



A MAiSPACE WHITE PAPER

## Advances in Modular Office Furniture Systems

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## Introduction and Overview

Today, modular open office panel systems are offered by a variety of manufacturers. Office managers and planners are confronted with a bewildering array of designs and price options. Purchasing decisions have grown more complex with the need to accommodate the massive increase in intelligence being accessed by employees. The term “computer-intensive workspace” describes a totally different environment than that of 30 years ago when a telephone, electric typewriter or shared word processing systems comprised office technology.

Managing technology in the workspace has become a science of its own. For example, there are standards that govern the design and placement of voice, data and video cabling upon which employees depend for high-speed Internet access, for file sharing on their firms Local Area Networks (LANs) and to communicate with other company locations, customers and suppliers via intranets and extranets.

These concerns have become more critical with the introduction of the “fluid workspace.” Today’s office floorplans are far from static. Work areas expand, contract and reconfigure to meet the ever-changing needs of a business. Modular office furniture and wall systems – and their cabling infrastructure – must accommodate these Moves, Adds and Changes (MACs) quickly, inexpensively and reliably.

Systems must be designed to conform to proposed OSHA standards related to health problems associated with intensive computer use, and to address work-related disorders such as carpal tunnel syndrome and repetitive strain injuries. These conditions affect millions of workers and cost companies billions of dollars in lost productivity and disability payments.

For the most part, the office furniture industry has largely been unresponsive to these dramatic changes in the workplace. Many manufacturers are constrained by obsolete product designs, marketing and distribution methods dating back to the 1970s and 1980s.

This paper will take a close look at modular furniture systems and provide guidelines to help office and information technology managers make educated purchasing decisions. It will examine first costs and lifetime costs of a system, cable management, ergonomics, construction details, lighting, accessories, privacy, and other concerns impacting the purchasing decision. While the paper will broadly focus on cable management in office systems, a companion paper, “An Introduction to High Performance Cabling Systems,” provides a more thorough treatment of that topic in today’s technology-packed offices.

### **A Look at Some Trends**

Today, many businesses are spending more on high technology office equipment than on industrial machinery. An office without a computer is more the exception than the rule. Moreover, employees frequently have intelligent peripherals such as modems, printers and fax capability in their own workspace, or if not, have access to shared facilities.

Meanwhile, organizations where personnel spend a bulk of their time out of the office are turning to alternative solutions such as “hoteling” to achieve two objectives. One is to lower real estate cost; the other is to reduce the number of workstations below the number of employees, who reserve space in advance when they’re in the facility. While these actions result in efficient space utilization, they call for greater flexibility in furniture and equipment to accommodate the changing needs of the staff in an ad-hoc environment. Companies are also reducing the average amount of floorspace per employee to approximately 200 square feet today from 250 in the middle of the 1990s, according to the Building Owner and Manager Association.

Added to this is an increase in what is called the corporate churn rate. The International Facilities Management Association reported that the average corporate relocation rate is now 44%, meaning that in any given year, 44 out of each hundred employees move within the facility.

Other trends relate to softer factors that nevertheless can play a major role in the ultimate success of an organization. Highly skilled workers will always be

in demand, and because of that, have an influence on the way offices look. Monolithic cubicles of “Dilbert” fame can act as a deterrent to attracting qualified personnel. Instead, forward-looking firms are installing office systems that allow workers to put their own signature on their workplace in terms of varying panel heights, the use glass panels, marker boards, shelving and other accouterments. This new “residential” approach to office design helps attract employees and make them feel more at home on the job, instead of a numbered peg in a monolithic hole.

### **Aesthetics and Worker Productivity**

It has been said that attractive surroundings contribute to worker morale, productivity and support the recruitment process. Today, dramatic designs and a wide variety of colors and textures are affordable options in systems products. Modern manufacturing and assembly techniques, when coupled with state-of-the-art approaches to supply chain strategies and distribution systems, put beauty, durability, functionality and choice within reach of what otherwise would be considered modest budgets.

