



Time & Motion Study

MODEX Modular
Electrical Wiring Systems
November 2007

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Executive Summary

Alcan Cable, part of Rio Tinto Alcan, a global leader in aluminum and aluminum recycling, is now offering MODEX. This product consists of a comprehensive range of commercial electrical wiring systems that include job site delivery of prepackaged units containing complete UL listed factory assemblies. Alcan commissioned RSMeans to conduct a Time & Motion Study to provide third party confirmation that installing MODEX products delivers significant bottom line savings to contractors.

The research objective was to evaluate the material and labor costs, process and efficiencies associated with installing Alcan's pre-wired MODEX system compared with using the conventional Metal Clad (MC) method.

The subject of this study was a 1271 square-foot simulated two-bedroom condominium unit with metal stud framing and a 9-foot ceiling mock-up inside a warehouse located in Indianapolis, Indiana. Representatives from RSMeans witnessed and recorded data on three applications, one for a conventional MC wiring system

and two for the MODEX pre-wired assembly system.

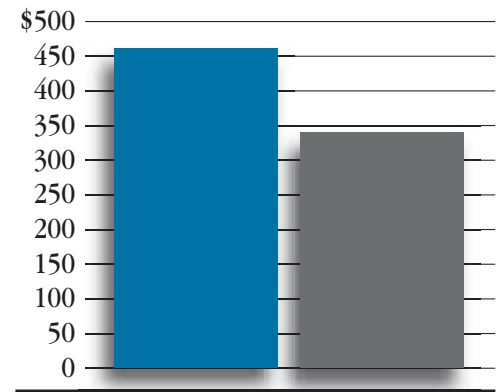
The most significant finding from the study was that MODEX demonstrated a definitive reduction in installation time - an average of 68 percent - over the conventional method (see Figure 1).

It should also be noted that the second installation of MODEX showed a 25% increase in cost savings over the first. This suggests that its long term use will produce even higher levels of savings for contractors. (see Figure 2).

Adding in material costs, MODEX maintained a total cost savings of 15 percent over the conventional method. In addition, by comparing total material and labor cost savings between two installations of the MODEX system, Means engineers found that a 4 percent cost savings accrued which pushed the savings to 18 percent.

The Time & Motion Study clearly demonstrated average installation cost savings of over 17 percent to users of MODEX.

Figure 2
MODEX Labor Cost
Learning Curve Benefit - 25% savings



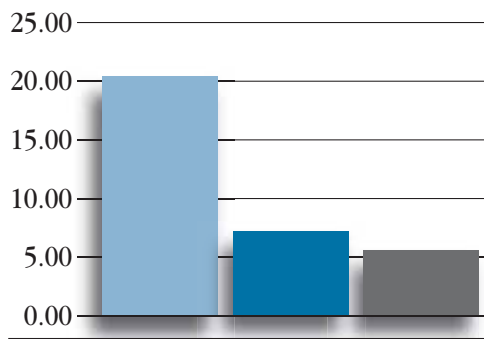
	Labor Cost	
	MODEX Systems 2.1	MODEX Systems 2.2
Labor Cost	\$457	\$344
Total Cost	\$457	\$344

as materials for the installations. Materials were off-loaded, inventoried and stored, and electricians reviewed installation sequences and created work plans. For the first evaluation the conventional MC Cable with connectors were readied for installation; conventional MC wiring material had to be sorted and moved to the work site storeroom preparatory to rough-in.

For the rough-in, individual materials were moved to the work area. Screws were driven through metal studs to install brackets for outlet boxes which were then installed along with plaster rings. For voice and data outlets brackets only were installed. Metal Clad cable was fed through metal stud openings, cut, stripped and given an anti-short bushing. Next, readied cable was inserted into prefabricated inside boxes, screws tightened, and cable strapped per code. (Cable had to be tugged inside outlet boxes before being installed into receptacles or switches.)

