FLEXIBLE BUILDING DESIGN CONCEPTS AND ORGANIC WORKSPACE.

MAXIMIZING THE POTENTIAL OF THE WORKING ENVIRONMENT.

HOW TO MAXIMIZE THE POTENTIAL OF THE WORKING ENVIRONMENT…….

In a world of increasing environmental awareness & accountability, rising real estate costs, rapidly advancing technology, changing workplace requirements and shifting demographics, maximizing the potential of the working environment is perhaps the greatest challenge faced by building owners, users, architects and designers alike when seeking to be effective in the marketplace.

This challenge is daunting enough when applied in today's world however no longer can any guarantee be given that a solution, though current today, will still meet the demands that may exist even a year from now.

How do we therefore react to today's demands and still provide flexibility for tomorrow in a cost-effective manner?

This document attempts to provide some of the answers to this question.

Although each of the concepts discussed herein are not necessarily new, it is hoped that by juxtaposing them in this manner we can arrive at a structured approach and a process that, when combined with the correct range of products, will meet this challenge.

Flexible Building Design Concepts.

1. Introduction.

The main challenge around the question of flexibility exists due to the difficulty of "predicting" the needs, and therefore the layout, required for the space over time. There are tools that can assist in the prediction itself however no tool can predict change itself and no change at all is not necessarily a healthy option either.

We know that today change happens more frequently and in less predictable ways than ever before and will not slow down.

In addition to this we now have to contend with new expectations and standards of quality, environmental performance and social responsibility combined with new demographic shifts meaning that the historical benchmarks that were generally relied upon to assist in the prediction process, can no longer be utilized in contemporary space design. If we can no longer use the past to predict the future then perhaps we need to change our toolset.

What if instead of trying to perfect prediction we utilize a kit of parts and employ strategies that either reduce or eliminate the expensive and disruptive consequences of change? This would remove the pressure of accurate prediction, as it would provide a solution that would embrace rather than fight the prospect of change.

Modular products and techniques exist that can be incorporated into the design and implementation of flexible buildings. This document presents flexible building design concepts and suggests how they can be achieved for interior construction from base building through to completion.

Creating a truly productive interior environment involves many decisions throughout the design development process ranging from aesthetics, to technology, to future needs and beyond.

Considering that the technology is now available, it should be utilized to build flexible interiors that can respond to new demands and changing needs.

The perfect condition arises when modular planning can be implemented during the initial conceptual stages of the design. This being the case, key decisions can be made early in the process that will significantly improve the future potential of the building at little or no additional cost.

The objectives of this process should be:

- To deliver an effective environment at a cost comparable to conventional construction budgets.

- To create the ability to control the design with a consistent aesthetic as opposed to purely relying on local trade capability.

- To administer the budget with known supply and install costs rather than conventional construction allowances and contingencies.

- To reduce the schedule complexity with simple installation dates instead of so many multi-trade, multi-task and multi-level schedules.

- To create a facility designed for future remodeling at dramatically reduced costs and levels of disruption.

- To create facility designed or configured to allow the implementation of new technologies using a relatively simple upgrade process.

- To provide a solution that is inherently sustainable in terms of materiality and ongoing reduction of waste through re-use and the concepts of Loose Fit, Low Energy and Long Life.

In addition to elements that align directly with current USGBC LEED criteria there is much about this solution that is inherently sustainable in terms of its long time performance and impact.

The quality of interior elements, proliferation of natural light, flexibility without downtime and disruption, user control, air quality and comfort all provide significant improvements in the People performance.

Less energy, less waste, reuse of elements all leesen the impact on the environment and use of natural resources.

Cost effective delivery and the ongoing reduction in energy and the cost of adds, moves and changes provides the Financial benefits.

The concepts discussed in this document are not new but they have matured over recent years both in terms of the products themselves and in the application of these approaches becoming much more common in North America.

It is the hope of this document to assist others in understanding the features and benefits of this approach and the methodologies involved in the successful implementation of such ideas.

2. Modularity Overview.

If buildings, and in particular interiors, were designed based more on a modular concept many benefits to the end users would be achieved including: -

- **Effective Use of Space** – Modular design allows the space to be sub-divided with consistency and in a configuration that includes standard and non-standard sizes will often enable the incorporation of additional workstations and offices.

