

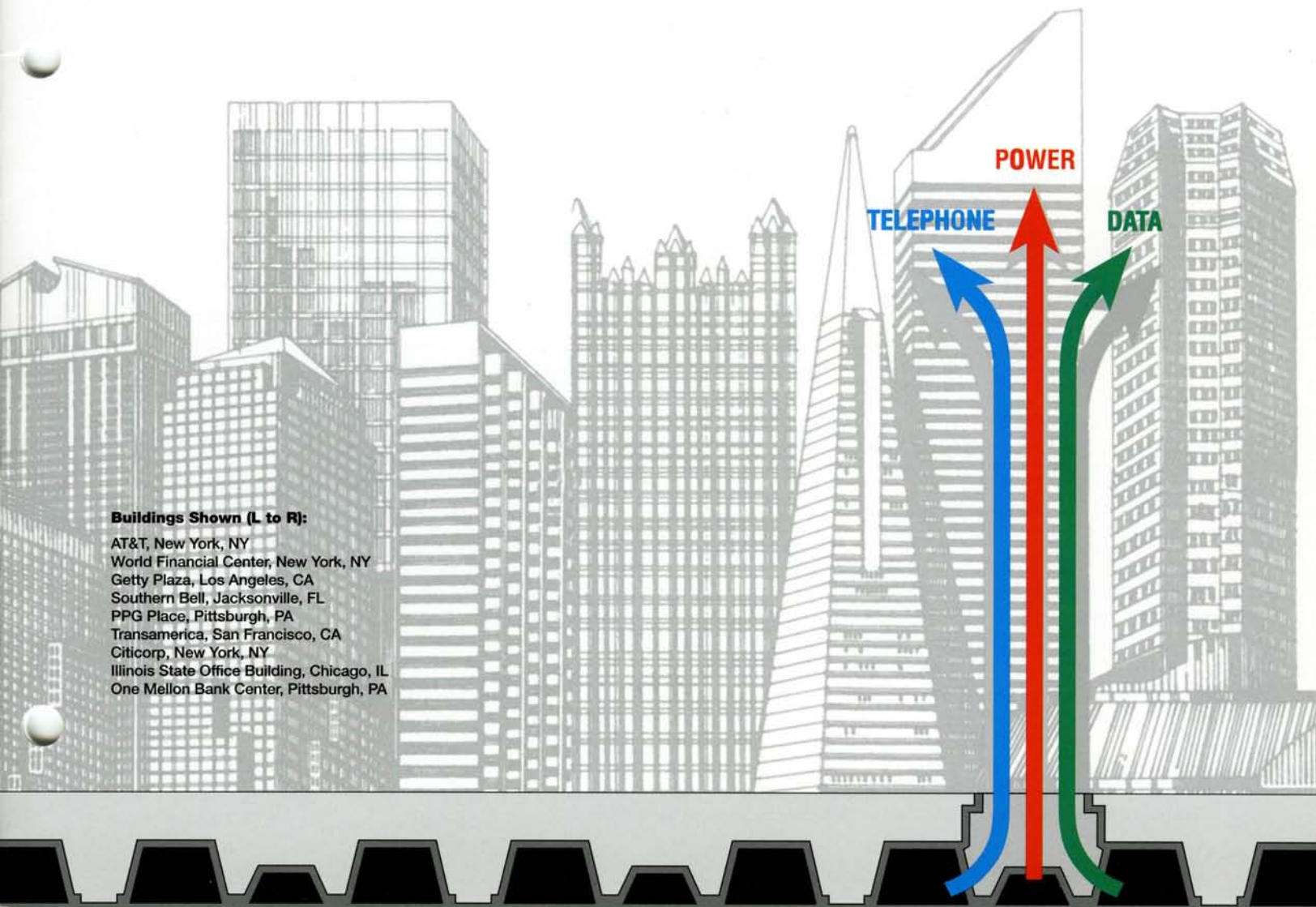
H.H. Robertson

# Q-Floor/Taproute System

“Cabling within the floor is the only fire-safe, wire distribution system with adequate wire capacity for today’s office buildings.”



CENTRIA



**Buildings Shown (L to R):**

- AT&T, New York, NY
- World Financial Center, New York, NY
- Getty Plaza, Los Angeles, CA
- Southern Bell, Jacksonville, FL
- PPG Place, Pittsburgh, PA
- Transamerica, San Francisco, CA
- Citicorp, New York, NY
- Illinois State Office Building, Chicago, IL
- One Mellon Bank Center, Pittsburgh, PA

# THE FIRE SAFE\* WIRE DISTRIBUTION SYSTEM: Q-FLOOR/TAPROUTE SYSTEM

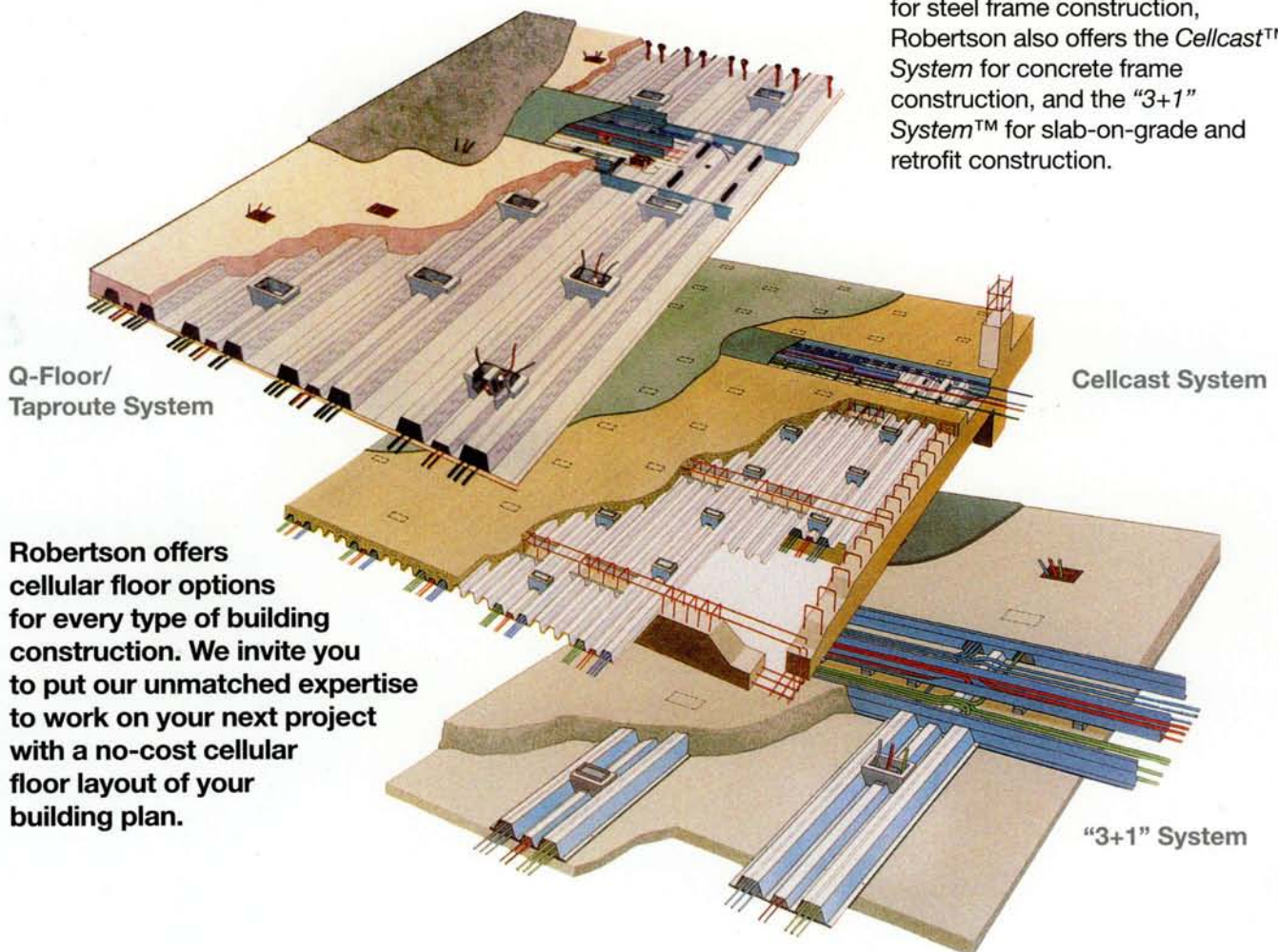
Advancements in cabling technology continue to reduce the wire space needed to service today's office floor. The building team must plan for future needs by selecting an economical wire distribution system that provides adequate capability and ease of activation.

