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A Study on Space Program of Korean Floating Marina Clubhouse

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Abstract : *Domestic marina facilities today consist mostly of composite-type marinas with particular spatial composition characteristics, due to the regulatory restrictions that keep their development in the public sector and the tepid growth of marine leisure-sports. To develop a marina club design appropriate for domestic conditions, this study establishes space program standards for designing Korean marinas based on a case analysis of existing marina clubs and a survey of floating marina clubs. It is possible for a current composite-type Korean marina club to have a spatial composition of 16~18% for marina-exclusive facility (mFA), 47~49% for commercial facility (cFA), 27~30% for public space (pFA) and 5~8% for management space (emFA). With this composition as a basis, space program estimation of a Korean marina club can be done through the process of estimating in order the marina-exclusive facility area, the floor area by each space and the total floor area, the first floor area, the deck area and the pontoon area. Since the space program established in this study can be utilized as a tool for designing a Korean marina club, it is expected to be helpful in designing marina clubs in the future.*

Key words : *marina, marina club, space program, floating architecture*

1. Introduction

1.1 Research Background and Objectives

With the rise in income level, domestic leisure-sports population and marine tourism have increased, and at this point, interest and continued demand regarding domestic marinas are projected to grow. The First Marina Harbor Basic Plan announced in 2010 by the Ministry of Land, Transport and Maritime Affairs as a measure to meet new demands brought into focus the need for providing more facilities. A marina is a section of land and service facilities integrated as a single body that provides mooring and storage services for pleasure boats as well as other conveniences for users. The central facility of a marina is the clubhouse, also known as a marina club. However, there are only very few domestic marina clubs, and precise designing of marina clubs is at a rudimentary level. When marina clubs that have been recently completed or are under construction design such as Seoul Marina in Yeouido, Ara Marina in Gimpo and Jeongok Marina in Hwaseong are examined, they are found to have a very particular spatial composition, because they were developed as public projects.

Despite the increasing demand for practical space and the particular space composition inherent in domestic marina clubs, no standards exist for space program estimation which can be used as reference when planning a marina club in Korea. Hence there is a need for a study to provide the space program standards and estimation process which can serve as a starting point for planning and designing a domestic marina club. The aim of this study is to present space program standards for a Korean marina club appropriate for domestic conditions as a measure for dealing with the projected growth of marina clubs in the future. This will improve the current situation where arbitrary judgments are made during the designing of a marina club, and also provide data to the working staff. The study also seeks to explore the possibility of designing a marina club that incorporates a floating architecture which allows active experiencing of maritime culture.

1.2 Research Methods and Scope

This study starts from the basis of preceding research related to floating architecture and marinas, as well as the spatial composition ratio extracted from a survey on the three domestic marina clubs mentioned above. Through a survey on floating marina clubs, the study examines the awareness level of the public, and based on this, establishes the space program estimation standards, as well as presents the overall space program estimation process for a Korean floating marina club. Lastly, to increase practical utilization, the study shows the specific example of appropriate space program estimation for marina club construction in

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Note) This paper is a revised and expanded version of the paper "Space Program Standards of Floating Marina Clubhouse" presented at the June 2012 Spring Academic Conference.

Saemangeum, considered to be a suitable location for floating architecture.

2. Review of Preceding Research and Current Situation

2.1 Existing Standards for Area Estimation

1) Marina Club Total Area

The only standards for establishing a space program when planning a domestic marina club is provided in "A Study on Building Marine Tourism Infrastructure" published in 2006 by the Korea Maritime Institute. It also covers the need to introduce marina facilities to promote marine tourism. The marina club size estimation presented by this report is as follows:[1)]

The total area of a marina club, Fc, is given by

Fc=[(number of moored boats by type)×(peak day concentration rate) + (number of visitor boats by type)] × (area per person)

Here, the peak day concentration rate = (number of boats in operation for planned days) / (total number of boats in storage), and values in the range of 0.3~0.5 are usually used for this variable. Generally 0.15 is applied as the visitor rate, and normally 2~3㎡/person is estimated as the area per person.

The above estimation formula includes an important error which is presumed to occur during application. It is the omission of the average number of people on board by boat type. When the average number of people on board is omitted, the multiplication by area per person is meaningless. The following people on board averages can be applied: two per boat for dingy boat, three per boat for small-sized motor boat, five per boat for medium-sized motor boat, seven per boat for large-sized motor boat, and five per boat for cruiser yacht.[2)] Accordingly, the equation for estimating the total area of a marina club should be corrected as shown below, and the result can be utilized as the standard area when a marina club space program is being constructed.