There are several examples of affordably priced features and options that enhance the workspace. These include perforated steel panels to improve air flow and comfort, coordinated work surfaces and accents in matching wood grain or painted finishes, sandwich glass panels for privacy and sound management, tackable acoustical and whiteboard tiles, painted, fabric and wood grain tiles. Other examples include mobile pedestal files and tables that can be transported to other workstations or meeting areas in a “hoteling” environment, personal movable or permanent storage towers, adjustable panel-mounted task lights, and ergonomically designed chairs and workstation surfaces that adjust up or down.

The advent of stackable, frame and tile system has made a significant contribution to aesthetics, personalization and productivity. Wall heights, textures, colors and functions can vary within a single workplace and across the entire officescape. They bring added visual, morale and productivity

improvements when compared to the institutional look of monotonous, monochromatic single-height cubicles.

### **Cost Factors**

Determining best value when considering systems furniture purchases calls for balancing first costs with lifetime costs. One of the most overlooked factors affecting lifetime cost is that associated with supporting churn – the MACs that are increasingly part of the modern office scene. As voice, data and power cabling requirements within individual workspaces increase, the impact on the costs of MACs can become substantial. If unmanaged, these costs over time can frequently exceed the initial cost of an installation. This is illustrated by statistics that show the cost of reconfiguring network cabling can be as much as \$500 per cable in designs that do not incorporate a standards-compliant cable management system. If repositioning cable disrupts an entire office or department, costs can be considerably higher.

Stackable, frame and tile systems also contribute significantly to reducing lifetime costs. Managers need not be constrained by traditional expenses related to altering workspace wall heights and floorplans – a task that until now called for tearing out completely the monolithic panels (and providing for storage) then replacing them with an equally inflexible system. There's no longer a need to agree to a wall-height average throughout the entire officescape. Modern, segmented panel systems support micro changes in wall height and do it without disrupting power and data cabling. Changes can be accomplished in a matter of hours by popping on frames, snapping in the tiles or whiteboard or glass panels, then adding the required storage cabinets and shelving. If the wall height needs lowered, the process is reversed. These reconfigurations are accomplished at half the cost of those associated with conventional monolithic systems.

Other lifetime costs relate to productivity increases and potential tax savings that can result when modular full-wall systems are used in place of traditional construction. Open office designs prove their worth in workspaces that require teamwork and collaboration. But studies show privacy can improve

personnel productivity by up to 250% for task-intensive knowledge workers<sup>1</sup>. Systems are available that allow managers to move or reconfigure floor-to-ceiling wall layouts overnight at 1/3 the cost of conventional drywall construction. Moreover, because these full wall systems are not part of the building structure, companies may be able to take advantage of more liberal furniture depreciation schedules and lower real estate tax assessments. The DRG White paper “Incorporating Technology, Versatility and Design in Movable Wall Office Systems” provides a more through discussion of this vital topic.

As noted above, office systems must respond to proposed OSHA standards related to health problems associated with intensive computer use, and assist firms in complying with the Americans with Disabilities Act. While the costs of work-related disorders such as carpal tunnel syndrome and repetitive strain injuries have been well documented, today’s tight labor market adds another dimension to the picture. Companies that address ergonomic issues to help insure employees’ comfort and well being are a step ahead on hiring and holding talent essential to their success. Indirectly, ergonomically correct systems represent an element in lifetime system costs.

### **Crafting the RFP**

The following paragraphs describe considerations that should go into crafting an RFP (Request for Proposals) to office furniture dealers and distributors supplying technology-compatible modular office systems. Managers may place more weight on certain considerations over others, but should insist that their vendors strive to meet all of these desirable features.

#### **1. Panel Considerations**

Start with the basics. Modular systems get a lot of hard use. Structural systems (the skeleton or framework) that support panels, accessories and work surfaces should be constructed of 16-gauge cold-rolled steel. This provides strength and rigidity when in use and enables the systems to remain distortion-free during MACs. Panel tiles should be at minimum 24-gauge

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<sup>1</sup> BOSTI – The Buffalo Organization for Social and Technologic Innovation

steel while shelves and filing cabinet drawers should be of 18 and 20-gauge steel.