A variety of systems are available for consideration. Yet, when all factors are evaluated, there is one choice that rises above the rest. That system, *cellular floor*, has been the preferred system for steel frame construction since *Q-Floor*<sup>®</sup> was introduced by H.H. Robertson in 1931.

During its 76-year history, *Q-Floor* has become the standard for floor systems in which steel cellular sections are used for wire distribution, and to support vertical loads applied to the floor slab. Over the years, this dual electrical and structural function has been judged so cost-effective and beneficial that it has been used in thousands of buildings, many of them among the nation's most recognizable landmarks.

Today, Robertson offers the *Q-Floor/ Taproute System*, with the innovative *bottomless trench header and flush-mounted preset outlet boxes*, which were first introduced by H.H. Robertson Company in 1971. Both cellular and non-cellular units are pre-cut to length and pre-punched with all the holes necessary to accommodate the *Tapmate*<sup>™</sup> preset outlet boxes and the trench header wire feed system. The result is an in-the-floor wire distribution system that minimizes slab depth, lowers activation costs, and reduces construction time in ways unmatched by any other system.

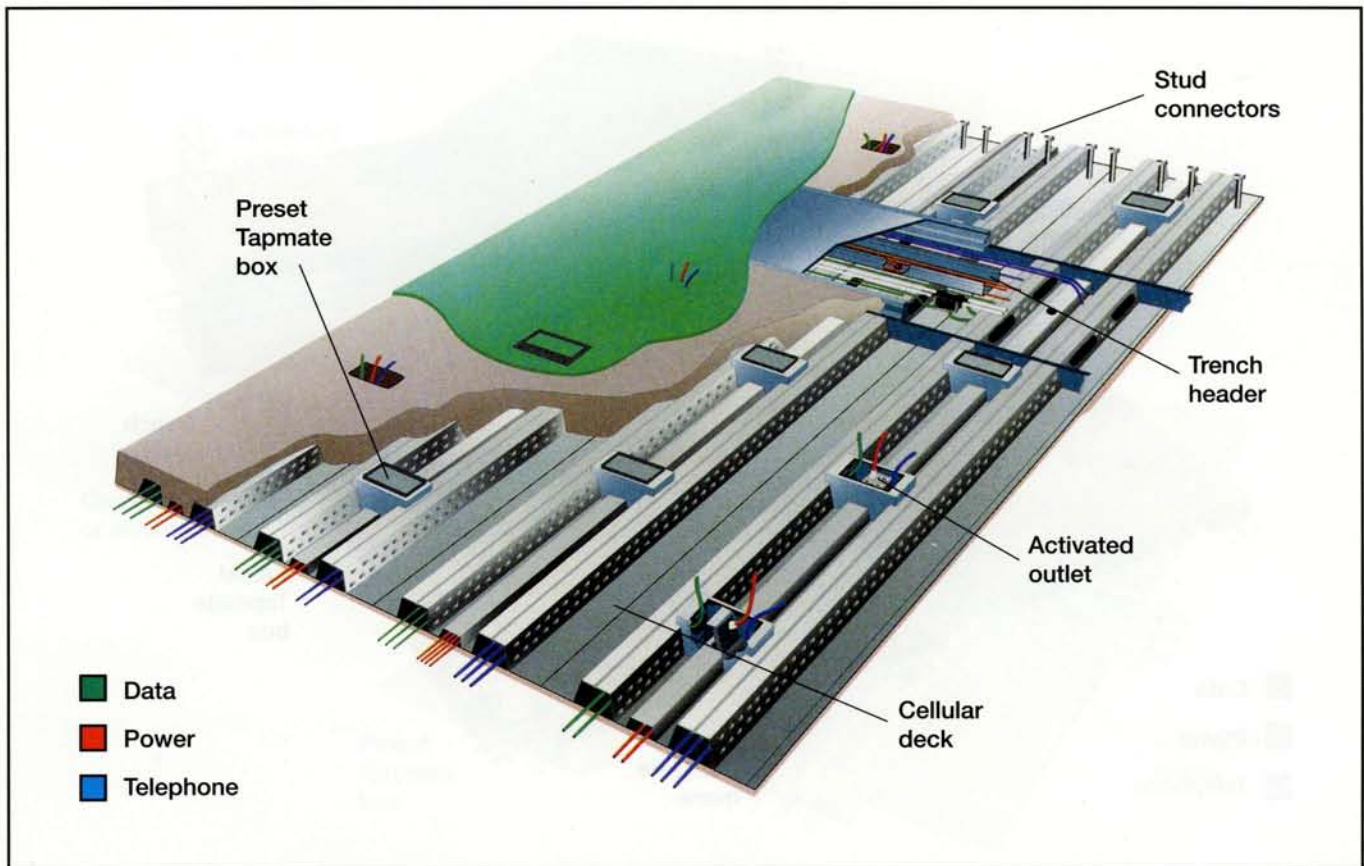
In addition to the *Q-Floor/ Taproute*<sup>®</sup> for steel frame construction, Robertson also offers the *Cellcast*<sup>™</sup> System for concrete frame construction, and the "3+1" System<sup>™</sup> for slab-on-grade and retrofit construction.



**Robertson offers cellular floor options for every type of building construction. We invite you to put our unmatched expertise to work on your next project with a no-cost cellular floor layout of your building plan.**

\* Plenum cabling exposes combustible plastic to flame in a fire event, producing large amounts of toxic smoke. NFPA Standard 90A requires the removal of all abandoned materials from plenum spaces.

## Q-FLOOR/TAPROUTE: CELLULAR FLOOR FOR STEEL FRAME



### The Standard of the Industry for Steel Frame Construction

The basic component of the Q-Floor/Taproute System is the Q-Floor cellular composite unit. The rib geometry and cell placement allow full-shear stud capacity for efficient composite beam design, which can reduce horizontal steel frame weight by up to 35%.

Available in full cellular, and various blends of cellular and non-cellular deck units, Q-Floor offers a number of advantages that ease installation and activation.

First, Robertson pre-punches all the openings needed for wiring at the factory. By accurately placing these openings at the neutral axis of the cellular unit web, Robertson's Q-Floor avoids strength reductions that plague other cellular floor systems, while ensuring easy and efficient pulling of wires.

