Analysis of Functional Layout of Architectural Space of Port and City Interface

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ABSTRACT: Port and city interface space refers to the geographical dividing line between the port land and urban land, or the port land conversion to urban land area, as access to the port and the city's core area, which has abundant resources, frequent human activities, and it is the important nodes and growing point of interaction between city and port. The design of architectural space of Port City is very important to its formation and development of spatial morphology. Because of the limited land resources of the city's port area, the architectural space form appears the particularity of the waterfront, which makes building and site conditions symbiosis, and maintains a close interaction with the urban space. In this paper, it wants to summer effective design method of architectural space layout in specific port city interface through analysis to the architectural space layout of port city interface.

KEYWORD: Layout Architectural Space Port City

1 PORT OF BASIC COMPONENTS
Port basic components: water and land ports, waterways and land arrivals into port road. Port architectural space studied here mainly refers port land space Category.

2 OVERALL PLAN
2.1 Port planning and urban planning
Port planning and urban planning should be arranged coordinate, rational distribution, the development between them should be coordinate with each other without disturbing each other. Port arrangement should not affect the urban environment and traffic layout. in excellent condition coastline depth left Port used at the same time for the city to leave enough space scenic waterfront. Depth good condition coastline should be stayed for harbor, and should be stayed enough waterfront scenic space.

2.2 Short and long term planning of port
Port master plan must have design concept, fully consider the near and long-term plan to ensure the orderly and sustainable development of construction. In staging the project, each project should be arranged to be flexible.

2.3 Shoreline resources of port
Depending on the nature and size of the port, fully rational allocation and utilization of shoreline resources, rational distribution of all kinds of nature work area, to avoid cross-interference, make good use of the port collection and distribution facilities.
Table 1. Port basic components.

<table>
<thead>
<tr>
<th>Port waters</th>
<th>Port outer anchorage</th>
<th>Anchorage berth</th>
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<tr>
<td></td>
<td></td>
<td>Handling Anchorage</td>
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<tr>
<td>Harbor waters</td>
<td>Inner Harbor, import, turn, stop</td>
<td>Operation waters (Basin)</td>
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<td>The harbor channel</td>
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<table>
<thead>
<tr>
<th>Port land</th>
<th>Production operation area</th>
<th>Wharf, frontier yard, railways, highways, handling and transport machinery</th>
</tr>
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<tbody>
<tr>
<td>Auxiliary production and living area</td>
<td>Cargo area workshop, appliance warehouse, administrative office and living space, logistics parks</td>
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<td>Stations</td>
<td>Port station, district yard, handling lines and facilities</td>
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<td>Reserved development</td>
<td>Forward port construction</td>
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<tr>
<th>Entrance channel</th>
<th>Some sea or sand to be marked out with the beacon, or artificial channel to be built by the method of deepening</th>
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<tbody>
<tr>
<td>Into the port over-land road</td>
<td>various of Port roads (railways, roads, pipelines)</td>
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2.4 Architectural space of port area
Architectural space of port area as an important part of the urban space, should take into account the port of economic, social, and a certain landscape space in the planning and design.

3 SPACE LAYOUT
Daily production activities include four production processes, such as the sailing port, handling, storage, and distribution. The spatial layout of the port should start with these four areas (Fig. 1), coordination of the production activities in order to complete the integrated production ports ability, which is namely throughput (Fig. 2).

3.1 Port waters
Port waters should have good water conditions, the approach channel and quay waters should have enough depth to satisfy the draft capability of the ship; the approach channel arrangement should be convenient for ships entering and leaving the port, berthing wharf; basin has good mooring conditions, for ship convenient for loading and unloading operations, passenger upper and lower ship safety; the waters of scale should also be able to meet the needs of navigation, swing, parking, braking.

3.2 Port Land
Port land arrangement should reasonable arrange various transport systems combining with loading and unloading process and natural conditions, should reasonable arrange goods the flow of goods and people, and reduce mutual interference. Port land ideal space layout mode should compact arrangement as "dock" - "Production operations area" - "Port rear" - "urban land" sequential depth.