Most manufacturers offer solutions that restrict flexibility in managing space and placing components. A new approach called off-modular design allows much greater freedom in locating bins, shelves and divider panels. Similarly, factory-assembled structural systems were traditionally limited to what fits into an elevator and confined designs to linear or right angle configurations. Newer technologies such as knockdown and ready-to-assemble structural elements overcome traditional restrictions and, as a bonus, add flexibility while reducing production and erection costs. These new features give designers and installers virtually unlimited options in task-tailoring today's office and workspace layouts.

Another benefit of this new construction technology is the stackable panel frame – an innovation taking office furniture systems literally to the next level. Load-bearing walls 30 inches to ceiling high can be constructed, moved and reconfigured quickly and efficiently to create spaces in harmony with the work being performed or support a wholesale job change. Size, height and functionality limitations disappear when specifying load-bearing stackable panel systems that are shipped with knockdown, ready to assemble structural components. Bins and shelving can be attached where needed; glass, solid and airflow panels are easily and intuitively inserted, moved or removed.

## 2. Cable Management

Cable management for power and voice/data/video is a major challenge to be addressed in technology-intensive workplaces. Vendors should confirm that their cabling installers are trained and certified for power and data installations, and that all wiring and cabling conform to local codes.

Power systems should not share channel space with voice and data systems, and should be available for positioning either above or below the worksurfaces. The power distribution system should provide a minimum of one dedicated circuit plus a maximum of 3 common circuits sharing a 10-gauge neutral wire for each workstation. Duplex receptacles should be easily



installed and removed. The design should support “plug and play” moves, adds and changes (MACs) by trained office technology personnel.

The horizontal voice, data and video cabling system serving the office must conform to applicable industry standards such as TIA/EIA 568-A and 569-A<sup>2</sup>. More recently, the TIA has introduced new guidelines in response to the growth of open offices. Called TSB (Technical Services Bulletin) TSB-75<sup>3</sup>, it specifically addresses cable management for office layouts characterized by frequent MACs.

Most manufacturers are only now beginning to address cable management. The pioneer was MAiSPACE, Inc of Fairfield, NJ in collaboration with The Siemon Company, Watertown, CT, introduced MAiSPACE as the first modular system in compliance with TSB-75. It uses a simple “plug and play” design that permits employees equipped with a minimum of training to handle in a few hours the MACs that formerly would require trained outside technicians working several days to accomplish. The cost of change can drop to \$50 per cable vs. \$500 in conventional systems.

#### A Cable Management Check List

Manufacturers of modular office furniture systems may claim to have addressed cable management in their designs. Here’s a sample of what managers should look for:

- Certified conformance to TIA/EIA TSB 75 and TIA/EIA -568-A
- Dedicated power and dedicated voice/data cable pathways
- Consolidation points supporting a zoned cable infrastructure
- An internal structural design that supports the concept of “fanned out cable management” behind easily removed and replaced panel tile segments
- Disconnect blocks that connect horizontal cabling from the telecommunications closet to the workstation cabling to permit isolating and testing circuits without removing cable terminations
- A simple “plug-and-play” design allowing personnel equipped with a minimum of training to add, remove or reposition workspaces or cabling without disrupting the entire office

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<sup>2</sup> Telecommunications Industry Association/Electronic Industries Association

<sup>3</sup> “Additional Horizontal Cabling Practices for Open Office Designs.”

- Lay-in cabling runs outside structural framing but behind modular removable office wall tiles. This provides more cabling capacity, pathway options and easier access
- Concealed cable management anchor points for slack cable storage
- Easily installed data ports in several work area options

### 3. Data Throughput

Data throughput, otherwise phrased as the data handling capacity of the office network, is a subject of its own. Companies will continue to wrestle with the tradeoff between costs and the efficiencies gained with high-capacity networks. Only a few years ago, for example, the concept of LANs operating at 56 kilobits of data (56,000 bits) per second seemed farfetched. Today, networks in technology-intensive companies, organizations and institutions are being specified to handle billions of bits (Gigabits) of data per second. These throughputs are required to accommodate massive file transfers or downloads, lightning speed Internet access and full-motion video to the workplace.

A companion decision, also a subject of its own, is what medium to use for office data cabling. Choices include UTP (unshielded twisted pair) ScTP (screened twisted pair) and STP (shielded twisted pair) copper wire cables, fiber optic cable and coaxial cable, each option with its own sub-categories.