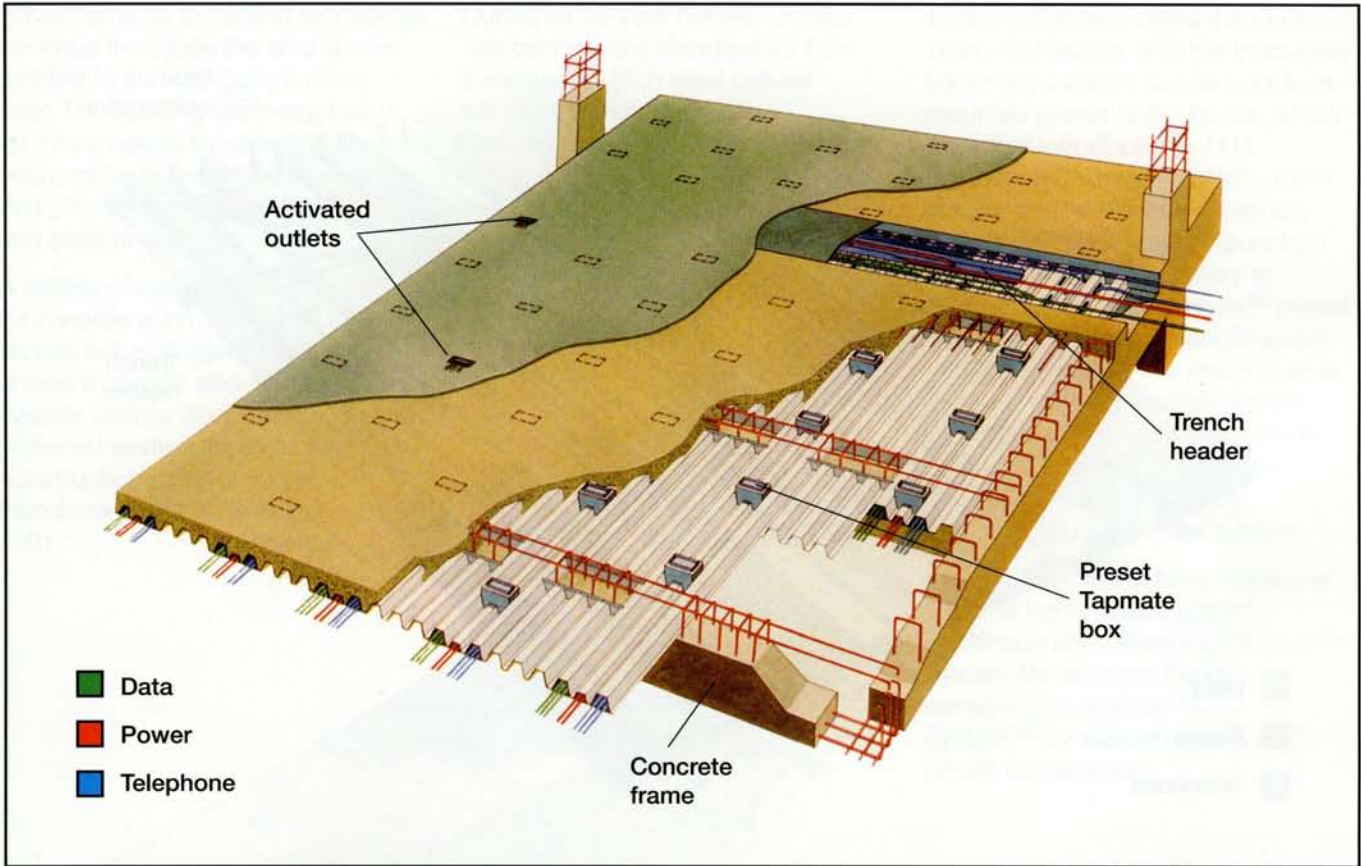
At activation, Robertson's Tapway™ bottomless trench header provides wire distribution through segregated compartments and direct access through shop-punched cell openings. This design also allows passage of low-voltage wires beneath the power compartment to optimize low-voltage wire space. The Tapway trench is completely hidden in the floor and is virtually invisible when covered with broadloom carpet.

Installation is also eased by using Robertson's Tapmate preset outlet boxes, which snap quickly and easily into place over factory-punched holes at precise locations to maintain accurate modularity. The snap-in design ensures that the preset remains in place during concrete placement and provides a positive electrical ground for each box.

*Robertson designs, manufactures, and tests its Q-Floor/Taproute System. There is no substitute for this single-source responsibility. Project sequence accountability is especially valuable to contractors who need to achieve a custom-designed, code-approved system meeting user criteria and construction schedule deadlines.*

**Note: Cables are always fire safe in a cellular floor system. Less expensive cable can be used safely and may be abandoned in place. The Q-Floor/Taproute system is UL-listed and approved and fully compliant with the NEC.**

## CELLCAST FLOOR SYSTEM: Q-FLOOR/TAPROUTE FOR CONCRETE FRAME



### The first high-capacity, low-cost wire raceway system for concrete frame construction

Robertson has developed the first structural, cast-in-place, monolithic-poured wire distribution system for concrete office building construction. It's called the Cellcast Floor System.

Unlike earlier embedded cell raceways, Cellcast allows the composite steel floor units to carry both dead and live loads and *completely eliminates conventional slab forming and shoring.*

By combining the structural slab and the electrical functions within the normal depth of the floor slab, the Cellcast System becomes the most efficient and economical wire distribution system available for concrete-framed office buildings.

The Cellcast System will fit into most one-way slab and beam framing designs without major changes in the beam reinforcing bar details.

Steel floor units are factory-cut to proper length and marked for assembly onto the beam and girder form work. This stay-in-place slab form speeds the erection process.

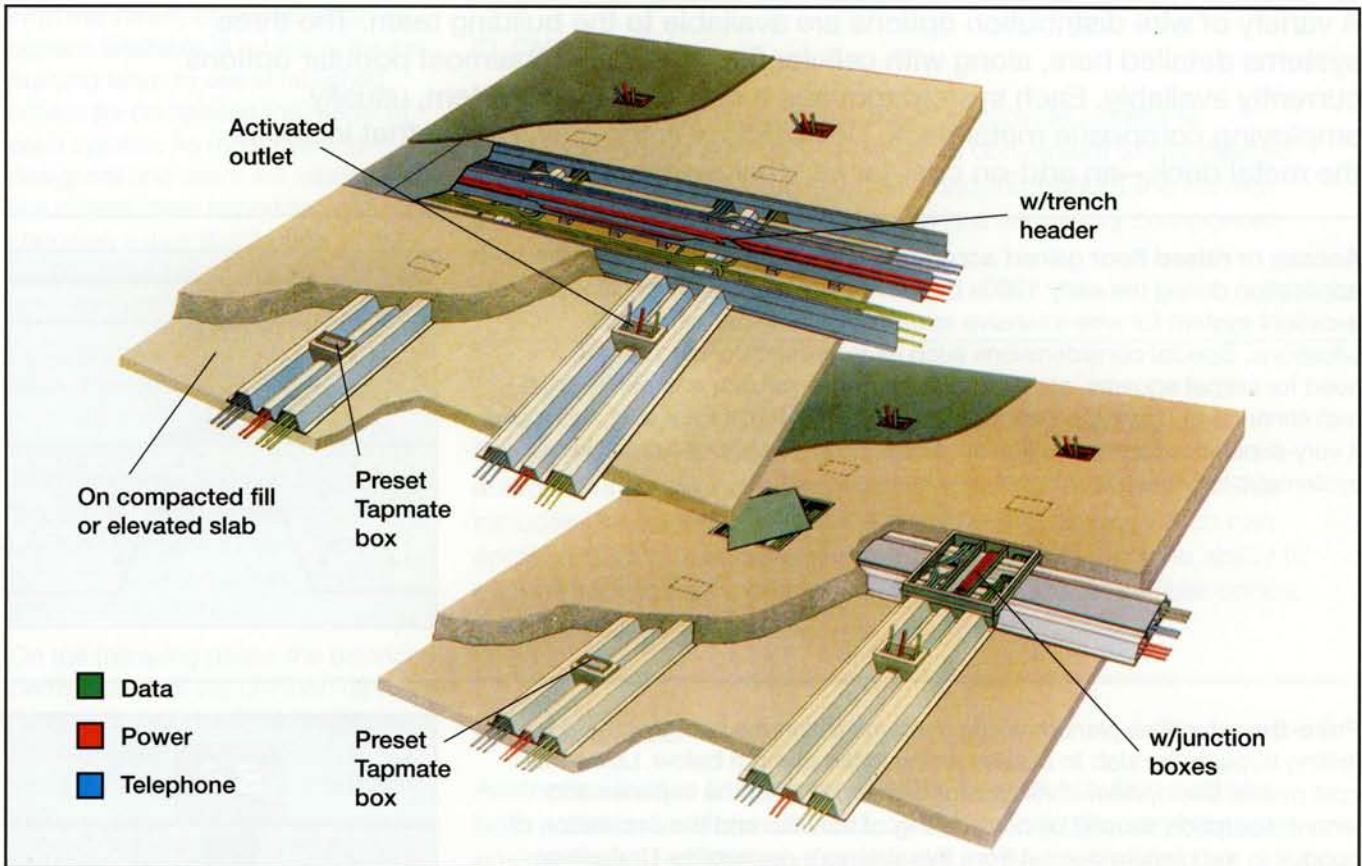
All cellular units are factory-punched with necessary electrical access holes at each Tapway trench header and at modular, pre-determined spaces where Tapmate preset outlet boxes will be located. After deck erection and fastening, the trench header is laid over the proper access holes and welded or riveted to the steel floor units. The outlet boxes are snapped into place over factory-punched holes, which will later permit access to power, telephone and data cells.