- **Flexibility** - The walls, furniture and interior components could be disassembled and erected in new configurations as needs changed. Components would be re-useable several times over in numerous layouts rather than being stripped out and transported to landfill sites that are already full of construction debris.

- **Quality of Environment** – The working environment is of great importance to employees and modular design can enhance the ability to deliver a higher quality space. As far as future reconfiguration is concerned, the destruction, debris and disruption associated with demolition of conventional construction elements in occupied space would be avoided.

- **Technology** - The arduous and expensive task of running new “home run” power, voice and data cabling from the main board or computer room to each new location through a maze of cluttered ceiling plenums and service ways makes up a significant portion of the cost of reconfiguration. Under a modular design, this practice can be practically eliminated.

- **Cost Effective** – Through implementing a process that fully integrates products in a such a way that there are savings that offset additional cost, it is possible to be first time cost effective. Furthermore the future cost to the end user of all these construction elements being torn down, disposed of and then rebuilt all over again each time a reconfiguration is undertaken, will be dramatically reduced.

Modular space planning must consider the integration of all the various construction elements and how they will interact with each other. It is not sufficient to only consider how they will interact with each other initially; it is also vital to consider what possible combinations may occur in the future. With any good system however, proper planning will allow the components to be placed together in an almost infinite variety of ways.

The building shell must have the capacity to serve different functions. Although walls and furniture can be tailored to meet special dimensional constraints, rooms should be designed to fit into the building’s column and mullion modules if possible. This reduces the “customization” that would be required and the inclusion of too many different module sizes which will tend to increase the initial cost and limit the future flexibility of the space.

Components used to build the rooms should be modular enough to create any room size required and flexible enough to serve them adequately. Furniture modules should relate to both the private office sizes and the open office plan. All pieces must complement each other.

When the space does move, it should do so gracefully. Effective movement of an interior build out requires that components disconnect and reconnect with the various mechanical and electrical services to them. Movement of base building items such as sprinklers, diffusers, and lights should create minimal or no disruption. The base building itself must have the ability to integrate new technologies to the interior space with minimal disruption and cost.

3. Planning the Base Building for Flexible Interiors.

Shell space designed for maximum flexibility should have a consistent floor to ceiling height throughout. Exterior, core, and demising walls should have flat vertical surfaces to allow walls and furniture to be placed anywhere in the space without interference from unusual building elements.

This ideal space would allow for the new walls and furniture to be connected to the building's electrical, communication, lighting, mechanical, plumbing, and fire protection systems without disruption to the shell space, finishes, or other tenants.

It is also essential that this flexible intent does not detract from the design of the space, but rather compliments it. This can be accomplished through the following techniques.

3.1 Column and window mullion spacing.

When designing the building module, consideration should be given to the sizes of offices, conference rooms and open areas. Column and mullion spacing could then be designed to coincide with office sizes to eliminate jogs on interior walls so that they align with a fixed building element. This reduces cost and enhances the appearance of any system placed against it whether it is a moveable wall or drywall partition.

Another benefit of eliminating these "jogs" is that the office furniture can be placed in any position without cutting the furniture or sacrificing space. This creates a very strong argument for designing the columns to fall on the outside of the exterior wall to further reduce interior obstacles.

There is perhaps some merit in considering not furring out columns at all and just finishing them directly. This will obviously be subject to the design intent however if electrical and data are in a raised floor system then there is less likelihood that the columns will have to be furred out to accommodate these lines. This may not be so appropriate in the case of "I" beam profiles but hollow section steel can be primed and painted. In the case of concrete columns this will depend on quality of finish.

This will ultimately reclaim the vital inches that are often missing when trying to maximize the dimension available for furniture or wall placement thereby enhancing the flexibility of the space.

3.2 Exterior Walls.

If offices are to be incorporated on the outside perimeter the vertical section should be straight without ceiling recessed blinds or protruding fan coil units. If fan coil units are required, they should be strategically placed to minimize their impact.

Window mullions should be placed flush to the inside face of the exterior wall.

These techniques create a surface to place walls and furniture against that maximizes space and allows for simple and clean connections.

3.3 Demising and other walls.

The same rule applies to this element. Straight vertical surfaces are the most simple to connect to. Unusual features in walls should be encouraged but in such a way that the office interior can still move with fluidity.

3.4 Ceilings.

The ceiling plane should be consistent throughout.

Changes in ceiling heights pose difficulties for re-using movable walls and full height furnishings designed for another height. Drywall bulkheads are often necessary obstacles to be contended with.

