

SCOPE



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Pittsburgh, PA

INTEGRATED ACCESS FLOORS — A Necessary Step Towards High- Performance, Info-Tech Office Spaces

THE USE OF access floors in the workplace is rapidly gaining popularity since they present a solution that is specifically designed to support information-rich and highly computerized business environments, such as call centers. Owners and developers, along with building designers and facility managers, face the challenges of constantly changing space needs, technology-driven operations, high churn rates and the almost impossible task of maintaining flexibility while keeping life-cycle costs down. All of these challenges demand a new outlook on planning and constructing buildings and some insight into assuring that all building systems are integrated so they become mutually supporting.

The costs of both change and maintenance are exceptionally high in traditionally planned buildings, and in many instances, users defer needed changes at the cost of organizational comfort and efficiency. In fact, many traditionally designed facilities become obsolete due to wiring and wiring distribution problems created by organizational changes and advances in technology. If the building is planned correctly though, with enough thought and creativity, changes can become almost routine, and technology can be easily integrated. A well-designed, intelligent building not only has the flexibility and the capacity to accommodate change, it actually promotes change.

In this article, the first in a series of two, we will introduce the concepts and fundamentals of access floors and discuss potential benefits and limitations associated with their use. Part II will explore the advantages and disadvantages in greater detail, attempt to quantify them through computer modeling and case studies and offer suggestions and recommendations on applications and design implementation.

The Concept Behind Access Floors

An access floor is a floor placed upon a floor, thus creating an accessible plenum for the distribution of building services such as power, voice and data and the distribution of heating and cooling services. The floor can be raised by as little as 2½ inches to more than 3 feet. When the under-floor plenum is used for air distribution, the floor is raised at least 8 inches above the slab. The access floors consist of bolt-together steel or aluminum pedestals and metal or concrete floor panels. The system is modular with the ability to plug and unplug any of the electrical components in the entire system from the panel board to the receptacle. The finished floor surface can be carpet tile, vinyl tile, laminate, finished concrete or natural materials such as wood or cork.

The under-floor HVAC system not only eliminates most of the ductwork and insulation requirements associated with the overhead system, but also enhances mechanical system flexibility because the non-ducted diffusers can be easily removed and relocated. Floor-mounted diffusers or workstation-mounted solutions distribute conditioned air from the access floor directly to the occupant's level. From there, the air gently mixes with the room air and rises to return grilles at ceiling level. The integrated access floor system also boosts the flexibility of telecommunications, data and electrical power delivery in the workstation. Simply by removing the access floor panels, building managers can now accommodate space and workstation changes as people relocate into, out of and around the office space.

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Benefits of Access Floors

Integrated access floors for telecommunication, power and air distribution offer several economic and environmental benefits. The most significant are identified below:

① *Ease of Reconfiguration – Easy Access*

The integrated access floor system is engineered to permit fast, easy installation and quick wire and cable changes, enhancing the ability to reconfigure the offices without disrupting power, voice and data services, as well as the air distribution system. Variable Air Volume (VAV) Terminals can be easily added, removed or rearranged to respond to changes in occupancy or heating and cooling loads. Even in workplaces with very low churn rates, constantly evolving technologies in the communications and networking sectors may demand occasional updating of the cabling and wiring systems. These updates are quite simple with access floors.

② *Energy Savings*

The use of an access floor plenum for conditioned air distribution can significantly reduce energy use in many possible ways.

- **REDUCED FAN POWER.** The under-floor supply plenum with the large cross-sectional flow areas can supply air with very low overall pressure drops.
- **HIGHER CHILLER EFFICIENCY.** Under-floor systems can use warmer supply air (about 60 to 65 degrees F, rather than 55 degrees F), which permits, in dry climates, a warmer cooling coil and warmer evaporator temperature.
- **EXTENDED ECONOMIZER RANGE.** In mild climates, the use of warmer supply air significantly expands the opportunity to use free cooling, or the direct use of outside air, without operating a chiller.
- **BETTER HEAT REMOVAL.** Since the airflow is from floor to ceiling, most of the heat generated from ceiling-mounted lights is removed before it can enter the occupied zone. The cooling load is therefore reduced, allowing warmer air to condition the space.
- **FLOOR SLAB AS A THERMAL MASS.** The concrete slab becomes an active thermal mass, thus reducing temperature swings and peak cooling requirements and permitting the realization of benefits such as night precooling in under-floor air applications.

③ *Capital (First Cost) Savings*

- **CEILING HEIGHT.** In new construction, the use of an access floor for service distribution can considerably reduce the overall building height, since floor plenums are usually shallower than ceiling plenums. Access floors can lower structural costs by allowing architects to reduce floor-to-floor height by a minimum of 6 inches.
- **FLOOR LEVELING.** The adjustable access floor pedestals accommodate for the imperfections in the floor slab, allowing the floor to be laser leveled. The construction schedule can also be tightened by eliminating the need for slab screeding.

④ *Occupant Health and Comfort*

Reportedly, the most common complaints among employees are thermal discomfort and indoor air quality. With floor-mounted diffusers, or workstation-mounted solutions, such as task air modules or personal environment systems, the air is distributed directly to the workstation. The occupants have the ability to control both the volume and the direction of the incoming air, and the fan units can be turned off to accommodate reduced cooling requirements. As a result, personal comfort complaints are virtually eliminated. Case studies also show reduced absenteeism levels, since the system improves the indoor environmental conditions in other ways as well.