The Cellcast System offers still another advantage. Embedded duct systems supported on hi-chairs can become filled with rainwater after the concrete pour. Draining these systems can be costly and is, at the least, very inconvenient. Cellcast can be drained easily because the bottoms of the cells are exposed at the underside of the slab.

Other advantages of the Cellcast System include lower overall cost, faster erection, thin slab construction and elimination of core drilling for electrical activation.

**NEW!**  
**The Cellcast System is also compatible with precast beams and girders. Call for details.**

# THE "3+1" SYSTEM: Q-FLOOR/TAPROUTE FOR SLAB-ON-GRADE AND RETROFIT



## For 4" Slab-on-Grade or Retrofit Applications

*Robertson's "3+1" System™ Offers Five Major Advantages over Conventional Cellular Systems or Underfloor Duct Systems...*

First, Robertson's "3+1" System can be installed with a single pour of concrete directly over compacted fill. A mud slab is not required, but is recommended only beneath the trench header.

Second, Robertson's 4"-deep, open-top trench provides a larger feeder system, with significantly more feed capacity than 2" depth cells or 2" header ducts.

Robertson's full-size, 3"-deep cells also mean larger cell capacity. "3+1" provides the same distribution area normally associated with elevated slabs, but not previously available for slab-on-grade. The result is much greater capacity than with conventional duct systems.

Larger flush outlet boxes are another advantage of the "3+1" System. A Tapmate 3-service preset outlet box for "3+1" allows adequate wiring space *within the floor*, with room for two duplex receptacles, plus telephone and data connections to satisfy the typical workstation need.

Finally, on-grade and elevated slab activations are identical in appearance meaning consistent activations from one outlet to the next. A variety of activation options are available.

The "3+1" System is also available with a cell feeder, utilizing large junction boxes instead of trench headers. Both systems are detailed here.

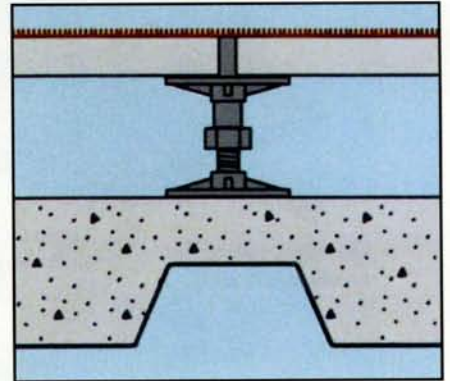
When retrofitting with the "3+1" System, the cellular components are simply laid-out on the existing slab and then a second 4" slab is poured over both the old slab and the components.

***More capacity, less labor, larger outlets and lower cost than underfloor duct systems!***

## ALTERNATIVE DISTRIBUTION METHODS

A variety of wire distribution options are available to the building team. The three systems detailed here, along with cellular floor, represent the most popular options currently available. Each system requires a structural floor system, usually employing composite metal deck. Cellular floor is the only system that includes the metal deck—an add-on cost for all other systems.

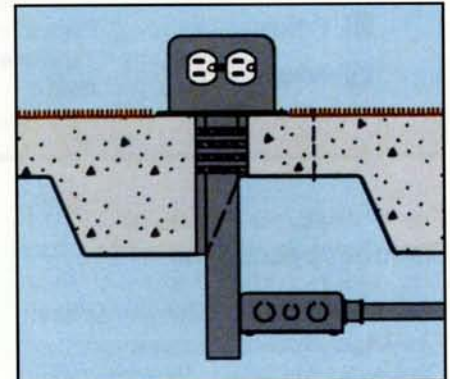
**Access or raised floor** gained acceptance beyond the computer room application during the early 1980s by providing generous wire space. It is an excellent system for wire-intensive applications or in certain retrofit situations. Special considerations such as increased building height, the need for carpet squares, steel conduit for power cables, and continuous maintenance of flooring panels all increase this system's total cost and make it very expensive for most office applications. Access floor also lacks a systematic approach to internal wire management.



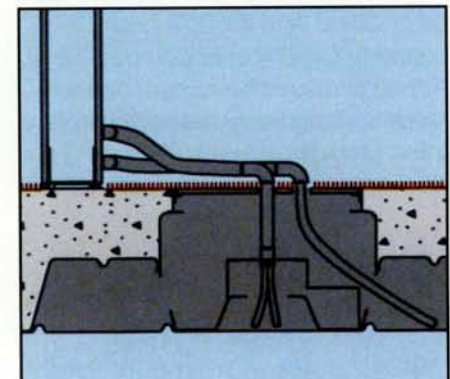
**Poke-thru** identifies plenum wiring systems which are activated by core-drilling through the slab to access wiring in the plenum below. Low initial cost makes this system attractive for developers; but the expense and tenant disruption caused by core-drilling of the slab and the installation of conduit in the plenum detract from this system's desirability. Underfloor space for connections is also limited, and the life-cycle costs are higher than for any other available system.

Remember, poke-thru activations are limited by U.L. to one per 65 sq. ft. of floor area with no two outlets closer than 2'-0" O.C. If fireproofing is removed during installation, it must be re-sprayed to maintain fire rating.

**"Poke-thrus" are neither tested nor approved for smoke penetration. Toxic smoke can migrate from floor-to-floor.**



**Wired partitions** provide plug-in capability at desk-top, eliminating the need to connect at floor level. However, since wired partitions function only as a delivery system, an additional feed system, such as poke-thru, cellular floor or column feed, must be utilized. For this reason, the total cost of wired partitions is generally higher than initially thought. Another alternative to wired partitions is the use of convenience strips at desk-top level, with service fed through cellular floor.



# A BALANCED SYSTEM: MAKE THE COMPARISON

With the variety of wire distribution options available, it is helpful for the building team to use established criteria for comparing the merits of each system. As most building designers and users will attest, the five criteria most important in choosing a wire distribution system are *flexibility, capacity, aesthetics, wire management, and cost.*

Achieving an effective balance among these criteria is absolutely essential to choosing the best available wire distribution system. *With more than 300,000,000 square feet installed, the Robertson Q-Floor/Taproute System has proven uniquely qualified to meet each of these criteria.*

On the following pages the balanced performance of the Q-Floor/Taproute System is explained. We invite you to judge other wire distribution systems using these same criteria.



Respironics Headquarters,  
Pittsburgh, PA

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## FLEXIBILITY

Flexibility defines the system's ability to provide access to telephone, power and data services as convenient to the desired location as possible ... both initially, and throughout the service life of the building. Ease of activation is a necessary component of flexibility.

*(See page 8 for details.)*

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## CAPACITY

Capacity identifies the system's ability to accommodate all workstation wiring needed during the service life of the building. This includes the capacity to provide preset outlet boxes, which can enclose power, telephone and data connections, and the ability to accommodate future changes in technology, such as fiber optics.