3.5 Ceiling fixtures

Ceiling mounted lights, sprinklers, diffusers, etc. should be placed where it will be unlikely that they will have to move. A grid layout may be one means of achieving this. If they do have to move they should do so easily.

Indirect lights can have a plug-and-play connection to the electrical source and switch. The ceiling tiles, complete with each hanger wire support, can be relocated to a new position and the existing tile will exchange with the old one.

Sprinklers designed to pivot 180 degrees on a 48" radius are being used in many jurisdictions.

Elastic flexible ducts could be used to give the diffusers enough "play" to reach other ceiling tile locations.

Strategic placement of diffusers will allow them to handle a number of different wall locations and room sizes.

3.6 Electrical Distribution

Traditional methods have tended to distribute electrical to the interior space for lighting, HVAC and convenience power requirements by way of runs from an electrical closet to the point of use - or "Home Runs".

Although moves, adds and changes may allow some reuse of the existing distribution system, more often than not new runs have to be installed to service the demands. This is both time-consuming and expensive.

It would greatly enhance future flexibility to incorporate a grid or "zone" distribution system that comprise a simple, inexpensive, non-invasive connection at the point of use. At the other end of the connection are electrical outlets, lights, furniture, and any other "hardwire" connections that can stretch to the grid via extender cables. A plug-and-play connector at this point can offer considerable future savings.

3.7 Communication distribution

The same "Home Run" principles have been applied to voice and data distribution with the same disadvantages. With the ever-increasing pace of at which technology changes, the lack of flexibility could prove to be even more crippling.

A simple solution to high communication distribution cost and lack of upgrade-ability is to use structured zone cabling similar to the electrical system. It is recommended that all cable be run to the point of use regardless of what its final function is to be. This will allow the plug in the wall, floor or furniture to serve a multitude of purposes without any change other than re-dedicating its source in the computer room and plugging the device in.

This is all accomplished without the expense of running new cable and re-terminating the ends with significant future savings.

3.8 Raised Floor system

Computer flooring has always been an excellent means of distributing large quantities of wiring and cables to equipment in high-density computer applications. Unfortunately it is so expensive and awkward to install that it has never been practical to use extensively in an office environment. This too is changing.

Low profile raised flooring can now be installed for about one-third the cost of traditional computer floor and at very low heights. Factor in carpet tiles and you have the easy non-invasive access you need to facilitate rapid change.

The low heights also have the advantage of not compromising overall floor to ceiling height. This is particularly important when retrofitting existing space where the height available cannot be changed.

Long, steep ramps with handrails are not necessarily required. If desired, ramps can be configured so that transition from a building corridor or lobby to an office suite is barely noticeable.

For build-to-suit and new construction opportunities full height raised floor is becoming increasingly common. At 12 – 16 inches on average this allows the HVAC delivery to be managed from the floor along with the power and technology component.

When a project can accommodate full height raised floor c/w air delivery the project takes on many different characteristics.

As with many new ideas, products or concepts we tend to worry about cost impact too easily and in any cases dive into line item prices without the benefit of a sophisticated solution based holistic approach to whole project cost.

Raised floor as a product may be a line item but raised floor as a building strategy is much more than that.

We will deal with specifics in a separate document but in order to illustrate consider the number of design, scope, and consequently, cost impacts of raised floors as a building strategy.

Full height raised floor with HVAC will have many implications on the building design – here are some of the highlights

1. A laser leveled adjustable raised floor with a smooth upper surface does not need a high tolerance power trowelled concrete sub floor as would carpet or other direct

applied floor coverings. The concrete sub floor can be rough leveled and sealed. The saves the time and cost of a troweling process.