3.2.1 Port land arrangement
Port land arrangement organically combines different capabilities such as storage and collection and distribution capabilities, to ensure safe transport of goods, to reduce the
loading and unloading areas, to reduce operating costs. To improve ship and set vehicle operation efficiency, each operating system and through the ability should adapt to each other coordination.

3.2.2 Rational using of coastline and terrain conditions

Rational using of coastline and terrain conditions can save project investment and operational management costs, achieve deep waters with deep, shallow water with light. Full using of natural terrain, can reduce damage to the environment, with construction convenient, fast construction scheme of arrangement. After production can facilitate maintenance and management, reduce management costs.

3.2.3 Production operation area

Port are usually divided production operations area according to professional, chooses the appropriate location for each work area in accordance with the nature of the goods, the flow, build Harbor area topography, hydrology, meteorology and other conditions. In parallel with the harbor site selection, professional work area layout issues should be considered, it should be arranged in front of the production area land. Modern comprehensive port having loading and unloading operations for different types of cargo in different handling techniques and specialized equipment, can improve handling efficiency, speed boat, car turnover, achieve better economic efficiency, while can improve handling quality, easy management, help port safety and environmental protection.

1. Operating area is divided reasonable depending on some conditions like the different kinds of goods and the size of throughput, handling characteristics and berths division, and it can make port water and land transport and port inner and outer contact convenient.

2. Operating area is assigned with local conditions to reduce basin excavation, land cut and fill quantities and other construction costs, according to the required depth of the different ship and land site conditions required by different goods. For example, oil loading docks and large cargo ships docks should be located in deep water; bulk cargo and containers which need a larger yard, should be arranged in the land flat, open areas.

3. Operating area is divided and assigned with the standards of port area safety. Flammable, explosive and other dangerous goods should be set up in a separate work area, and they should be maintained a certain distance from the operating area.

4. Operating area design focus on environmental issues of port area and the city, cargo-handling area with dust, odor and noise pollution should not be linked with other work area, and should maintain a certain distance from the urban area. This type of operation is disposed of the bottom area, outside or edge of the town to consider the impact the wind direction and the flow direction.

5. Division and assignments of operating area should be coordinated with transportation, industrial layout, the use of the city's shoreline, passenger station should located in the convenient zone. The bulk transit cargo working area should be arranged in the city periphery to avoid the flow of goods through the city affecting urban transport.

6. Operating area should pay attention to each operating area traffic saturation level and the possibility of export balance, should reduce the mobility and shifting moor of ship in the harbor.
7. Under the premise of meeting the above requirements, the entire port area should be arranged compact and relatively concentrated to save space and to facilitate the management.

3.2.4 Auxiliary production and living areas

Auxiliary production and living areas service for ancillary production of the port area, the main building for a truck shop, warehouse should be arranged in front of the production area land, other auxiliary buildings such as administrative offices, living rooms should be arranged in auxiliary area of the land rear; warehouse should correspond to the front of the berth, dangerous and polluting warehouse should be arranged in the maximum frequency of the downwind side or minimum frequency of the upwind side.

3.3 Shanghai Waigaoqiao second spatial layout analysis

3.3.1 Production operation area

Port land arrangement organically combines different capabilities such as storage and collection.

1. Storage yard:
   (1) Heavy container storage yard is set in a first second and third tier production areas.
   (2) Empty container storage yard is set in the fourth line, which has a total of five blocks.
   (3) Dangerous goods storage yard is located between the flood control embankment and the first lateral roads.
   (4) Rear storage yard is located in the rear of heavy container storage yard, both sides of empty container storage yard.

2. Container Freight Station: it is set after rear yard for easy access, and is set close the access door and close the into port road.

3. Dock: the wide is 50m, coastline is 899.168m long, it connects to the first dock shoreline, connected to storage yard with four approach spans and can simultaneously berth two fourth and a first-generation container vessels.

3.3.2 Auxiliary production and living area

To make functional area clear, easy to manage and customs inspection, and to reduce the number of individual buildings and occupied land, the port management, production scheduling, production and maintenance aid, are concentrated located outside the container gate.