*(See page 9 for details.)*

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## AESTHETICS

Aesthetics relates to the impact of the wire distribution system, both activated and deactivated, on the overall office ambience or environment. Two primary considerations are minimizing the overall visual impact of wire delivery and treating wire egress at the workstation as attractively as possible.

*(See pages 10-11 for details.)*

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## WIRE MANAGEMENT

Wire management describes the ability to systematically track existing circuits, as well as later additions or modifications to circuits caused by office relocations.

*(See page 12 for details.)*

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## COST

Cost includes all the items necessary to initially install, activate and maintain a system's usefulness through a building's service life. Related items, such as the cost of system maintenance, building height increases, conduit extras, plenum-rated cable, etc. as required by each system, must be considered when evaluating total system cost.

*(See page 13 for details.)*

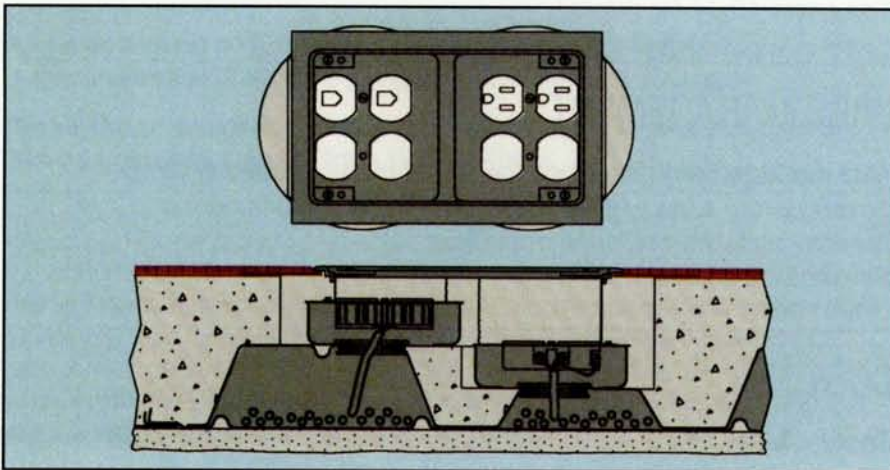
# FLEXIBILITY: FOR TODAY AND TOMORROW



## The Q-Floor/Taproute System Accommodates Any Building Module

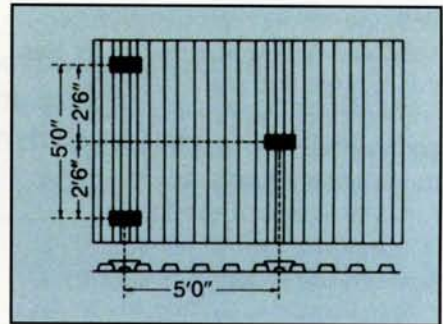
A wire distribution system should be carefully planned, not an add-on after construction. Open office landscaping and ever-changing communications technology require that workstation equipment

relocations be made quickly and easily. Robertson's Q-Floor/Taproute System offers a wide variety of outlet box patterns that provide virtually unlimited design flexibility.

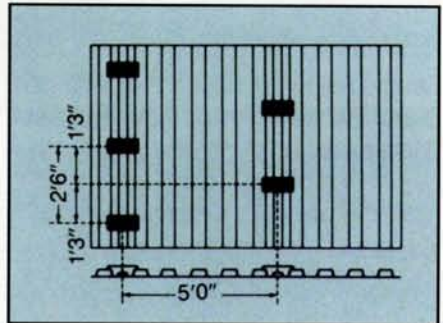


**Expanded flexibility...** To accommodate exact delivery location requirements, Robertson also offers a multi-service outlet box. It can be placed at any point along the cellular unit *after* the concrete

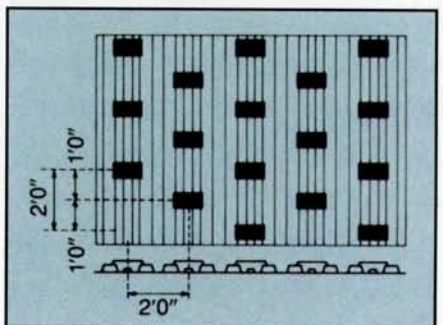
pour and delivers power and low-voltage service using the same hardware *and providing the same appearance* as the preset Tapmate® outlet box.



**Basic Flexibility...** The Q-Floor/Taproute 5' x 5' module provides one preset outlet box or potential activation point every 25 square feet of floor area. Similar patterns at 4' and 6' spacings are also available.



**More Flexibility...** By doubling the number of preset outlet boxes, this modified 5' x 2'-6" module provides one activation point every 12.5 square feet at a very nominal cost increase.



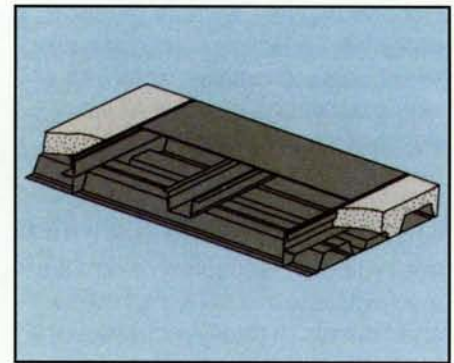
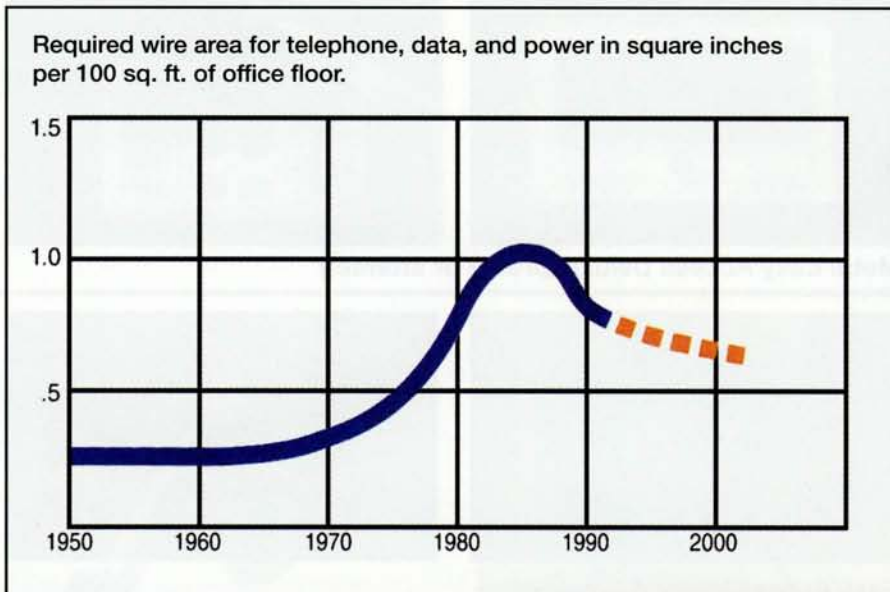
**Greatest Flexibility...** The Q-Floor/Taproute full cellular 2'-0" x 2'-0" module provides one potential activation every 4 square feet for maximum flexibility.

# CAPACITY: CURRENT AND FUTURE WIRE SPACE NEEDS

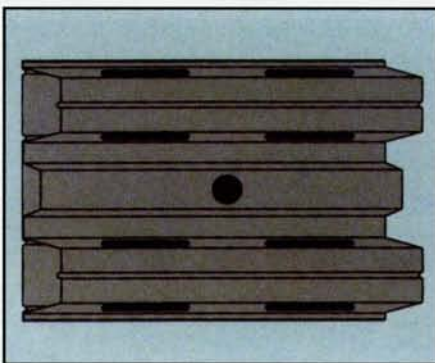
A properly planned electrical/communications distribution system must accommodate all current high- and low-voltage cabling, while, at the same time, providing the additional capacity to handle emerging technologies.

