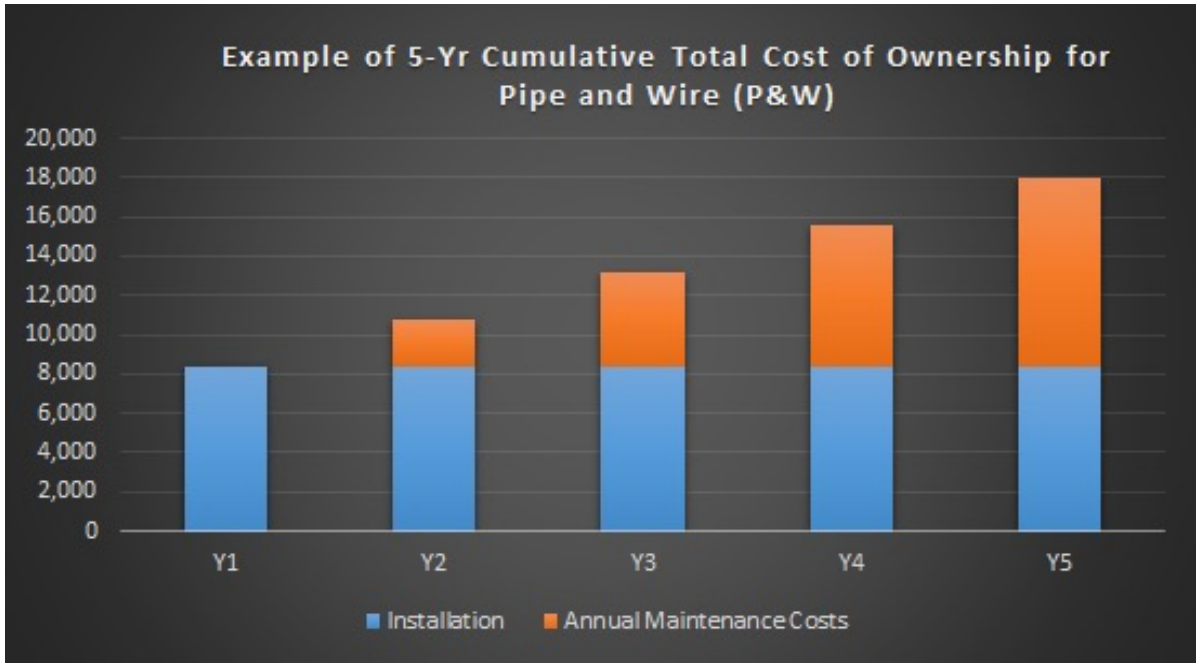
BILL OF MATERIAL

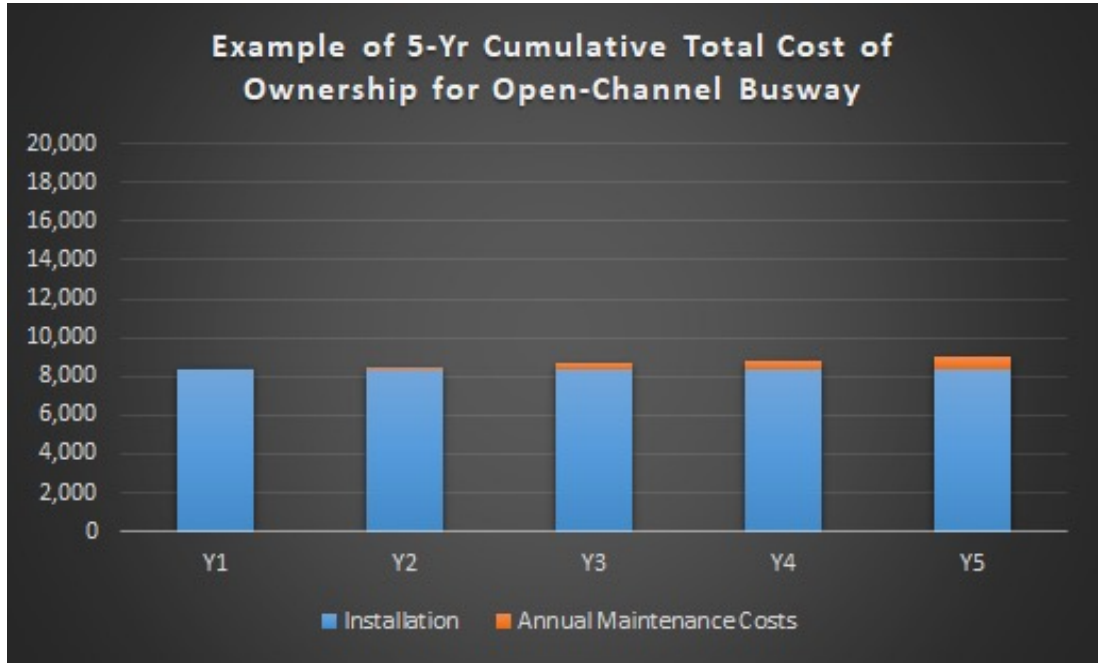
Qty	*Description*
5	20 ft long,100A, 600V Busway, 4pole/gd
1	End-Feed Power Supply, 4P, 100A, 10kA, 600V, UL
1	End Cap
12	TB/FB Hanger Bolt w/ 3/8 Rod Coupler
5	Housing Coupler, 60A
15	15A 120V Rec//Fuse/Blue Plug in Units
	TOTAL MATERIAL COST: $ 5,602.30

TOTAL COST (Material + Labor): *$ 8,345.73*

Cost Comparison

Now compare the TCO cost between traditional pipe & wire and a track busway system:





More Information

To download Starline's White Paper on Flexibility for Change: How Manufacturing and Industrial Companies Can Use Track Busways to Create A Customized, Flexible, and Scalable Power Distribution System in Their Facilities, please visit:

www.starlinepower.com

THANK YOU!

Questions welcomed.