Figure 1
Install Time Comparison

Time in Hours



Application	Total Time
Conventional Method	20.04
MODEX 2.1	7.38
MODEX 2.2	5.57

Methodology

The objective for installing electrical services is the same for both methods. The main difference is that the conventional approach requires a rough-in procedure, which involves installing brackets, outlet boxes, and plaster rings, and tugging the wires into the outlet boxes. The final two steps are to mount wiring devices and plates. In contrast, installing MODEX Modular Wiring Systems is accomplished by simply mounting the pre-wired modular bracket and snapping the cable plug into the second pre-wired assembly.

For this study the work crew arrived at the site at the same time

By contrast, the pre-packaged MODEX assembly packets labeled by room were moved directly to work areas.



Boxes were opened and contents laid on the ground as were kick brackets for floor mounted devices. Screws were then driven through brackets to ready wall mounted devices. Pre measured and configured Metal Clad cable was run through metal studs and secured per code by simply plugging pre-assemblies into the 5-pin connectors.

RSMean representatives recorded activities based on a list of standard electrical service installation activities, using a stopwatch and five-minute intervals. This is referred to as Group Timing Technique (GTT), a technique that utilizes a list of tasks, an observer, and a stopwatch. The observer records the start and finish times on each application at five-minute intervals. At the end of data collection, the amount of time spent on each application is determined by subtracting the start time from the finish time. Application times were based on the actual time required to install electrical wiring utilizing the two different methods.

Cost Savings Analysis

The MODEX installation showed an average total cost savings of 17 percent.

In the first application, the savings were 15%, and 18% in the second, clearly indicating that greater savings can be realized due to increased productivity.

Material Cost Material costs were calculated as billed by suppliers. For conventional materials the cost was \$2090, and for the MODEX pre-packaged units a total of \$2373.

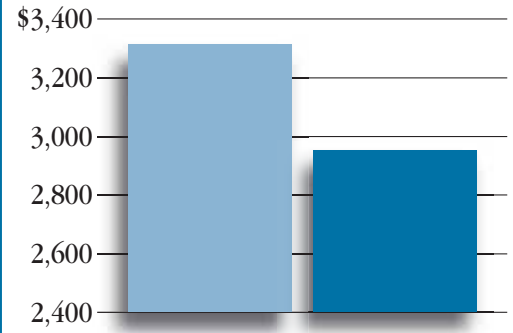
Labor Cost Labor costs are based on normal job conditions and mobilization within 150-200 feet. There is no adjustment for existing structural conditions or a highly productive crew. However, a contingency factor of 5% is built into all applications. An RSMean labor rate of \$61.84 per hour was used for this study, based on \$42.66 Indianapolis union wages including fringe benefits with \$19.18 overhead and profit mark-up for Indianapolis, Indiana.

Labor costs for the conventional installation were \$1239 versus \$457 for MODEX.

Equipment Cost As neither installation method involved rental costs, and both used the same small tools there was no reason to add in equipment costs.

Figure 3
Installation Cost Comparison

Modex vs. Conventional - 17% savings



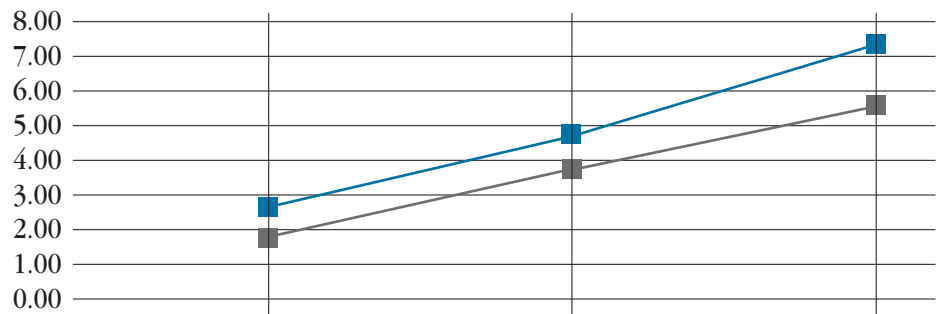
Application	Total Cost
Conventional Method	\$3,329
MODEX Systems 2.1	2,830

Despite higher material costs, the MODEX product was installed for \$1499 less. In addition, by comparing cost savings between installations of the MODEX system, Means engineers found a 4 percent cost savings accrued. Utilizing MODEX pre-wired modules reduced installation time by an average of 68 percent and amounted to a cost savings of \$782 for the 1271 square-foot building in the study.