The graph below summarizes on-going wire space needs. The current decline in space needs is primarily due to two factors: First, the reduced use of heavier shielded cable and increased use of light gauge, twisted-pair cables. Second, the increased use of universal wiring systems, which reduces the need to abandon wires.

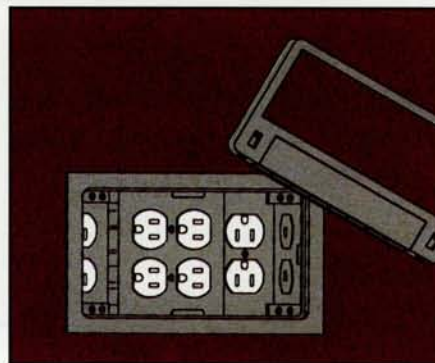
Future wire space needs will decline even further with the increased use of fiber-optic cables. However, during the transition from copper wire to fiber, both types of cable will often be used simultaneously. The Q-Floor/Taproute System can accommodate both types during this transition period, assuring capacity for the future.



Robertson's Tapway bottomless trench has the capacity to feed large floor areas from separate high- and low-voltage wire compartments. Robertson's cell access holes are always punched at the neutral axis of the cellular unit to avoid strength reductions.



With Q-Floor's nine pre-punched holes at the trench-cell interface, cable routing and/or bending radii requirements can be readily accommodated. Wires may enter and exit a cell in either direction without doubleback bending of the cable, which results in the loss of effective trench header capacity.



The Tapmate IV preset outlet box accommodates telephone, data and up to four duplex receptacles below floor level. This creates more usable space than any other preset because the power receptacles are clustered together in the bottom of the outlet box.



**NEW!** Tapmate IV preset outlet box offers 325 in.<sup>3</sup> of interior space. The **largest** preset outlet box available for cellular floors!

Tapmate V uses the same activation covers as Tapmate IV, so you can mix or match on the same floor!

## AESTHETICS: ENHANCING VISUAL APPEAL

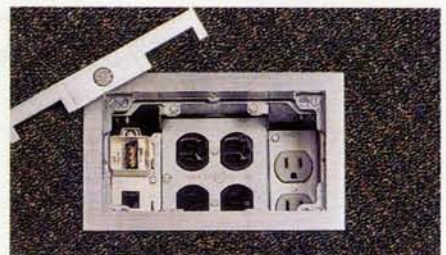
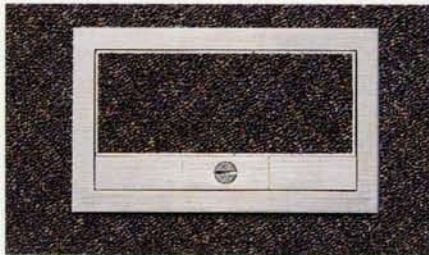
In addition to flexibility, capacity and wire management, Robertson's Q-Floor/Taproute System offers a pleasing appearance that may be color coordinated with any floor covering. Compared with competitor's activation options, Robertson creates an attractive appearance by lessening the visual impact of wiring on office decor.

Robertson uses Tapmate preset outlet boxes, which combine power, telephone and data services into a single outlet and conceal all the connections within the floor. All services are provided through an activation ring and Lexan® cover which can be supplied in any desired color. Aluminum covers are also available in a variety of colors and finishes. A totally recessed look can also be achieved with a slit in the carpet for wire egress.

All Robertson activation hardware is compatible with Tapmate preset outlet boxes and with afterset applications.



**Easy Access Deluxe (preset or afterset)**



**Metal Easy Access Deluxe (preset or afterset)**



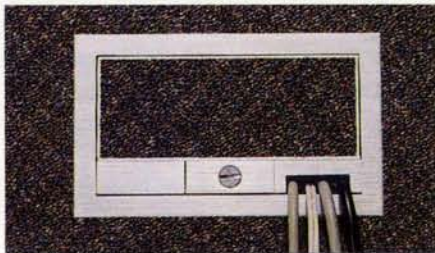
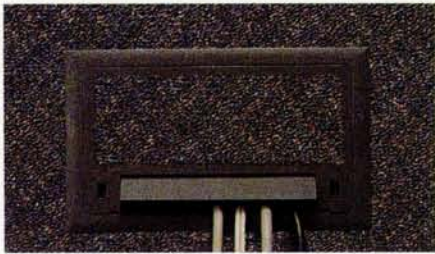
**Easy Access (preset)**



**Concealed (preset or afterset)**

Lexan® covers are available in the six standard colors shown at right, or in a rainbow of special colors (above) to match your decor.





### Lexan® or Metal

Robertson's history with cellular floor systems has given us insight into many customer preferences, one of which is non-metallic covers at workstation outlets. Shock caused by the release of static electricity build-up, which can occur when touching metal covers, is often incorrectly perceived by users as being ungrounded electrical equipment. In many instances, this creates reluctance by tenants and employees to use the in-floor outlet. Lexan covers eliminate this problem.

However, for those who still prefer the metal cover, Robertson also offers attractive and versatile aluminum activations in a variety of finishes.



### Tapway Trench Header: Open

- Large capacity compartments for telephone, data, and power wires
- Adjustable, bolted power compartment dividers to support the steel cover plate
- Interchangeable cover plates fastened with spring steel clips
- Lay-in wiring capability
- Extruded aluminum siderail keyed into concrete to assure against separation

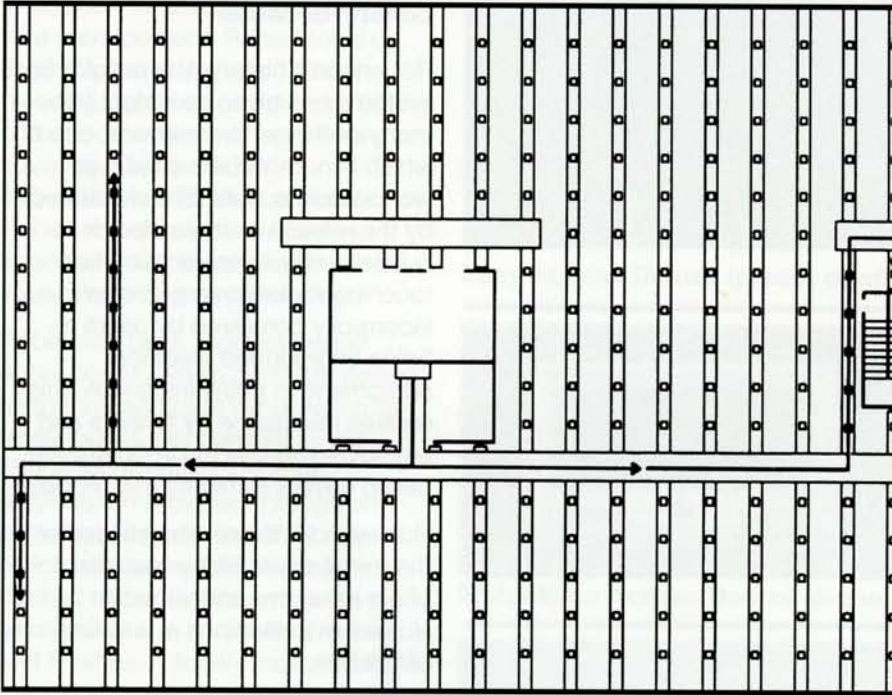


### Tapway Trench Header: Closed

- No visual impact
- Solid feel underfoot
- Convenient, quiet, efficient wiring additions



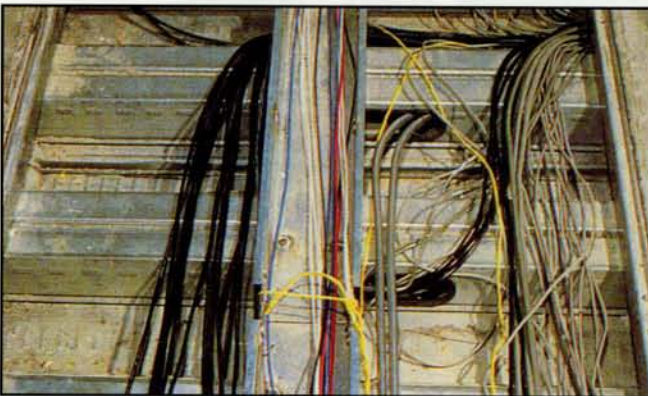
## WIRE MANAGEMENT: THE ESSENCE OF A CELLULAR FLOOR SYSTEM



Regardless of how thoroughly office space is initially planned, reconfigurations are inevitable. In many cases, the changes start even before the building is occupied. On-going workstation changes amplify the need for *disciplined wire management*. If office wiring cannot be tracked and modified easily, it can quickly become a liability.

