Steel Tube Institute™

Conduit Beats MC Cable in a First-10-years Cost Comparison

Commercial building owners save with every change and expansion

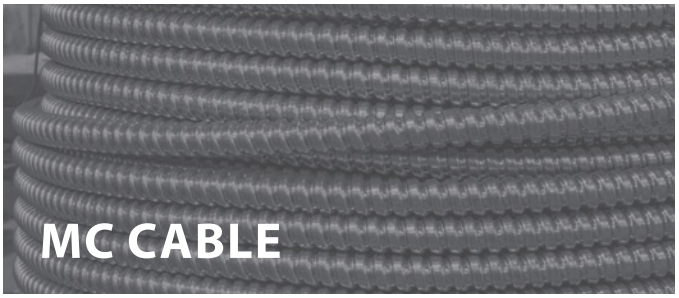
Most commercial buildings undergo renovations and upgrades every few years to accommodate new business needs and new tenants. It's important to keep this in mind when selecting a wiring method for a new building, because long-term costs can far outweigh savings on initial installation. To help you understand all the cost factors over time, the Steel Tube Institute offers this first-10-years cost analysis of a typical commercial building wired with steel conduit vs. MC cable.

A side-by-side comparison of not only the initial cost of installation, but also the costs of several upgrades and / or repairs, is investigated. These scenarios were chosen because they could reasonably occur in a modern building in today's construction and business climate. While each scenario could be outlined in multiple ways, care was taken to choose a practical and conservative course of action, so as to not provide bias to either electrical raceway in the comparison.

Initial Installation

This hypothetical commercial building is three stories tall. The first floor contains retail space and the third floor contains office space. The second floor, the focus of this comparison, is intended for office space.

Many contractors would choose MC cable to wire this type of building, but conduit is a fully compliant and cost-effective alternative.



MC CABLE

Feeders

- 155' of MC cable — four 3/0 THHN copper, and one 4 AWG bare copper
- Two MC connectors
- 35 MC cable straps
- 70 #10 pan head screws
- Labor to install MC cable (concealed within walls and/or ceiling not exposed to damage)

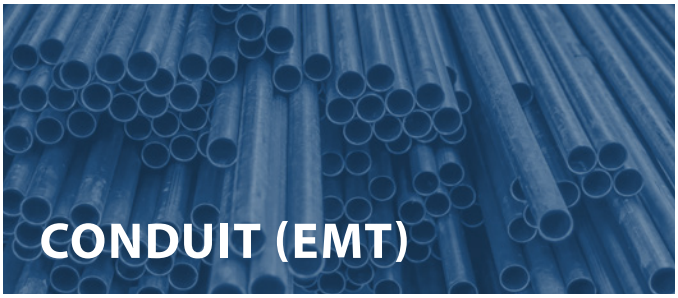
Office Space

- 4,320' of 12/2 MC cable
- 720 MC connectors (12 per office x 60 offices)
- 1,560 MC cable straps (26 per office x 60 offices)
- 1,995 #10 pan head screws (26 per office for straps, 435 for home runs)
- 52 MC connectors for home runs
- 435 MC cable straps for home runs
- Labor to install MC cable

MC Cable Initial Installation		
	FEEDERS	**OFFICE SPACE**
Materials	$2,425.63	$22,947.07
Labor	$938.93	$10,378.80

INITIAL COST

$36,690.43



CONDUIT (EMT)

Feeders

- 150' of 2" EMT
- Two 2" EMT set-screw connectors
- 14 EMT set-screw couplings
- 465' of 3/0 THHN/THWN copper wire
- 155' of 1/0 THHN/THWN copper wire
- 17 2" EMT two-hole straps
- Labor to install EMT, bend two 90º elbows, pull in the 4 conductors

Office Space

- 8,640' of 12 AWG THHN copper wire
- 4,320' of ½" EMT
- 400 ½" EMT couplings
- 60 ½" EMT connectors
- 60 J-boxes at 4 11/16" x 2 1/8"
- 60 J-box blank covers
- 100 ½" EMT straps
- 100 1" x #10 pan head screws
- Labor to install EMT & 12 AWG
- Labor to wire each office

Conduit Initial Installation		
	FEEDERS	**OFFICE SPACE**
Materials	$1,704.12	$11,643.35
Labor	$2,526.62	$24,924.00

INITIAL COST

$40,798.09

Year 4: A Short Is Discovered

Four years after the initial installation, a short is discovered in the main power feeder, which measures 150 feet from the service to the distribution panel. Because so much time has passed since installation, the problem is the responsibility of the building owner, not the contractor. Consider each of the following scenarios.

MC cable: The feeder is located in an exposed or accessible area, such as above a suspended ceiling. In this case, the MC cable must be removed and replaced, along with approximately 65 ceiling tiles. The repair work interrupts business for two days, unless the building owner pays overtime to complete the work within one day.

Conduit: The feeder is located inside EMT with no junction / pull box and with two 90° elbows built into the run. One phase conductor shorted to ground, and a Megger test on the de-energized system shows the insulation on the other conductors is within factory specifications. All four conductors must be removed; the damaged one is replaced, and all four are reinstalled. The repair work interrupts business for only half a day, and it requires no removal or replacement of building finishes.