Larger cost savings are realizable in repeated applications due to increased productivity as can be seen on the following chart:

Figure 4
MODEX Installation Time

Learning Curve Productivity Increase



Application	Non-Installation Time	Actual Installation	Total Time
MODEX 2.1	2.68	4.70	7.38
MODEX 2.2	1.84	3.73	5.57

Conclusions

The most significant finding from the Time & Motion Study was that choosing the MODEX Modular Electrical Wiring System produces substantial labor cost savings by reducing installation time an average of 68 percent.

There were other significant findings related to enhanced efficiencies and superior ease of use. These included the following:

Fewer assembling tasks:

MODEX pre-wired modules include brackets; hence there is no need to take measurements prior to assembling the devices. This saves electricians' time.

Cleaner work site:

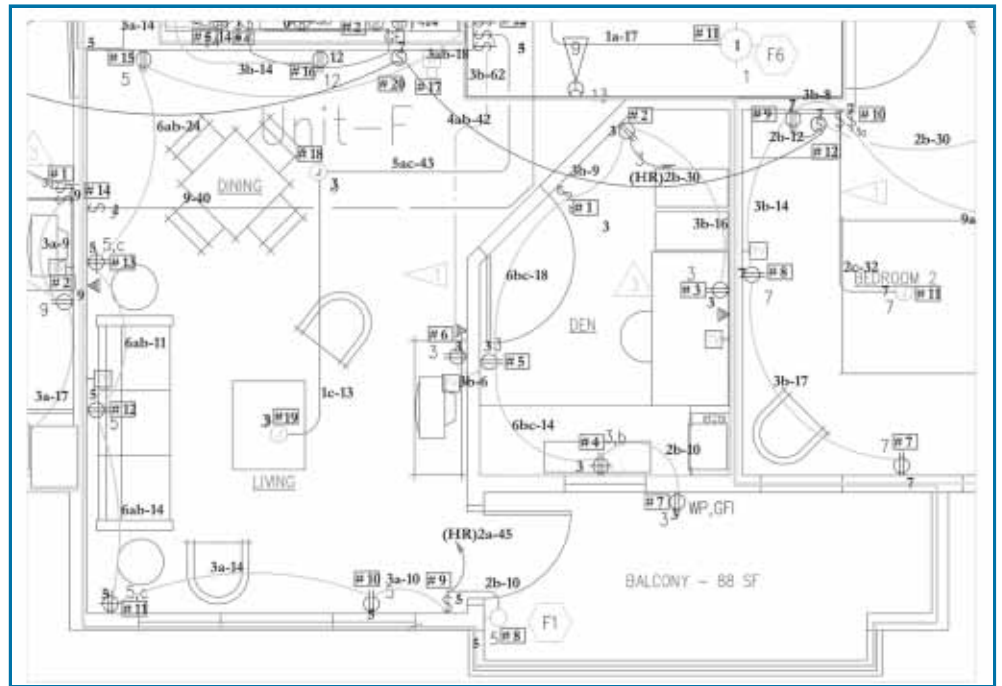
the plug-in 5-pin connector feature means electricians do not have to continuously cut, strip and terminate metal clad cable. This saves time and eliminates accumulating waste that has to be cleaned up later.

Reduced training costs:

assuming knowledge of conventional MC Cable installation, there are no additional training needs associated with MODEX installation.

The competitive advantages of Alcan's MODEX Modular Electrical Wiring System were clearly demonstrated through the Time & Motion Study. As Alcan's pre-fabricated products have

historically translated into cost savings for contractors, the RSMeans Business Solutions Team confidently projects significant cost savings for users of MODEX in the future.



Alcan would like to acknowledge the participation of Bill Casey Electric Sales which owns the warehouse, and Barth Electric Company, Inc., which installed the representative electrical services for this Time & Motion Study.



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