2. Full height raised floor and a pressurized plenum distribution accommodates the electrical and low voltage requirements that would normally be in the ceiling. The significant dimension of ductwork distribution and VAV boxes etc has a significant influence over the size of the plenum and consequently drives the structural slab-to-slab dimensions and therefore the overall building height. This is all now housed within the raised floor in much less space than would have generally been allocated in a conventional distribution. This leads to possible structural height reduction and overall building height reduction with consequential cost savings in structure, envelope and all vertical elements such as stairwells, elevator shafts etc. In taller buildings it can even lead to additional floors in the same height.
3. Power and data are much easier to install in the floor than with an overhead approach and the routing is much more direct leading to material, labour and schedule savings.
4. All the methods used to get the power and data from the ceiling to where it is needed such as Cable trays, 'J' hooks, power poles and coring are eliminated.
5. Air is delivered via adjustable floor diffusers and follows a displacement rather than mixing logic in conditioning the space. Independent testing clearly shows the impact of better user control, higher levels of thermal comfort, ventilation effectiveness and indoor air quality IAQ with significant user effective performance and reduced energy benefits.
6. Air from the floor does not need to be chilled to the same extent as air from the ceiling as it enters the breathing zone without having to fight down through the hot stratified air in a conventional distribution.
7. There is a significant reduction in sheet metal and HVAC equipment – even the potential for reduced cooling which all lead to cost savings.
8. Changes to layout are now a fraction of the cost as in addition to the power and data simplicity the HVAC is easily reconfigured to suit new requirements.
9. If correctly managed the whole approach expedites the construction and interior fit out.

4. Movable Walls.

4.1 Aesthetics and Functionality.

Aesthetically speaking, walls convey a message about their occupants, which can mean anything from confidence, to style, to visionary prowess.

Walls provide separation between space and functions, they maintain acoustical privacy, deliver electrical, voice and data, plumbing services and also support storage units and plumbing fixtures.

Modular walls should be capable of achieving all these requirements without limiting you to a fixed ‘catalogue’ of aesthetics.

4.2 Modules and Flexibility.

Greater flexibility can be achieved if the numbers of different wall modules, whether they be glass, vinyl or doors, are kept to a minimum. This allows different panels to easily replace one another in a reconfigured layout.

Chances are that most spaces will require unusual size panels to match the inherent modularity of the building. If required these panels should also be fully interactive and reusable within the modular system.

Avoid modular wall systems which are ‘progressive’, meaning that an entire run of walls would have to be taken down to replace or move one panel. Special posts should not be required to attach new walls. These posts can introduce dimensional ‘creep’ into the modular equation, limit your ability to add or remove future walls, and detract from the aesthetics of the walls.

4.3 Electrical Considerations.

Modular walls should be capable of meeting any electrical or phone/data needs at the location they are required. Furthermore, they should not prohibit adding, moving, or removing service in the future.

Current technology allows for all electrical outlets and devices up to 20 amps and phone/data jacks up to 1gig/sec speed, to be unplugged within the ceiling or floor, moved, and plugged back in to the closest ‘zone’ distribution point.

Zone distribution is discussed in greater detail later in this document.

5. Raised Access Flooring.

5.1 General.

As stated earlier raised flooring is now an available means of delivering technology and power and HVAC to a space without inhibiting or adding to the cost of future upgrades and/or changes when required.

5.2 Placement and Accessibility.

Raised floors should be used through the space to maximize flexibility and to serve all of the space with a consistent system.

Low Profile floor is of particular value in existing buildings as it allows the high performance character of floor based distribution of power and data to be provided.

The adjustable nature of the leveling supports also means that the raised floor can deal with poor and uneven substrates without the time and cost of expensive leveling screeds and remedial work to the existing structural slab.

Low profile floor ramps can be reduced or ‘floated’ out to longer lengths so the transition is barely noticeable.

As full height raised floor tends to be more applicable to new construction it is easy to set the thresholds of entrances, stairwells and elevator shafts etc so as to eliminate any ramps and facilitate flush transitions throughout.

5.3 Zone Electrical Distribution.

Distribution points should be placed throughout the area in a Zone system.

The distribution points have ‘home runs’ to the electrical closet with a circuiting capacity that can handle any of the departments within the space and takes into consideration what the maximum permissible occupant density of the space.

Connections from the Zone Electrical Box to the wall or furniture system should all be standard 8-wire quick connect that can accommodate up to 4 circuits each.

No part of the system should prohibit special requirements such as dedicated or UPS power.

5.4 Structured Zone Cabling for Phone/Data.

The distribution of the phone/data system should closely follow the electrical system but maintain required separations. This proximity will aid in locating and connecting to the grid when need occurs.

Plenum rated cable is generally not required in this non-plenum type of floor.

As with the electrical system additional capacity to be built into the cabling to accommodate any special use space and whatever maximum densities are anticipated.

It is recommended that all cable to the point of use be of the same type. This allows outlets to be re-dedicated as phone, data, fax, modem, or building control systems without re-cabling.

5.5 HVAC

The HVAC distribution can now use the floor as the plenum which eliminates the need for extensive ductwork.