Year 4 Costs

	MC CABLE	CONDUIT
Materials	$2,192.25	**$352.43**
Labor	$1,340.85	**$483.60**
Business Downtime	$20,000.00	**$5,000.00**
Removed Wire Scrap Value	-$443.50	-$106.63

Year 7: Light R&D Conversion

Seven years after the initial installation, new requirements demand twice the power of the original office environment. The feeder must be upgraded. Consider each of the following scenarios.

MC cable: The original cable cannot be used because paralleling requires a full-size equipment grounding conductor (EGC) in each cable. The original 200-amp cable contains a 4 AWG copper EGC, sized per Table 250.122 of the National Electrical Code®, to the 200-amp overcurrent device. Since the new feeder will be protected by a 400-amp overcurrent device, the EGC in each cable must be a minimum of 3 AWG copper. The conversion work requires removing the original cable, acquiring non-standard replacement cable with a long lead time and high cost, cutting the cable in half, and installing cable from the service gear to the new remote distribution board. This process takes two electricians 12 hours each.

Conduit: The original installation simply has to be duplicated.

Year 4 Total Costs

MC CABLE

$23,089.60

CONDUIT

$5,729.40

Year 7 Costs		
	MC CABLE	CONDUIT
Materials	$4,782.50	**$1,702.72**
Labor	**$2,232.00**	$2,526.62

Year 10: Health Care Retrofit

Ten years after the initial installation, a tenant moves out and the second floor is converted into a walk-in health care center containing medical offices, waiting spaces and 30 patient care spaces (NEC® Category 2). The change in occupancy requires an emergency power source and a transfer switch supplying the critical, life safety and equipment systems.

Per 517.18 of the NEC, each exam / treatment room requires a minimum of eight receptacles (four duplex receptacles), which must be supplied from both the normal and critical branches. In this case, the receptacles will be equally divided between the two branches. For the 30 patient rooms, 120 receptacles (60 duplex) will be served by the normal branch and the same from the critical branch. Each receptacle must be connected to an insulated EGC run with the circuit conductors, per 517.13. For this comparison, each circuit will serve 12 receptacles, just less than the code maximum of 13. This is not an optimal installation for a health care facility, but it meets minimums per the NEC and ensures a valid comparison. As such, 10 circuits will be provided from the normal branch and 10 from the critical branch.

MC cable: The original cable to both lighting and receptacles (totaling 4,320' of cable) needs to be removed (or abandoned in place) from the entire Category 2 section. Because this space originally comprised 60 offices totaling 9,700 sq. ft., the rework also requires removal of approximately 22,000 sq. ft. of drywall. The removal of the cable and drywall requires about 233 hours of labor.

Then, the building owner must replace the branch circuit wiring with either MC cable or conduit (EMT). Wiring with MC cable involves running 10 cables from the normal branch panelboard and 10 from the critical branch panelboard (a total of 2,200' of cable), which requires 20 home runs and 20 junction boxes and over 166 hours of labor. Wiring with conduit requires 1,800' of ½" EMT and only six home runs, because the EMT holds up to nine 12 AWG THHN conductors.

Conduit: The original EMT can be reused, along with the original seven home runs serving the area. Because the NEC prohibits multi-wire branch circuits for this application, an additional neutral conductor and insulated EGC will be added to four of the raceways, and two raceways will have an additional circuit installed in order to provide the required 10 circuits from the normal supply and 10 from the critical supply. All existing wiring must be withdrawn to facilitate the installation of additional wire, and a small portion of the wall sheetrock must be removed for access. The entire removal and rewiring process requires less than 100 hours of labor.

Year 7 Total Costs

MC CABLE

$7,014.50

CONDUIT

$4,229.34

Year 10 Costs		
	MC CABLE	CONDUIT
Materials	$2,112.74	**$1,012.49**
Labor	$24,070.18	**$7,142.40**
Removed Wire Scrap Value	-$372.63	NA

Year 10 Total Costs

MC CABLE
$25,810.29

CONDUIT
$8,154.89

Conduit: The Future-proof, Cost-effective Wiring Method

The wiring changes detailed above at years 4, 7 and 10 are common in today's commercial sector. As this analysis shows, wiring a building with conduit (EMT) might cost slightly more upfront, but it saves money over time because it can easily accommodate new circuits and conductors with minimal rework — minimizing costs related to materials, labor and business downtime. Conduit is clearly the more cost-effective wiring method.

First-10-years Total Costs		
	MC CABLE	CONDUIT
Materials, Labor & Business Downtime	$92,604.82	**$58,911.72**

$33,693.10
SAVED BY CHOOSING CONDUIT

About Steel Tube Institute™

The Steel Tube Institute (STI) was founded in 1930 and sponsors cooperative member efforts to improve manufacturing techniques for conduit and other tubular steel products and informs customers and fabricators about these products' utility and versatility. It is headquartered in Glenview, Illinois.

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