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fonction et le film. Le cinéma sphérique est une sphère creuse (construction précontrainte d'un double voile avec des éléments de raidissement, dont la surface intérieure est l'écran de projection, et où le centre de l'image se trouve au sommet de la sphère). Un plan horizontal rond divise la sphère en une partie inférieure, où se trouvent les installations techniques, la cabine de projection, les toilettes et les vestiaires, et en une partie supérieure qui formera la salle. L'œil de projection se trouve au centre du niveau plan qui est accessible depuis l'extérieur par des escaliers roulants disposés en étoile.
Le cinéma sphérique permet toutes les méthodes de projection: méthodes traditionnelles, projection de chaque film sur chaque forme d'écran (rectangulaire, triangulaire, circulaire, elliptique ou forme libre) et dans chaque grandeur jusqu'à l'image totale couvrant toute la surface de projection qui va jusqu'au niveau des spectateurs et qui se limite seulement par l'angle de vue de l'œil humain.
* Demande de brevet en France.
Le cinéma sphérique crée l'illusion totale du film.
Il permet de nouvelles conceptions cinématographiques par la projection de films sur des écrans de grandeurs différentes, ou par la projection d'un film sur une forme d'écran qui varie selon chaque scène ou sans cesse.
Les spectateurs couchés, complètement détendus, orientent leur regard vers le haut, n'aperçoivent pas leurs voisins et peuvent se concentrer entièrement sur la jouissance esthétique.
La distance entre les spectateurs et l'écran est la même presque partout, la direction du regard et celui du rayon de projection est la même, donc les conditions optiques et acoustiques sont excellentes. Toutes les places ont la même qualité.
Les dessins du cinéma sphérique sur une plage correspondent à une vraie grandeur de 97.20 m de diamètre extérieur et d'une capacité de 1623 spectateurs. Si les proportions sont respectées, on peut concevoir des volumes plus grands ou plus petits. Les rapports économiques entre la grandeur et la capacité, ainsi que la qualité acoustique et optique restent constants.

Summary

Friedrich Frank,
Anton Schweighofer, Vienna
Peter P. Schweger, Hamburg, Vienna

Project A

Service shed in Vienna

(page 368–369)

Under construction

General requirements

Scientific and technological advances, changing economic circumstances, can sharply modify the ascertained lay-out. There has to be a guarantee that a free expansion and reorganization of the complex is possible within the scope of a previously elaborated system. (In the elaboration of the system the total complexity of the environment must be taken very thoroughly into account.)

Site

Building site inside the city with streets on west and north and square to east; old buildings on $^1/_3$ of the area. Possibility of connection to quieter square to east. Building stage $^1/_3$, after reorganization of old buildings $^1/_2$ of the site.

Organization of plan

1st stage

New construction PKW express service, repair shop on ground level with auxiliary facilities.
Basement level: cloakrooms and new car shipment.
Connecting building: spare parts stores.
Old building: spare parts storage, administration, reception, in sheds LKW repairs and PKW fittings.

2nd stage

Administration with reception, old building extension with reorganization of spare parts stores.

3rd stage

Extension of the PKW express service, displacement of LKW park to another site and reorganization of a part of the old shed structure.

4th stage

New building PKW repairs, extension and reorganization of the PKW express service.

5th stage

New building spare parts stores.

Construction

The basic module is derived from the functional, structural, installations and extension unit, module 50 cm.
A functional unit has the dimensions 5.00 × 20.00 meters, a structural and extension unit 20.00 × 20.00 m. The addition of units is possible in both horizontal directions.
The units are added in the 1st stage to three 20.00×40.00 m. sheds.
The structural elements of a shed of this type consist of prestressed subsidiary beams in the 20.00 m. axis and main beams in the 40.00 m. axis. The main beams have a span of 15.00 m. and project 2.50 m. In the main and subsidiary beams gaps in the modular arrangement are provided to house the installations lines.
In the case of a juxtaposition of the sheds perpendicularly to the main beams there appear double beams and double supports with intermediate cavity to accommodate the horizontal and vertical power and water lines. The main power line is housed perpendicularly to the "cavity" in a duct running tangentially to the sheds; this duct can be entered.
The sheds have a non-pitched roof of Prevanol and peripheral gutters. The face is fully glazed with double profile slits. South side gets outside brises-soleil.

Project B

Delivery point in Salzburg

In planning stage

(page 370–372)

Building site on periphery of city in the open country, with access to railway and motor highway. Through highway and railway connection from west. Buildings cover $^1/_2$ of the terrain at 7 meter level. (It could as building site be the extreme of Project A if the planning team had been called in at time of purchase of site).
Heating by radiators and cooling via ventilation system (ductless) for fresh air and circulation. The units are set up detached on the roof.

1st stage

Ground floor: New car readying and shipment, spare parts stores and spare parts shipment, display, waiting-room and offices.
Basement: new car storage and bulky parts.

2nd stage and additional stages

Percentage extension, not previously determinable, of all functions. Possible extension in longitudinal axis of building and perpendicularly thereto, in this case in the shape of new structures.
A steady reorganization is to be expected in the future.

The industrial module of 62.5 cm. was selected as the basic module in the case, since the different and not definitive functions could not be brought into a determination of a module.
The analytical results of the construction have not yet been finally evaluated as to their feasibility. In the compact analysis there were investigated steel lattice constructions with unit sizes of 15.00×15.00 and 30.00×30.00 m., spatially conceived steel elements with variable unit dimensions and corrugated concrete elements with unit dimensions of 25.00×30.00 m.
The analysis shown here forms part of the very extensive research work that has been carried out. It has to do only with construction from the standpoint of partial problems: materials, performance, movement, assembly, construction proper, elements, installations, components, etc. with maximum adaptability. There are provided non-pitched roof with exception of the corrugated structure, complete glazing in galvanized steel elevation elements (possible choice between glazed and closed elements), outside vertical brises-soleil on south side (position can be altered as required), radiators for main load heating, ventilation units (ductless) for circulation, fresh air intake and air-conditioning.
Consultant for statics: E. Rapolthy, Grad. Engin., Zurich.
Consultant for heating and ventilation: T. Schweger, Grad. Engin., Zurich.

Leif Damgaard, Stockholm
Collaboration: Jörgen Möller and Denis Douglas

Brewery at Wårby

(page 373–378)

Little excavation was necessary as an extant gravel pit could be utilised. Consequently the brewery is to a large extent concealed, garage facilities, store areas and fermenting areas being housed underground.
From the exterior, one distinguishes between the brewery building, with its vertical system and the flat bottling hall with its horizontal work system.
The round walls of the boiler hall and the gables of the toolshop were conceived to allow speedy and safe traffic circulation. Total volume of complex: 130.000 m^3.
The production buildings have curtain walls with aluminium parapets. The toolshop, boiler hall, reception and porter's lodge are built in exposed brick.
Large glass surfaces allow for maximum view of production procedures.
The gleaming coppers proclaim from afar the building's function: cleanliness is an advertisement. From the express road the building is visible at night by means of spotlights. The south façade is constructed in aluminium; conical panels provide all-important sound insultation.
Visitors view the production hall from a gallery. The laboratories on the top floor are equipped with insulated glass panelling. Construction is in ferrous concrete.
The bottling shed has double T concrete beams, constructed in situ. The production hall is spanned by 14 m. long pre-fabricated and pre-stressed concrete beams and an H-shaped transversal section.
A 21 m. in diameter cupola spans the boiler hall.
All stairways are readily cleaned owing to their simple, prefabricated design.
The brick walls in the production shed and boiler shed are left exposed. In the administration section the inner walls are clad with Oregon pine.
An extension is planned to the North: a mineral water factory. The complex will then consist of two elements with work shed, boiler shed and garage ramp in the centre.
Rust-free steel and glazed panels in all production sections make for easy maintenance and cleanliness.