Figure 1. Shanghai Waigaoqiao second spatial layout.
4 SPACE ENVIRONMENT

4.1 External space environment designing.

4.1.1 The integrity of the space environment of port

Architectural Space of Port is different from civil architecture, it has its own specialty mechanical process, the integrity of its architectural space environment is easy in a fragmented state, in the space environment of the port, especially the layout of the environment of production and living area is more important. The external space environment design of port architecture should consider environmental factors and internal order, arranged from the architectural community space, image aspect of single building, road transportation, landscape architecture and other aspects, should highlight the characteristics of the space environment harbor itself, should emphasize the integrity of their own style with unified and harmonious spatial processing, should highlight the identifiability of port’s industrial buildings exterior space.

4.1.2 The ordering of exterior space of port architecture, front area design of port

Staff should comply with certain regularity from the outside into the interior port area, the architectural spatial organization should consider the law of people and to be overall unity. Port border is the most direct contact with the city streets, such as gates, fences etc, and it is the first impression to enter the harbor; port border and port front area are important building spaces, which are the important factor in harmony with the urban landscape.

4.1.3 Port Landscape integrity

The form design of port landscape layout is not limited to roads on both sides and front area of port to avoid rigid arrangement, single form, it can form dimensional green of rich layers by using renewable space of wall and roof of port architecture. Port green landscape has a certain particularity, we should pay attention to landscaping integrity and scientific, and create a pleasant port green landscape with the technique of centralized and decentralized, in conjunction with the key and general, blending three-dimensional and plane, to make port environment and urban ecosystem coordination, and self-contained.

4.1.4 Port road space

Roads are the paths to experience and observe environment and architecture, through them people can gain a first impression of the environment.

1. Dealers roads should easy to reach, should be cooperation with the layout of the building, Port roadway work zones, production areas and other buildings. Trucks can convenient reach port work zones, production areas and other buildings. Roads planning and port planning should be carried out at the same time.

2. Walking roads design can reach the results of smooth and natural, one view per step, through separating with urban road, combining with landscape walk route, strengthening road’s hydrophilic.

3. Water Road: Water traffic is port-specific traffic organization, it must meet the production needs of port, meet people's hydrophilic requirements, and it can apply people to watch the water scenery.
4.2 Interior design of the space environment

4.2.1 Coordination between the different functions of buildings

Because of different purposes and features of port architectures, such as office buildings and other production-assisted construction having civilian buildings nature, and warehouses, factories, workshops and other production buildings having industrialized nature, to harmonize the internal environment of buildings, we need to use certain environmental artistic language, through some intermediary space, such as hedges, gardens, sketches, through these ways we can coordinate different functional properties of architectural space, reduce visual impact and impact on, and enhance the integrity of the single building.

4.2.2 Natural environment permeation

The interaction and penetration in interior space and the natural environment of productive architecture of port can weak the psychological dull, depressed and tired, can create opportunities for people close to nature, can let the staff be inspired, to ensure production quality and efficiency, reduce the occurrence of accidents in production through using plants, sunshine, fresh air and other elements to regulate mood. Design techniques can improve the indoor environment through setting the viewing window, indoor gardens, green etc., and can learn from some of garden design methods.

4.2.3 Improving the quality of indoor space

Improving the quality of indoor space can enriching the indoor environment expressive and ban also attain the similar nature of the landscape. For example, indoor color design can choose pastel-colored tone type, in order to form bright quiet, harmonization of spatial effects, and it can also use color to adjust brightness of interior illumination.

4.2.4 Pay attention to the building space design of day life

In a production environment in addition to the production and management capabilities, through adding daily life space design and function spaces such as a shared space lounge, activity room, etc. can facilitate communication between staff, creating an architectural space of people-centered and breath of life, reduce fatigue and irritability arising from the work, and the industrial building space can be improved from the device-dominated to human-dominated space.

5 SUMMARY

In this paper, the functional layout of the Sunshine City building space interface for analysis, including basic components of the port, the port’s overall plan, design elements of the components of the port and design of space environment of port and city interface. This is the whole grasp to the architectural space of port and city interface, and it look forward to be certain significance to reasonable and orderly development of port and city interface spaces.

THE FUND NUMBERS:
Shandong Jianzhu University Doctoral Scientific Research Fund (No. XNBS1415)
REFERENCES:


