

Access Floors in Computer Centers

Data in the Cloud – Server Racks on Solid Floors

The safe hosting of data in computer centers, with software and hardware, gives rise to ever increasing requirements on building construction and building infrastructure. As a consequence, access floors have become an important structural feature in the interior design of computer centers. They are at the interface of interior construction and building services.



Access Floors in Computer Centers

The development and construction of access floors started at the same time which also saw the rise of computer centers in the 1960s. In those early days, MERO combined a modified space frame structure and a panel covering to create a space for routing the cable connections of the big, unwieldy computers of the time, a space which simultaneously gave protection and prevented accidents. As the evolution of computers progressed, the requirements on access floors multiplied:

- Equipment with increasing weight requires floors able to bear higher structural and dynamic loads. Heavy duty structures today can take point loads up to 20 kN.
- Sensitive electronic elements must be protected against damages by electrostatic charges. This is ensured by floor structures which deflect electric currents from the surface material to the carrier plate and through the substructure to the connection with the potential equalization of the building.
- Increased processing power creates more heat. Cold air supplied through the access floor in connection with adjustable ventilation floor panels prevents any overheating of the computers with optimum energy efficiency.
- The fire rating properties of access floors guarantee the safety of the personnel and of the firefighters providing assistance in case of an emergency. The fire rating requirements are set out in the codes and standards for composite floor systems (MSysBöR) and have their fixed place in the building codes of all German federal states.

Thus, over several decades, a separate segment of construction services with individual systems has grown. Its technical requirements are regulated by industrial standards, application guidelines, data sheets, and certificates of conformity.

Buildup of Access Floors in Computer Centers

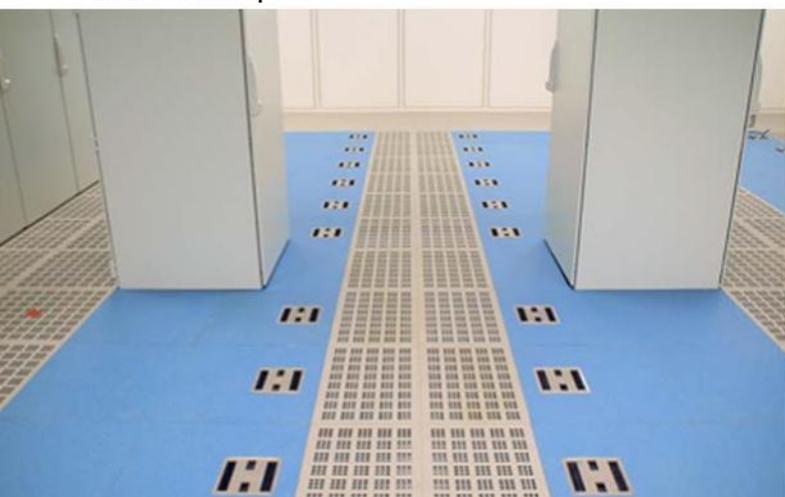
Due to the continually increasing variety and complexity of installations, and the clearance necessary for air conveyance, access floors in computer centers are currently constructed with an overall height of 500 to 1500 mm.

The basic construction principle of access floors, consisting of height-adjustable threaded steel pedestals (substructure) and industrially pre-produced square access floor panels (load-bearing top layer) with a length of the edges of 600 mm, is not sufficient for this type of application. The individual access floor pedestals must be at least connected by stringers hooked in at (or bolted to) the pedestal heads. An even better solution are C-type stringers bolted on to form a grid on the pedestals. These special constructions for switchgear stations achieve a maximum of load bearing capacity and rigidity.

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Cool air for hot data cabinets: The whitish-gray ventilation panels with adequate free cross sections provide the air supply from the air duct of the hollow floor space.