Proprietary diffusers that the end users can adjust to accommodate their individual comfort needs deliver conditioned air to the space on a constant volume system. As non-ducted elements they can be added or moved with little or no cost.

Perimeters may be isolated using plenum dividers to facilitate separate control of this zone and the main space may or may not be broken up. This will depend on the building layout and the ways in which air can be supplied to the floor.

Lighting.

6.1 Ambient versus Direct.

Many work place environments are moving towards ambient lighting with flexible task lights for the work surface. This method, while not appropriate for all space functions, offers several advantages including:-

- Less eye strain on the individuals working within the space due to the lower lighting levels.
- Flexible task lighting allows personal control of light levels and direction or position by the user.
- Energy consumption is also reduced due to the lower lighting levels of the space.

Ambient lights reflect off the finished ceiling and are diffused downward. The flexible task lights are required at work surface height to give the necessary light to provide adequate foot candles for functions occurring there.

6.2 Impact on Acoustics.

The impact on acoustics is that recessed lights create penetrations through the ceiling that allow sound to pass through what is otherwise a good acoustic barrier.

To enhance acoustic performance avoid recessed lights where possible, and where they are required select lights that do not incorporate return air diffusers.

Recessed lights with double-wall construction or other natural barriers will provide better pass-through acoustics than those without.

6.3 Flexible Task Lighting.

With the reduced overall lighting level comes a need to provide greater light at the work surface. Flexible task lights, which give the user the ability to position the light in a variety of locations, allow the individual control for their own specific tasks and glare needs.

Actual foot candles recommended at this level will vary depending on the overall lighting solution for the space.

6.4 Cost Impact.

Initial cost for ambient lighting ranges from slightly more than traditional recessed to substantially more depending on design. Savings on electricity and operating cost however are realized annually and at some point in the future overcome the initial outlay.

As with all cost issues, this becomes a consideration of the owner's preferences and facility strategy that must be decided relatively early in the design process.

6.5 Daylight and Views

It would be wrong to deal with lighting and not include this valuable strategy.

Over recent years the importance of Daylight and Views, long supported by many European design practices, has become a primary focus of many buildings.

This is both a quality and an energy efficiency benefit as there are obvious improvements in the health, welfare and therefore productivity of occupants along with opportunities to harvest natural light and in doing so reduce energy and cooling loads.

There is much more on this strategy available but no lighting design and no building strategy should ignore this valuable building amenity which, in addition to the benefits listed above, is emerging as a fundamental feature in setting one building apart from another as it has become influential in the space's role in assisting companies in recruiting staff.

7. Acoustical Strategies.

7.1 Changes in Interior Environments and Their Impact.

The concept of open plan workstations rather than private offices still applies to a significant portion of office interiors. This creates a higher density of occupants working with fewer physical barriers between them.

In considering acoustics the different requirements for various parts of a building should be taken into account.

- Sound protection in an office should be from room to room.
- Sound protection in an open plan area should protect against noise traveling within the space.
- The system within a classroom environment should allow for ease of communication inside the room while protecting between spaces.
- Any solution to the noise problem to be treated must be a systematic approach that considers all elements of the space that will impact acoustical performance.

7.2 Wall Protection.

A wall, whether conventional or modular, must provide a sufficient barrier to the transmission of sound. Modular walls must be comparable to conventional walls with sound batting as part of the assembly. All connections, joints, and building interfaces of the modular walls must be acoustically protected and free of 'seams' that allow sound to pass through. Proper and certified installation of any wall system is a necessity.

7.3 Ceiling Installation.

Many improvements have been made in recent years to the acoustical performance of ceiling tiles.

Traditionally spaces requiring acoustical privacy had walls running from floor to underside of structure above or, at minimum, to just above the ceiling. With the improvements in ceiling system performance it is now possible to place a single consistent height ceiling throughout and run walls flush to the underside of the grid and tiles. This connection must also be tight if it is to perform to its full potential.

Installing a single grid saves time and money in the installation itself by eliminating the need to finish out each room individually and provides the future flexibility required in modern office environments.

7.4 Ceiling Penetrations.

Any penetration through the ceiling is creating a potential sound problem. Reduction and/or protection of these openings are essential to the overall acoustical performance of the space.

Suspended ambient lighting offers a distinct advantage over recessed in that the ceiling penetration is nominal and is also protected by an escutcheon plate.

It is strongly recommended that non-ducted return air diffusers be fitted with a sound baffle to protect sound transmission. Arrangement of supply air diffusers and the types of ducts serving will also assist in creating a consistent strategy to acoustical privacy.

7.5 Floor Finishes.

The floor area represents the largest surface inside of a typical space outside of the ceiling therefore its finish treatment becomes an important feature in the acoustical performance of the space. Carpets can vary widely in their ability to absorb sound and they are impacted by the type of backing or underlay that is used. If a raised flooring system is used, carpet tiles should have adequate backing to prevent 'foot fall' noise created by normal office traffic.

Again, whatever carpet system is to be used it should be considered as part of the overall acoustical system and should be planned consistently with the other elements.

7.6 Sound Masking.

Increased occupancy levels have driven a resurgence in 'sound masking' systems.

Very simply put, sound masking is the addition of a 'tuned' noised in the ceiling plenum that muffles sounds within the typical range of human voices. This is based on the principle that copy machines and other business equipment does not tend to distract an employee as much as an understood conversation nearby.

Sound masking does not eliminate these noises but rather obscures them so as not to cause distraction. The system can also be adapted to perform paging and intercom functions.

7.7 Finished Surfaces.

Specially treated surface or sound absorption material should be considered for areas where high levels of noise are expected. These materials and finishes can be used to enhance a standard wall's ability to protect to meet a specialized requirement. Any product or finish determined necessary for these special conditions should also consider the modular need to move.

7.8 Arrangement of Furniture.

Arrangement and height of furniture panels will make a significant impact within the open plan environment.

Soft finishes will aid in preventing sound from passing from one occupant's mouth to their neighbor's ear. Hard surfaces should be used carefully to avoid becoming a conduit for sound transmission between adjacent individuals in a workstation cluster.

Orientation of a worker in their station should also be carefully considered to avoid one directly facing another worker without any barrier in between.

Other considerations include the level of noise expected to be generated and the need for private communication for the occupant.

7.9 Acoustic Ratings

A number of different methods are used to measure acoustic performance.

STC - "Sound Transmission Class" - A single number rating of a structure's ability to block sounds a 16 speech frequencies from 125 Hz to 4000 Hz. The rating is weighted to reflect the unequal weight given by the human ear to different frequencies. STC ratings are, by definition, obtained from laboratory measurements in which only the specific component under consideration is tested. Measurement unit is decibels (dB).

FSTC - "Field Sound Transmission Class" - Rating similar to STC, but based on measurements conducted "in the field." FSTC ratings are typically 3-5 dB less than STC ratings for the same construction.

NRC - "Noise Reduction Coefficient" - A single number rating of a material's ability to absorb sound. Though this rating is widely used, it is of limited utility because no weighting is included to reflect the human ear's unequal weight given to different frequencies, and the rating is averaged across only four frequencies. Rating is from 0, indicating 100% reflection, to 1.00, indicating 100% absorption. (It is possible, due only to a mathematical aberration in the test procedure, to have ratings over 1.00).

PI - "Privacy Index" - rates the intelligibility of speech in a space or room. 0% indicates full intelligibility, while ratings greater than 95% represent confidential privacy, defined as the condition where none of the speech sounds heard may be understood, even though some of the speech sounds may be audible. PI less than 60% indicates that essentially all speech is intelligible. Measurement and calculation of the rating includes consideration of noise reduction between two spaces, speech levels in the source space, and ambient sound levels in the receiving space, making the measurement valid for a specific site with a specific set of components.

Modular Furnishings.

8.1 Module Sizes and Movability.

Modular furniture sizes should be modular relative to the space it is to be placed within, not modular to the manufacturer's standards.

Properly selected furniture gives one the ability to move it from an open plan setting to a private office with minimal changes to accommodate finish levels and configuration required for different user types. Not all components are likely to be identical but if the underlying platforms from which they are constructed are truly modular it will enhance future re-usability and reduce operating cost.

As with wall modules, the furniture modules should be based on building module sizes.

With sufficient consideration up front there is the potential to have a dramatic effect on initial space planning as well as future usage.

8.2 Moving Between Spaces.

Basic furniture functions provide work surfaces, storage, wire service management, and aesthetic hierarchy of status.

Assuming that common functions can be moved between different types of spaces then the only remaining issue is aesthetics and configuration.

As an example changing a small open plan station to a private office could be one of many challenging scenarios.