A cellular floor system addresses the wire management challenge by providing separate steel compartments for telephone, power and data wires in both the trench headers and the cellular floor units. By directing wiring in the *right angle paths*, cellular floor provides easy tracking of wires and cables.

Organization and accessibility...the essence of good wire management.



Separate trench ducts allow lay-in wiring and organize the wire plan. Cellular units enclose all cables in cells which provide wire security, RF shielding, and the best available wire management system. Expensive plenum-rated wire is never needed with a cellular floor system.



In other systems, such as access floor, wire management is difficult, if not impossible, since wires are placed at random instead of at right angles.

# COST: MEETING THE NEED FOR COST-EFFECTIVE WIRE DISTRIBUTION

How does Robertson's Q-Floor/ Taproute System compare to the other available systems for overall cost?

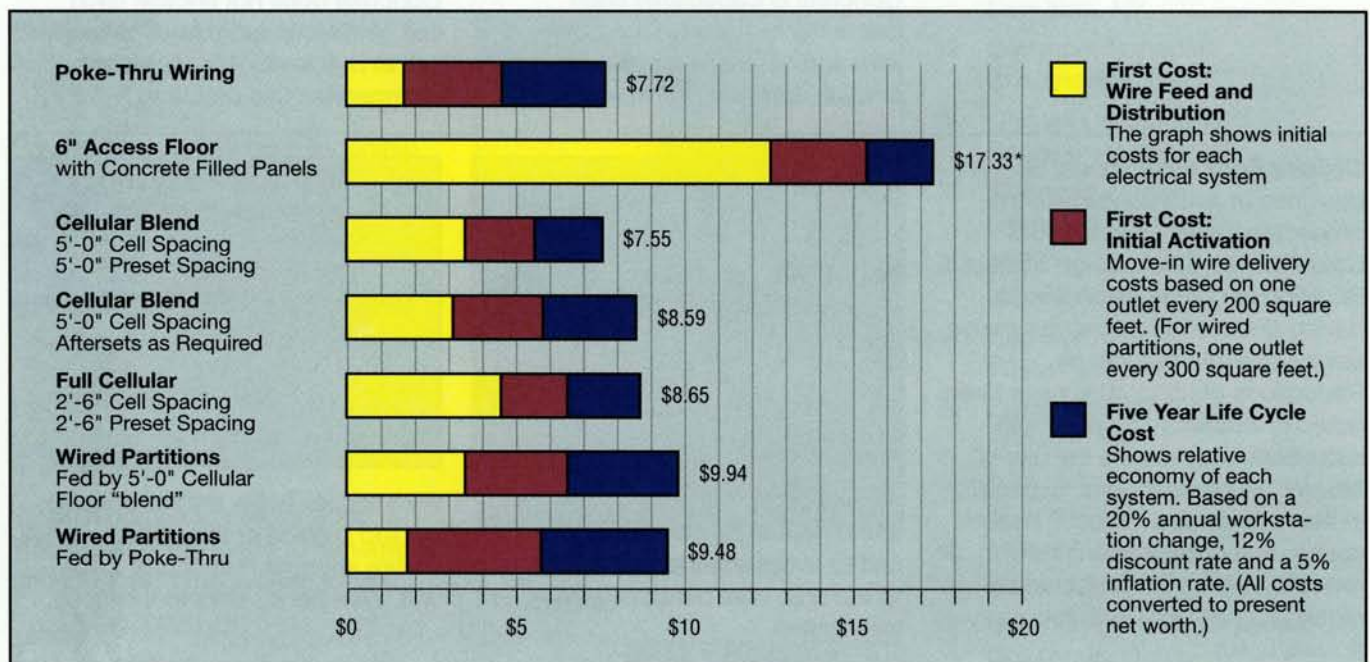
The answer is contained in an independent study completed by Hanscomb Associates (New York) in 1999, entitled "Study of Wire Distribution Systems for New Office Building Construction." The study compared both the initial costs and the on-going, life cycle costs of major wire distribution systems.

The report concludes:

- A cellular floor system with a 5' module is the most economical floor wire distribution system offering a good degree of flexibility.
- A full cellular system also has excellent capacity and flexibility, and is only marginally more expensive than the 5' module.

- A poke-thru system, providing a comparative level of service, is very competitive on a first-cost basis, but has very expensive life-cycle costs.
- An access floor system has excellent capacity and flexibility, but is considerably more expensive than the other systems.

The table below illustrates comparative costs, and indexes total cost for easy comparison.



A typical office area illustrating the superior aesthetics at carpet level of the Q-Floor/Taproute System.

\* Access Floor first cost is \$7.50 including panels. Additional related costs are for extra building height, carpet squares, elevated core and added structural supports. Annual maintenance costs are not included.

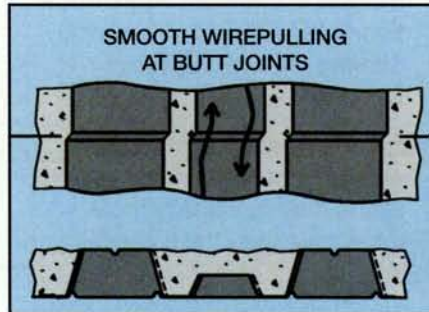
# ROBERTSON Q-FLOOR: YOUR ASSURANCE OF QUALITY

## ROBERTSON Q-FLOOR

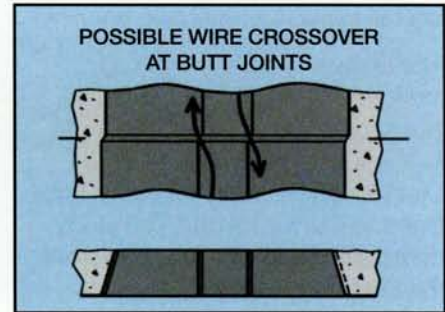
## ALTERNATIVE SYSTEMS

**When you choose** the Robertson Q-Floor/Taproute System, several potential structural and electrical problems are avoided.

Robertson's GKX cellular units provide complete separation and concrete encasement for each cell. A few of the problems involving cellular units with immediately adjacent cells are shown.

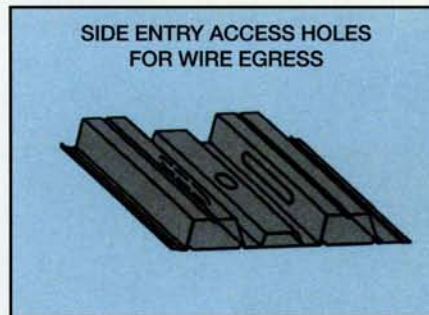


Concrete encapsulates each cell at the butt joint. Taped butt joint and concrete topping assure smooth, isolated cell wire-pulling.