Decisions as to which medium to use are beyond the scope of this paper. They require careful evaluation by a company's internal IT professionals working closely with independent consultants. But two points relating to the decision are within the scope of the paper.

First, whichever medium is selected, managers must make certain that the modular office furniture system can handle it and conform to the industry standards for that medium. Second, suppliers must certify that all components of the medium are compatible (balanced) and that throughput (the amount of data transmitted per second) applies to all components, not just a single element such as the cable.<sup>4</sup>

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<sup>4</sup> See MAISPACE White Paper "An Introduction to High Performance Office Cabling Systems"



An example is helpful. Gigabit Ethernet is increasingly being specified for corporate LANs in computer-intensive industries. There are two classes of UTP cables that support Gigabit Ethernet. Category 5e has published standards<sup>5</sup>, Category 6 has proposed standards. Category 6 systems, while costing 20% to 25% more than category 5e systems, have better performance parameters and offer 300 times the information-handling capacity of category 5e systems. If this improvement in throughput provides measurable cost-performance advantages, managers must insist that their vendors certify the network will exceed the proposed category 6 standards. This must be documented by independent third party testing.

MAiSPACE Inc, in collaboration with The Siemon Company, was the first to offer modular office systems with a standards-compliant category 6 plug and play option. MAiSPACE solution is also backward compatible and fully supports category 4, 5, 5e, fiber optic and coaxial cable networking.

### **Future Technologies: Wireless LANs**

Much of this paper focuses on cable management issues relating to modular office systems. Discussion has touched on the need to accurately forecast increases in data throughput and specify cabling systems that accommodate these throughputs. In recent years, attention has focused on the concept of wireless LANs – intra-building networks that use radiofrequency spectrum or lasers to replace cables.

For managers confronted with the tangled maze of cabling characteristic of conventional modular office systems today, a wireless solution can be a compelling proposition. As pointed out in a recent edition of *Communications News*, however, important challenges stand in the way of widespread use of this solution<sup>6</sup>. Among these are security, lack of spectrum, customer acceptance and interoperability.

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<sup>5</sup> TIA/EIA-568-A-5

<sup>6</sup> "From Bluetooth to Laser to LANs to Cellular, Wireless Technology is Rapidly Taking Center Stage." November 2000

The concept of wireless LANs is not new. The core technology – spread spectrum – dates from World War II. Initial deployment to support company LANs was on an individual basis, with all solutions proprietary and incompatible with each other. While compatibility is being addressed through organizations such as the Bluetooth Special Interest Group ([www.bluetooth.com](http://www.bluetooth.com)) and standards by the IEEE<sup>7</sup>, applications are generally confined to data rates of 11 Mbps or less, and prices remain generally high. Manufacturers are seeking to stimulate the development of a broad horizontal market by providing wireless LANs with the functionality and capabilities common to cabled infrastructures. Concerns remain about the robustness of signals as they transit through walls or a rack of computer components, and the interoperability of components provided by different vendors.

What about the impact of wireless LANs on the conventional cable-based network industry? David Boothroyd, writing in *Cabling Installation & Maintenance*<sup>8</sup>, says the overwhelming view is that the two technologies are complimentary rather than competitive, partly because there is still a significant difference between them in terms of performance and cost.

Therefore, until these technologies have been fully standardized and prove themselves, the most practical solution is a modular office system that incorporates sound cable-management practices using copper, fiber or coaxial media.

## **Conclusion**

Cable management is becoming an increasingly important criterion governing the specification and purchase of modular open and full-wall office systems. As information technology and the ability to move massive amounts of data between workers, and between company locations, suppliers and customers become more crucial, the cable management issue must be attacked head on and in an

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<sup>7</sup> IEEE 802.11 wireless LAN standard for inbuilding data systems

<sup>8</sup> "Are Cabled Networks Facing a Wireless Rival?" May 2000

intelligent manner. Only those office systems that fully support recognized industry standards for cable management should be considered in the purchasing decision.

Other factors impacting the morale and productivity of the workforce include ergonomics, team building, privacy and attractive surroundings. Office and MIS managers responsible for these issues should be certain their vendors respond to RFPs with full, proven and cost-effective solutions.