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## THE MODERN ENGINEER'S JANUS FACE: DELIVERING RELIABILITY AND MYSTIFICATION

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### Summary

The load bearing structure is often visible above the deck which was used to manipulate the spatial experience directly (e.g. series of hangers) or through a diagrammatic articulation of the structural behavior in the arrangement of components (e.g. truss patterns). A relatively late trend is the intentional disturbance of the common perception through the deformation or dissection of structural typologies which can lead to new interpretations and multilayered narratives. The aesthetic conception of the viewer's perception seems to have been shifted from a subtle manifold reading of a familiar structural grammar to a more direct influence on the pedestrian with clearly expressed structural figures.

**Keywords:** historical; aesthetics; structural concepts; space; variation

### 1. Engineers and artistic design

#### 1.1 The site

Like buildings bridges are part of the built environment. Unlike furniture which is formally self-referential and is produced in a location-tolerant manner to be placed and replaced anywhere and anytime, footbridges are important components of the urban fabric as they intentionally connect specific spaces. Often the design of a footbridge is articulated as a response to its surrounding environment, to existing structures and their materials or to the particular history of the location.

#### 1.2 Spatial arrangement

Apart from the sensual connection of the pedestrian with the site, another important driver in contemporary footbridge design is the creation of an internal spatial perception while being on or crossing the bridge. Therefore, the components of the bridge structure are mostly arranged above the walkway. Suspension bridges have their load bearing structure above the walkway forming a characteristic corridor through a series of cables: „The hangers define a walkable space offering a special visual experience when crossing the river“ (Tiergartenbrücke over the Mulde in Dessau, Stefan Polonyi). This evolving space, which subtly changes while choosing different viewing angles from the walkway, is further extended and articulated if the deck is not straight but curved. From this articulated space connections can be created with specific views. A spatially less complex but more formal approach is the articulation of a structural behavior through the visible components. It can provide a further narrative for the visible layers of the bridge.

#### 1.3 Structural and formal ambiguity

Analogous to the manipulation of space through the articulation of the walkway path and its structural components respectively, the display of structures as built diagrammatic patterns has been manipulated

differently. Through a purposeful confusion of the perception, the reading and understanding of the footbridge structure can easily perplex the pedestrian. This is classically achieved through a deformation of structural typologies and thus to oppose expectations of familiar structures. A very common strategy is the deformation of the classical arch typology. For an arch bridge, for example, hangers are normally attached to the arch in equal horizontal spacings consequently leading to a typical parabolic arch shape. To manipulate the arch shape and having it formed through the actual loads, the hangers would have to be arranged specifically in order to cause a desired arch form. In other cases cables are apparently missing, e.g. the backstay. The deformation or dissection of structural typologies leads to new possibilities of interpretations, new surprising narratives and new expressions beyond somewhat traditional structural concepts manifesting new contemporary types.

#### 1.4 Autonomic performance

The particular articulation and formalization of load bearing structures for footbridges can lead to a very strong singularization. In their dominance they are not just placed between urban places but they are acting on them. In some cases, the singular quality of the bridge structure is considered to be a piece of art with a superordinate autonomy. The possibility of inscribing more, very different meanings in a pedestrian bridge gives the basis of structural design – forces and their formal expression – a very powerful influence in contemporary design. The articulation of structural components can thus be extended to the information of the entire structure through the play of forces.

## 2. Reliability and mystification

Not only does flexible structural thinking enable the engineer to deliver adequate or even extraordinary structural proposals for a formal concept. Within a given design space of a footbridge, where there are comparably less structural requirements, the engineer is able to formulate his structural design even more directly and, since footbridges are more visible in detail within an urban context and with the pedestrian's perception, more articulated. Designing the space of a footbridge became more important since these structures have been acknowledged to potentially give impulses to the built environment around them. In order to shape and stimulate such a space – within the strong requirements of robustness and adequacy of costs – the load bearing structure has mostly been made visible above the deck and was used to manipulate this spatial experience. A relatively late trend is the intentional disturbance of the common perception through the deformation or dissection of structural typologies which can lead to new interpretations and multilayered narratives. In the spatial drama of structural components creating formally complex situations, the viewer is not only confronted with a carefully designed space but also increasingly with an overall design concept that aims to entertain. The aesthetic conception of perception seems to have been shifted from a subtle manifold reading of a familiar structural grammar to a more direct influence on the user with clearly expressed structural figures, shifting from the ‚readymade‘ to the ‚performance‘. The structure itself is not only more visible and actively involved in the spatial experience but it is designed to suggest a greater form of immediacy. Like Frei Otto provocatively explained during the inauguration of the German pavilion in Montreal in 1967 with its radically new formal language, he would not call it a building but rather a state, something that happens. In its formal directness, where the structural constellation directly results from given conditions like in a diagram, the appearance is of a radical temporality. Standing and moving within this resulting space the pedestrian seems to be taking part in the form and equilibrium finding process. The pedestrian or cyclist crossing the bridge is spectator and actor on the overall stage at the same time witnessing the spectacular play of forces and forms. This tendency is stimulated with the greater appetite for narratives, spectacles and landmarks but also technically with increasingly capable design methods today.

When Torroja suggests that bridges with their increasingly slender components appear like athletes performing with great easiness, many of contemporary spectacular bridges could appear like dancers combining the implicitness of their bridging task with a great deal of attention and elaborate motion. However, unlike the perennially and subtly readable classical bridge typologies, the dramatic appearance of such bridges seems in great danger of what Adorno called „Verkunstung“ (artification), the „immediate and unconcealed primacy of the perfectly calculated effect in typical products of the cultural industry.“ The designing engineer of footbridges full of relish seems to further deliver reliability and mystification in new remarkable footbridges.