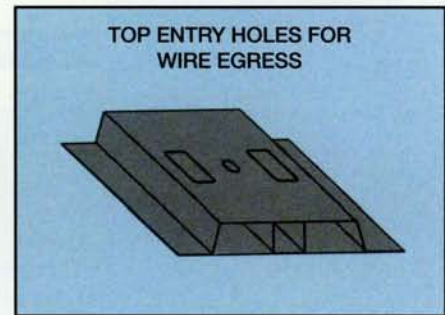


Concrete does not encase each cell. Wires can jump from cell to cell at butt joints. Misalignment exaggerates this problem.

**Cellular floor units** should be designed in accordance with the procedures outlined in the *AISI Cold-Formed Steel Design Manual*. Buckling of compression flanges having unstiffened edges can cause severe strength reductions. Reductions of up to 40% have been noted in laboratory tests. These reductions may require the use of heavier gauge floor units, especially in the noncomposite trench header spans. Test data or strength reduction calculations should be required for all units with top-entry access holes.

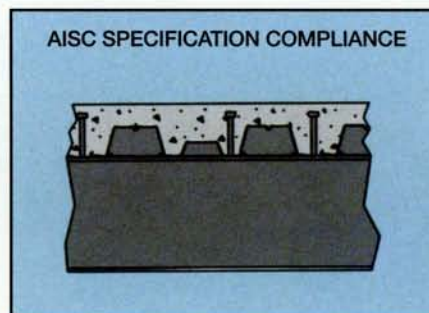


All wire access holes are punched at the neutral axis of the cellular unit to avoid strength reductions to the unit. Wire bends are also less severe.



Wire access holes are punched at the top surface of the unit causing severe strength reductions to the unit. Wire bends are more difficult.

**The current AISC specification** for composite beam design with steel deck slabs is based upon 77 full-scale composite beam tests. These tests utilized shear stud or deck welds 16" maximum on center. Studs or welds placed greater than 16" on center may jeopardize the strength of the composite beam. However, as a concession to certain deck suppliers, AISC now allows an 18" spacing.



The GKX shape was designed to allow deck welds or stud replacement at less than 18" centers to comply with AISC specifications.



Other cellular units violate the AISC specification since deck welds or studs cannot meet the 18" maximum spacing requirement.

## EXPERIENCE: THE WORLD LEADER

### MORE THAN ONE BILLION SQ. FT. SOLD SINCE 1931!



Steelcase, Grand Rapids, MI

Robertson's unmatched leadership in the cellular floor industry is recognized worldwide. The Q-Floor/ Taproute System provides the electrical and telecommunications lifelines for thousands of landmark buildings and services. More than 300 million square feet of space...*more than ten times the total of all other current cellular floor manufacturers combined.*

When it comes to cellular floor, Robertson is the name to remember and Q-Floor is the system to use.

Borgata Casino,  
Atlantic City, NJ



Independence Blue Cross,  
Philadelphia, PA

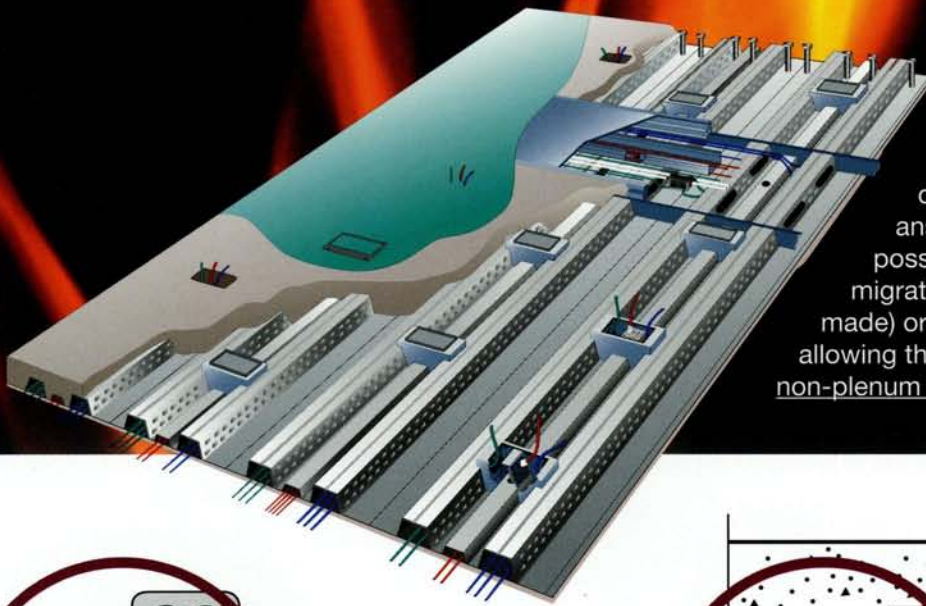


Aladdin Casino,  
Las Vegas, NV

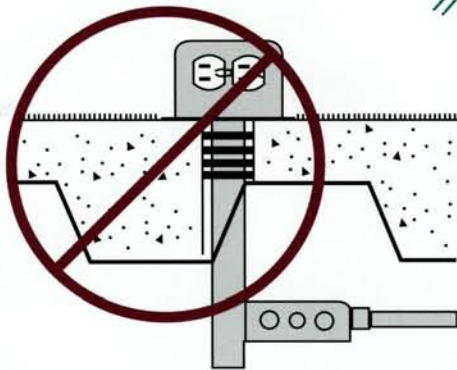
Here is a nationwide sampling of Q-Floor customers. Most are repeat users in multiple locations:

- Boeing Aircraft  
Seattle, WA
- Dollar General  
Goodlettsville, TN
- Federal Courthouse  
St. Louis, MO
- Citicorp  
New York, NY
- Covenant Transport  
Chatanooga, TN
- Connell Corporation  
Berkeley Heights, NJ
- American Airlines  
Dallas, TX
- AT&T  
New York, NY
- IBM Corporation  
White Plains, NY
- Federal Courthouse  
Phoenix, NM
- A. G. Edwards  
St. Louis, MO
- Mellon Financial  
Pittsburgh, PA
- Bank One Corporate Center  
Columbus, OH
- The Borgata  
Atlantic City, NJ
- Harrahs/Players Casino  
Maryland Heights, MO
- Steelcase  
Grand Rapids, MI
- World Financial Center  
New York, NY
- Hewlett-Packard  
Wilmington, DE

# Life Safety = Wiring in Ducts



Cellular floor and under-floor duct raceway systems are the answer. They eliminate any possibility of floor-to-floor smoke migration (no slab penetrations are made) or unsafe CMP wiring while allowing the use of much less expensive non-plenum rated cable.



Core drilled "poke-thru" outlets can permit the migration of toxic "cold smoke" through fire-rated floor slabs. "Cold smoke" is smoke generated by a remote fire that has cooled to a temperature too low to expand the intumescent disks used to fire-stop most "poke-thru" outlets. "Poke-thrus" are neither tested nor approved for smoke penetration.

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Plenum-rated cable (CMP cable) exposes combustible plastics to flame in the event of a fire. Although a fire retardant jacket covers the insulated conductors, there is no fire retardancy requirement in the governing codes. In fact, code compliant cables can ignite in minutes and produce large volumes of toxic smoke. The 2002 National Electrical Code and NFPA Standard 90A require the removal of all accessible, abandoned telecom cabling in plenums because of this fire and smoke danger.

Cellular floor and other in-floor duct systems enclose all cables in steel cells. Less expensive, non-plenum rated cabling (CMG cable) can be used safely in cellular floors and may be abandoned in place.

**Why risk the fire and toxic smoke potential of combustible cabling in ceiling and access floor plenums when steel raceways in the floor slab provide a permanent life safety benefit?**

**H.H. Robertson Floor Systems**  
450 19th St., Ambridge, PA 15003  
Phone: 412/299-8070  
Fax: 412/299-8083  
Email: [jmichlov@centria.com](mailto:jmichlov@centria.com)  
[www.hhrobertson.com](http://www.hhrobertson.com)  
(w/free downloadable details)