Access floors in computer centers at a glance: Space for installations, stringers enhancing the load bearing capacity, embedded elements with brush seals for cable ducts, and perforated ventilation panels

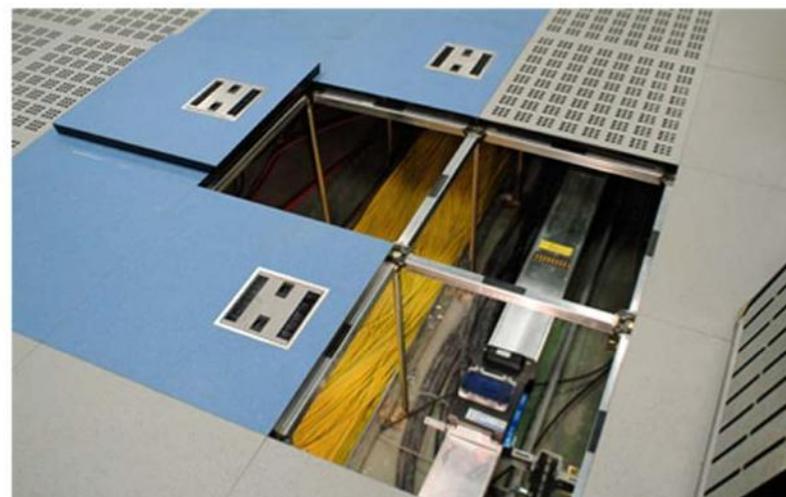




Foto: Mero-TSK International GmbH & Co. KG

Special interface in the data center: The access floor is where interior construction and information technology meet

Using C-type stringers increased by the panel thickness, it is possible to integrate pedestals level with the floor, for switchgear cabinets etc, in the floor itself.

The floor panels can be made of wood-based materials. In order to increase the load-bearing capacity and reduce the fire load, the material of choice today often is a non-combustible fiber-reinforced mineral material. The edges of the panels are chamfered milled and protected all round by a synthetic trim. The bottom side of the panels can be provided with aluminum foil or galvanized steel sheeting. The top side of the panels receives a factory-applied conductive and elastic covering of rubber, PVC, laminate or linoleum.

Important accessories for access floors in computer centers are:

- Ventilation steel panels with free cross sections of 16 to 53%
- Continuous air flow control for the ventilation panels
- cable outlets with brush seals
- Traversable cable outlets
- Stairs
- Ramps, and
- Railings.

Basics for Planning, Tendering, and Construction

The technical requirements for access floors and their accompanying test procedures are regulated in DIN EN 12825. This set of regulations is supplemented by an application guideline.

The load bearing capacity of access floors is determined on the basis of the imposed point load. Further to the type and frequency of load application, dynamic factors and safety factors also figure in this determination process.

If, for example, a computer on an elevating platform truck, with a total weight of 1,000 kg, is transported over an access floor, the idealized calculation runs as follows: 10,000 N: 2 load application points x dynamic factor 1.3 = nominal point load 6,500N x safety factor 2 = breaking load > 13,000 N element class 6 acc. DIN EN 12825.

In real life, an unequal distribution of the weight might lead to an even higher load on the floor.

The application guideline provides the basis for the calculatory verification needed for establishing compliance with the technical requirements. It contains valuable information regarding load assumptions, the determination of the load bearing capacity with details of distances between loads, load configurations, and the inclusion of dynamic loads (e.g. elevating platform trucks) with oscillation coefficients.

With regard to all technical requirements on access floors, it is important for the user that at all times the complete system is taken under examination, and not only its individual components. Only by following the requirements of the application guideline in combination with in-house and external monitoring will it be possible to verify the technical properties by way of a certificate of conformity. This guarantees the maximal safety for the user.

Functions and Advantages of Access Floors

The access floor in a computer center is a multifunctional building element. Besides absorbing structural loads, it must also provide a continuously accessible space for the installation of supply and drain lines, conform to fire protection requirements to ensure personnel security, deflect electrostatic charges, and serve as a ventilation duct.

The modular design not only gives nondestructive access to the installation space, it also frees the way for replacing individual elements, and a cost-effective adjustment of the floor to changing factors of building utilization.

Conclusion

As has been sufficiently established so far, access floors in computer centers are a crucial link in the overall concept of interior design and function. The interaction of building construction, building infrastructure, and information technology ensures a trouble-free and efficient operation. This means that planners will have to focus again and again on access floors.

For further reading

For further information on the subject of building construction and building infrastructure, please refer to "IT-Räume und Rechenzentren planen und betreiben" by Bernd Dürr, published by Bau + Technik, 78 €, ISBN 978-3-7640-0553-5.