- **AIR QUALITY IMPROVEMENTS DUE TO BETTER POLLUTANT REMOVAL.** The upward flow of the supply air draws the pollutants upward rather than letting them swirl around with the room air.

- HVAC FLEXIBILITY. The access floor system enables the easy reconfiguration of HVAC services when relocating workstations or in case the thermal load conditions in the space change.

① *Productivity Gains*

Access floors improve indoor air quality and provide temperature control to individual workstations, significantly enhancing personal comfort. Research studies have repeatedly shown a strong positive correlation between employee comfort and productivity gains. Preliminary productivity studies in the workplace also confirm significant savings due to occupant comfort and individual control of environmental conditions.

① *Tax Deferment Savings*

For tax purposes, the access floor, modular wiring and elements of the air distribution system can be treated as equipment rather than part of the building's structure and may be eligible for accelerated depreciation — over seven years, compared to 39 years for building depreciation — improving cash flow. At full corporate tax rates, the net present value of the tax deferment savings is almost 20%. (Consult your tax advisor.)

① *Environmental Advantages – Green Architecture*

The “plug-&-play” capabilities of modern access floors can adapt to technology, eliminating the need to discard an old system for a new one, thus offering a “green” system. Potential resource benefits due to the elimination of the HVAC ducts should be holistically evaluated.

Other advantages from the use of access floors may include lower labor costs that result from the ability to work at floor level rather than overhead, tighter construction schedules and greater design freedom for the ceiling, since it has no air outlets.

All these benefits could result — under certain conditions — in substantial overall cost savings. These potential savings, and the necessary circumstances, will be investigated and quantified, if possible, in Part II.

Limitations & Challenges

Integrated access floor systems also present challenges, both real and perceived, that constrict their widespread application. The most important are briefly discussed below:

① *Perimeter zone and variable load room requirements.* As with any HVAC system, the perimeter zones introduce additional heating and cooling loads that warrant the use of tailor-made solutions. Bringing in the HVAC engineer at the beginning of the design will ensure the system's effectiveness. Architects should also make the effort to minimize the impact by carefully designing multi-layered envelopes that encourage the desired thermal stratification in the workplace. An effective strategy to more closely match the varying conditioning requirements would be to place additional supply diffusers with individual booster fans in these spaces (e.g., conference rooms).

① *Dehumidification.* In humid climates, a potential drawback is the reduced dehumidification capacity due to the use of warmer supply air. One solution includes subcooling outside ventilation air to reduce humidity levels and then mixing it with room air.

① *Workplace acoustics.* Acoustical privacy may present a challenge in the workplace when using raised floors, since partition walls do not extend to the floor deck. Integrated approaches that employ highly absorptive furniture, flooring and ceiling material, plus a properly designed sound masking system, can effectively overcome these challenges.

① *Perceived higher costs.* Often times, access floors are eliminated out of concern for higher first costs. However, capital costs for the integrated system are comparable to traditional construction, while many other benefits, as described above, result in significantly reduced life-cycle costs that are hard to overlook.

Practical Applications

Access floors are widely used throughout many countries and are a standard in Europe and Japan. For the majority of U.S. building professionals though, access floors still represent a relatively new and unfamiliar technology. The picture is now changing, as we see growing acceptance of access floors by building professionals and explosive growth in access floor production. Tate Access Floors, Inc., the world's leading manufacturer, is constantly boosting production levels and currently expects to increase capacity by 40% by June 2001 — to 900,000 square feet per week! Furthermore, Tate's strategic alliances with YORK and Honeywell has led to the development of advanced, bottom-line-focused solutions that work together seamlessly and meet the needs of today's rapidly changing info-tech operations.

While access floors are most often used in new buildings, they have started to be utilized in renovation projects as well, with a greater role in structures being totally rehabbed. In cases where the building interior is completely stripped, access floors become an excellent renovation tool, construction goes much faster, and pre-engineering work required to locate supply ductwork does not have to be performed. Developers have also begun to embrace the idea that the flexibility of integrated access floor systems can, and often do, cut move-in times and make generically designed office space suitable for a wide range of potential tenants.

KSBA Architects have been designing info-tech workplaces with integrated access floor systems since 1995 and have pioneered their application in many high-density, open-plan offices located in several parts of the country, ranging from the dry southwest to the humid northeast regions. KSBA's holistic approach has provided the platform to explore a wide range of design and savings opportunities that will be discussed in Part II. KSBA's clients are now enjoying the multiple benefits that access floors have to offer.

Conclusions

Access floors present a practical opportunity to economically accommodate the service distribution changes demanded by today's workplace. Use of access floors throughout an entire office building is the key not only to flexibility but also to the ability to forestall building obsolescence. Access floors afford building owners and managers the capability to economically respond to tenant turnover, deliver superior flexibility and reduce labor, maintenance and energy costs, while improving occupancy health, comfort and productivity. The results of a life-cycle cost analysis will be presented in Part II in this series of articles on access floors, highlighting the many savings opportunities.

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This photo displays the major HVAC, power and carpeting components that make integrated access-floors worth exploring for most any information-technology facility, especially call centers.



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