Kurt Simberg, Helsinki

Tobacco factory in Turku

(page 379–381)

In an entrance-yard the porter's house, garages, a personnel building and the heating plant are located. The factory itself can be entered in a one story building where a left entrance leads to the personnel dressing rooms and showers and a right entrance to the administration. Behind this building fabrication halls arched with shell-type roofs follow, behind which the storage for raw tobacco is annexed. All these construction parts are designed in such a manner that they can be extended towards the south.

Jean-Marc Lamunière, Geneva

Pharmazeutical factory with laboratory at Petit Saconnex near Geneva

Execution: 1961

(page 382–385)

Situated on the perimeter of the airport at Cointrin. Clean-lined architecture: steel construction with brick fillings; glass surfaces with steel profiles, insulated glass; sun-shades on the outside.

Programme:

Upper level comprising office facilities, production shed on two levels with a central gallery illuminated by roof lighting. The laboratories are housed in the gallery.

Willi Stigler, Innsbruck
Collaboration: Horst Paton

Lignospan plate factory, Oetztal

Execution: 1960/61

(page 386–389)

The factory is situated 45 km. from Innsbruck, near a railway station and in the middle of a forest, an economically underdeveloped region.

Programme:

Production shed for wooden panels. Mixolite panels, door elements, floor elements etc.
The various production areas are partially connected: panelling shed proper, wood refining shed, store shed with access to railway, wood storage area, steam rooms, reservoir etc.
The energy is supplied by a private boilerhouse and a transformer unit.
Steel construction was preferred to facilitate all-the-year-round production.
The structure is carried on I-shaped steel columns from the floor. Cross beams (steel) are laid on the wings of the columns and the roof covering is in lightweight panels. This system allows for expansion in every direction without production breaks. Filling panels, Profilites glass and and wooden battens in a Mightyplate envelope complete the list of structural elements.
Square module: 1.25 m. Height from ceiling to floor: 5.0 to 10.0 metres.
An administrative building is planned as a subsequent stage.

Edouard Furrer, Sion,
and Hans Hostettler, Berne

Warehouse and office building of an industrial installations firm in Biel

(page 390–391)

The architects were required to construct a show-piece on the main artery Biel-Solothurn. The resultant structure is a conspicuous glass pavilion which at night, gleams like a cube of light.
Ground module of 1.20/1.20 corresponding exactly to the dimension of the Eternit façade panels and the insulation panels. Basement and columns are in ferrous concrete, walls in 'paneel' elements – strong wooden block panels, 37 mm. thick with 7 mm. strong asbestos cement panels screwed on visibly 7 mm. before them. Circulation: k = 0.9.
Secondary construction: steel sheeting for glazed and fanned wall surfaces.

Kurt Ackermann, Munich
Collaboration: Richard Martin

Finishing shed of Bavarian Motor Works in Munich

Project: 1961

Execution: 1961/1962

(page 392–395)

Programme

Basement: social offices.
Ground floor: depot, installation centre and toilets.
Upper level: mechanical assembly.
Considerable advantages derived from the short vertical transport passage. The floors are connected by conveyors, 5-ton goods lifts and stairways. Horizontal transport is along 5 m. wide roadways. A ferrous concrete ramp leads to the upper level. Heavy transport, especially of machines, is rendered possible by a 20 ton steel crane system above the ramp. Construction is in ferrous concrete with a 6.50/6.50 module; columns, beams and reinforced panels in the ground-floor; Construction in steel, distance between beams 19.50/13 and 26/13 m. to allow freedom in placing of machines on the first level.

Distance between ceiling and floor: ground-floor, 4 m., upper level, 6.50 m. The outer walls are of prefabricated 6.5/1.0 insulated concrete elements which may be speedily disassembled. These are nevertheless extremely stable in spite of the considerable traffic in the assembly shed.

Glass elements: thermolux.

Lighting: 300 Lux in the assembly shed The roofing is in porous concrete and pressed gravel. (Necessitated by condensation.)
Heating and air-conditioning: air is changed five times in the hour. Constructional requirement precluded customary fire systems. An extremely sensitive alarm system has been introduced and air ducts have been carefully conceived as fire escape routes.

Felix Candela, Mexico City

Store and bottle-filling shed of the rum factory Bacardi S.A., Tultitlan, Mexico

Execution: 1960

(page 396–398)

For the store area and bottling shed of the Bacardi Rum Factory in Tultitlan near Mexico City, Candela has applied two of his basic construction types: the funnel shape formed by 4 hyperboloids and the hyperboloid shell in the form of a cross vault.
The bottling shed is constructed in three cross vaults. From the strictly geometric point of view each of these consists of interpenetrating segments from the saddle of the hyperbolic paraboloid. In Candela's structure the groined arches and the outer members are paraboloid; the edge of the shell, extending beyond the outer members, is hyperboloid.
The shell strength (size 26.00/26.00) is only 4 cm.
Armatures: rectangular mesh in iron, $^3/_8$" thick with an intermediate distance of 20 cm. and $^5/_{16}$" with an intermediate distance of 15 cm. One side runs parallel to the outer members jutting clear of the shell.
The diagonal groins are strengthened to 16 cm. opposite the shell and reinforced by 5 ϕ $^3/_4$" and twice 3 ϕ $^3/_4$". This bears the weight of the shell, transferring it to the beams as a purely longitudinal force. These are diagonal and project beyond the shell.
This structure contains however, an entirely new element in the positioning of the projecting outer member (20 cm. broad, 25 cm. high; reinforced with 4 ϕ $^3/_4$"). As it cannot serve as a shoring element on account of its meagre dimensions and, since it is not required as such owing to the double camber of the shell, it is employed as a support for the vertical spars of the glass wall.
The leanness and elegance of the construction is particularly apparent from the outside. The extension of the rim of the shell over the spacially limited walls and the construction of the latter in glass and dark spars seems singularly fortunate. In this way the building achieves a maximum of delicacy and elegance. This impression is intensified by the slim proportions of the columns which bear the raised shell.
These fulfil their function as static construction elements.
This delicacy is achieved by the use of tension members which connect the base of the supporting columns.
In sharp contradistinction to the Air Terminal Reception Building at Idlewild, this construction is treated as an exercise in constructional form design: there is no attempt to tone in with natural surroundings. We may use the term 'technical construction form' with impunity in view of the fact that Candela's guiding principle is derived from the principle of maximum effect at minimum outlay.
In the interior is a high light room, divided up by roof lighting in the pendentives between the single units and side illumination.
The store hall is covered by inclined hyperboloid elements. Each of these upturned umbrella shapes rests on a centrally placed support. Shell strength is again 4 cm. This figure results from constructional considerations, notably the cladding of the iron with concrete. Statically, this figure could be even less. Armatures are a quadratic iron net, ranging from $^1/_4$" to $^3/_8$" in strength. The stress of the shell, operating at a tangent to the arching, are concentrated at the outer edges. Tensile stress at these points is curbed by iron elements within the shell. Pressure in the groins necessitates reinforcement.
Each element is 10.00/15.15 m.; diagonal cross section: 0.40/0.60 m. The foundation has the same form as the shell in reverse. It also is composed of four hyperboloids.

Herbert-Ohl, Ulm

The work of the Institute for Industrialised Building

(page 399)

These works are the result of continuous, precise and intense research over the past few years. The arbitrarily chosen problems correspond nevertheless to the technological and social development of our society or are chosen from the innumerable unsolved problems and experiments leading to the development of a building system. The variety of the problems and the desirable solutions are demonstrated by these projects and have induced from time to time new work procedures and methods. In all cases objective and rational study of specific development and application is of prime importance, as has long been the case in other technological and scientific fields. In this way solutions have been proposed which are a valuable basis for the whole range of architectural aspects of industry.

Herbert Ohl, Ulm

Integral Construction

(page 399–404)

The development of exemplary products in industrial building and architecture as a whole is constantly placed in jeopardy by the intermingling of heterogeneous elements at different stages of development. Building materials, building procedures, functional and architectural requirements fall into this category. Should any of these be at a lower level than the others, the project as a whole is at a disadvantage.
Even a fleeting comparison of industrial construction techniques with scientific and technical developments reveals the pressing demand for an integrated system of construction. Only the integration of all problems inherent in a single project can lead to a rational resolution of present-day constructional needs. Moreover, the industrialisation of architecture will engender new constructional aspects which will in turn be of considerable technical and social interest.
The development of industrial construction is based on the study of all the individual details in the structure, the choice of materials and procedures already applied with success elsewhere, and, last but not least, the use of pre-fabricated elements in a limited sphere (1 or 2 storied buildings) in conjunction with numerous institutes and industries.
It is a modular building system corresponding to national and international standards, an assembly process for universal application, a procedure which is highly precise in its use of widely different elements: bearing and non-bearing elements, rigid or elastic elements, metal profiles, panels, new installation features such as electric wall and floor heating, acoustic cladding, etc. The effect of this system will be felt throughout industry, from producer to consumer, from planner to user.

Patent applied for: integral liaison between ribs on bearing panels

Types of detachable joints and air proof joints used principally for ribs of rigid bearing panels: 1-point by point jointing; 2-linear jointing; 3-composite joint, linear and point-by-point; all three with or without an articulated or rigid liaison element.
The rigid or partly rigid point-by-point jointing by screwing, rivetting, is the most common form of joint. The disadvantages are poor stress concentration, a large number of work pieces, assembly difficulties. This is a static solution which does not ensure stiffness nor insulation.
Linear, swallow-tail joints are not used for panel work, merely for smaller objects such as window frames since their execution often leaves gaps which in turn make for undesirable movement.
In general these joints do not have the same form in the horizontal, vertical and various other positions. This indicates the need for a large number of elements with asymmetrical joints and liaisons to provide for an interchangeability of building elements.
Research on the above points to a linear joint appliable in civil, naval, aeronautical and automobile construction as well as in the fabrication of storage receptacles. The main advantage lies in the favourable transposal of stress to the panel elements. The linear joint ensures at the same time the impermeability of the joint. In order to avoid too great a number of construction elements of diverse types a liaison element, centrally and axially symmetrical, has been conceived to permit all possible assemblies by adapting itself to the form, thickness etc. of the panels.
The simple form of the joint allows for simple production and execution. The use of an elastic material or an elastic form of the element cuts to a minimum tolerance factors: Thermic dilation, transmission of static and dynamic stresses, sound insulation and diminution of vibration.
These panels, joined by integral joints, are designed to form stable 2- and 3-dimensional construction systems. These systems may be composed of flat, rigid, angled, concave, staggered, panels.
The joint (10) consists of an element of liaison (10.1) and a panel with countersunk rib (10.2).
The liaison element is linear, running along the rib of the adjacent panel, and is axially and centrally symmetrical. It consists of one or several plastic materials or one of the materials in elastic form. The profile of the liaison itself (10.1) consists of a core (10.3) and a pin which links the core to the panel rib. The number of pins corresponds to the number of panels to be linked. The rib (10.2) is axially linked. The rib (10.2), in axially symmetrical form, runs the entire length of the side. The above illustrated consists of a compressed cord profile applied to a composite panel. The rib of the panel consists of a tongue which receives the groove (10.4). The rib (10.2) transfers easily the stress in the two panel surfaces to the axial joint and makes for excellent adhesive properties.
The core (10.3) of the liaison element is a hollow tube (10.8). Assembly is completed by a rigid bar being placed at the open end of the tube or pulled through the liaison element in the direction of the liaison axis. The tongue of the liaison element (positive aspect of swallow tail with intermediate notches) is the complementary part of the groove on the rib. This prevents the elastic tongue from slipping, especially in the case of any axial deviation. The stress in the liaison axis is taken up by the friction between the elements and the adjacent slabs forming a three dimensional pattern. Stability is thus ensured in the case of a curved, folded or staggered axis. Tightness between the liaison element and the panel rib (in the case of liquids or gases) is ensured by the two profile ridges on the tongue (10.10) which are larger than the openings on the groove. The elastic is compressed at the point of juncture. Supplementary watertight proofing is possible on the panel surface, and on the liaison element. The groove on the rib (negative swallow-tail form) is the waterproofing complement of the tongue on the element of liaison. The liaison element in elastic can be reinforced by an armature or, alternatively, be composed partly of elastic material.
Example: the liaison element (11.1) is composed of a core (11.2) and a tongue (metal or synthetic) but is entirely clad in elastic.
There are several ways of introducing the liaison element (13.1). a) threading or slipping through the extremity of the profile in the direction of the liaison axis; b) cutting the rib corners to enable introduction of element in every direction. The resultant whole is proofed by an elastic fitment; c) the introduction of a liaison element into the grooves of the panels where the liaison element is in liquid or semi-liquid state; d) introduction of a liaison element which is extended or compressed in the process of assembly.
The stability of the entire structure is ensured by the juxtaposition of rigid panels forming a spatial angle, as in the case of curved, folded or staggered rigid panels.
The central and axial symmetry of the liaison element and the axial symmetry of the panel ribs allow a maximum of assembly possibilities according to panel connections, panel thickness and spatial distribution. (Variations from horizontal to vertical, positions.) The special qualities of these elastic liaison elements permit a consistency in construction, negligible deviations only being noticed.