This can be accomplished with the addition of different tops and storage component fronts (possibly with different finishes) while reusing the same furniture frames for wire management thereby saving money.

This is only a simple example of what can be achieved through working with your furniture vendor to reach your desired goals.

8.3 Electrical and Phone/Data Considerations.

Modular furniture must have the ability to be reconfigured with little or no disruption to other users in the same furniture cluster or in other areas of the space.

Electrical and voice/data should have the ability to connect and disconnect without requiring new runs and re-termination of cables by either an electrician or cable vendor. This point is critical in reducing and/or eliminating unnecessary future costs as the voice/data and electrical component of furniture reconfiguration can amount to 75% of the total cost of the move.

It has been found by some users that the average cost associated with a single workstation move in a new modular designed space with zoned data is $375. This can be compared with $1,500 for the same move in a conventionally constructed space. This is purely because the electrical and voice/data component was simplified to a plug and play process that could be largely carried out by their own facilities people. An electrician may still be required to shut off the power at the panel however this is much less expensive than running complete cables etc.

If these moves are contracted out then the saving in time will translate into a reduction in the contracted out cost.

9. The Bottom Line.

As with any discussion regarding the implementation of a concept into the construction process, questions regarding the cost implication of such a move will likely arise sooner rather than later.

The budget is generally established early and becomes a fixed element that is not negotiable.

The challenge is to be able to consider all these requirements and budget accordingly. If both the process and the products that are required to achieve maximum flexibility are taken into account then the budget will support their incorporation.

Many of the recommendations do not affect cost; others have a minimal initial cost that can often be offset by other economies during construction. All are designed to save future operating costs and aggravation.

The cost of implementing new technology and techniques can be largely offset by adapting the rapidly aging building methods they are replacing.

To illustrate:-

> The cost of movable walls is offset by the economy of building wide open shell space prior to the walls being installed. This non-demised environment leads to drastically reduced construction schedules, reduced trades on site, reduced construction debris and waste, tax savings, and re-usability.
>
> Cable access flooring costs can be offset from savings in the electrical and communication distribution systems.

The flexibility and cost-effectiveness of modular construction can even start working before buildings are completed.

For example:-

> It is often the case that floor layouts have not been fully approved or require amendments late on in the design or even after construction work is under way. A modular system can accommodate late decisions or changes with little or no impact on schedule and less additional cost, as there are fewer consequential extra items for other trades.
>
> Should the layout of an area require alteration to accommodate extra offices and meeting rooms due to a change in the tenant's requirements then the additional cost to the contract will be for the direct addition of walls and doors only. With conventional

construction there would be numerous schedule issues and consequential costs and extras that could make such a change extremely expensive.

Even if walls had already been erected in the area there would only be a minor labor element to reconfigure the existing walls to suit the new layout. With conventional drywall the existing walls would have to be demolished and disposed of.

With zone cabling for power and data there would only be a simple disconnect and reconnect process to existing zone distribution points.

New home run cables on the other hand would cost considerably more and there would be the additional cost element of existing installations either becoming redundant or being stripped out and disposed of.

10. Bid Documentation.

The key to delivering this type of space lies in the instructions given to the contractors within the construction documents.

A clear and concise bid package that clearly communicates the changes in methodology and process is the single biggest factor in obtaining the low initial cost to make this a reality.

The bid package should, as always, comprise both drawings and specifications. Care must be taken to clearly indicate not only the adjusted scope of work and all the relevant information related to each component, but also the shift away from the conventional process in scheduling and execution.

If the underlying concepts are not passed onto the contractors pricing the project then they will tend to price from a conventional standpoint and some of the financial benefits may be lost.

11. In Summary

Whether a building is designed with largely open plan work areas, heavily demised space or a combination of both, the correct application of all these principles will ensure that the building can support future reconfigurations in a cost effective, expedient manner.

A complete modular solution that incorporates a number of products and design elements will generally be cost effective when compared to a traditionally built space that is inherently inflexible. As with traditionally built space however, planning will ensure that the modular concept is implemented to maximum effect.

Cohesive planning with these goals in mind will deliver a finished space that is high performance, aesthetically pleasing and fully functional and one which will serve the users and managers of this space very well for many years to come.

In other words these concepts enable us to meet the challenge of MAXIMIZING THE POTENTIAL OF THE WORKING ENVIRONMENT for today and for the future.

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