Patent exigencies

1. The joint is characterised by a linear liaison element where form and assembly are by joining, axially and centrally symmetrical; by a rib whose form and assembly are by joining, axially symmetrical; by the use of elastic elements or an elastic form of the liaison element between the bearing panels. This enables a facile, articulated assembly procedure and is eminently adapted to the redistribution of stresses, static or dynamic, in every direction; watertight, elastic, insulating eradicating constructional tolerance: in a word, integral.
2. This same liaison (that is, these same liaison elements) permit assembly in an infinite number of directions.
3. This same liaison (that is, these same liaison elements) permits assembly of a number of panels in one direction with minimal deviation from the general constructional direction.
4. This same liaison (that is, these same liaison elements) is equally suitable in the case of curved panel jointing.

Herbert Ohl, Ulm

The Spherical Cinema

(page 405–406)

In spite of the fact that the Spherical Cinema is on the point of being patented in France, we do not believe it to be simply a matter of technical achievement. To use Le Corbusier's phrase – is this not an 'architectural fact'? The Spherical Cinema on the coast certainly represents one of Da Vinci's aims, the absorption of new, specialised ideas towards an integrated whole.
A few facts from the official description: The Spherical Cinema represents an essentially new conception of cinema, a correspondence between structure, function and film. The cinema is a hollow sphere, a pre-stressed double-shell construction. The interior surface forms the screen; the centre of the image is the top of the sphere. By the construction of a horizontal plane the lower half of the sphere is transformed into the audience area with the projector in the centre. This audience area is accessible by escalators leading in star shape from the exterior. Beneath this plane are technical installations, projection room, various offices, toilets and cloakrooms for audience and personnel.
The Spherical Cinema allows for the projection of every shape of image-rectangular, triangular, circular, elliptical and free forms-to cover the complete screen, extending down to audience level. Limitation of view is caused only by the limits of the human eye.
In this way the Spherical Cinema creates the total illusion which is cinematographically indispensable.
It also permits new cinematographic conceptions such as the projection of films on screens of varying size and the use of different sized screens or, more properly, viewing surface, for individual scenes.
The audience is recumbent, completely relaxed. Attention is focused on the screen above. In this way neighbours are 'eliminated' and aesthetic enjoyment given free reign. The distance between the spectators and the screen is practically the same throughout the cinema, the direction of viewing and projection is the same. All seats are of the same quality. Thus optical and acoustic conditions are of the first order. The design for a Spherical Cinema on a beach corresponds to a diameter of 97.20 m. and a seating capacity of 1623. Provided that these proportions are respected larger or smaller volumes are conceivable.