Fc=[(number of moored boats by type) × (peak day concentration rate) + (number of visitor boats by type)] × (average number of people on board) × (area per person)

2) Pontoon Area of Floating Architecture

When floating architecture design characteristics are examined, it is seen that a floating building is generally three stories or less in terms of scale, and that the deck area, which consists of the total area of the pontoon - the floating hull - minus the building's bottom floor area, makes up 30~35% of the total area (Sungsine Pak, 2011). Therefore, the pontoon area can be estimated by adding the first floor area of the marina club and the deck area expected from the scale of the building.

2.2 Spatial Composition Ratio of Marina Club Based on Case Studies

Since domestic marina facility development projects are led by the public sector because of regulatory restrictions, Korean marina clubs show particular spatial composition characteristics. A marina club in Korea exists as a composite type facility that takes into account the public's use of space.

Since it is difficult to develop a marina with investment from the private sector or operate a member-based marina club, commercial space open for the public takes up a much greater portion than space targeting consumers of marine leisure-sports such as yacht users. In other words, as shown

Table 1 Space Program of Marina Club

Category		Main Rooms
Marina-exclusive Facility	Education space	Education room, training room, infirmary
	Shower & dressing room space	Men's and women's dressing rooms and showers
	Convenience space	Stores, equipment storage room
Commercial Facility	Food & beverage space	Cafeteria, restaurant, PDR, kitchen
	Meeting & culture space	Multi-purpose room, banquet room
Public space		Corridor, lobby, lounge, hallway
Management space		Office, machine room, electric room

1) Estimation of marina facility size is discussed in pp167-170 of this report based on the study done in 2006 by the Korea Maritime Institute (lead research institute), Daewoo Engineering and Korea Marine Rescue Center (co-research institutes). The part on marina club size estimation is re-quoted from the standards section presented in 海洋性レクリエーション施設 (Maritime Recreation Facility) by Professor Akio Kuroyanagi of Nihon University, published in 1997 by 技報堂出版 (Gihodo Shuppan Co.). On August 7th, the basic concept of this estimation has been confirmed by Professor Akio Kuroyanagi through the discussion at '2012 Floating Architecture International Workshop' held in Busan.

2) Interview with staff of Jeon Gok Port resulted in the conclusion that the same standards can be applied to both Japan and Korea.

in Table 1, the spatial composition of a marina club is differentiated into education space, shower and dressing room space, convenience space, food and drink space, meeting and culture space, public space and management space, and of these, commercial facilities such as restaurants or multi-purpose rooms like banquet halls take up the largest area (Sungsine Pak, 2012).

From the completed Seoul Marina and Ara Marina, and Jeongok Marina with its design finished, the spatial composition of domestic marina clubs, as shown in Figure 1, can be verified. Commercial facility space is distributed over 35~66.4% of all marina clubs, and the space ratio between marina-exclusive facility and commercial facility is shown to be 21% to 79%. Composite-type marinas with large commercial facility sections will continue to be dominant until the regulatory conditions improve and the demand for marina-related marine leisure and sports matures.

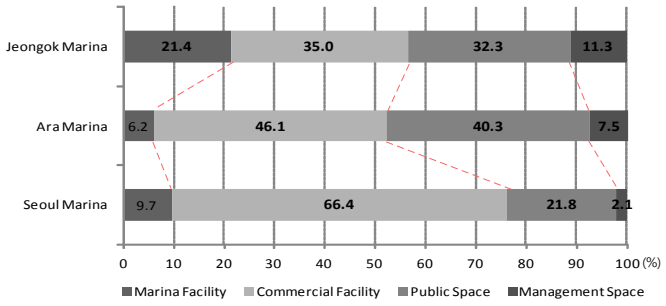

Fig. 1 Spatial Composition of Domestic Marina Club

3. Spatial Demands Based on Survey

3.1 Survey Outline

In order to complete a marina club space program, a forecast of future demand is needed. For this, a survey was done on the general population to assess the awareness and overall knowledge about marina clubs and floating architectures, as well as determine the need for each marina club space. The details of the survey questionnaire consisting of three sections and 12 questions are given below.

1) Questions related to floating architecture

① Awareness of floating architecture
② Floating architecture differentiated from general architecture
③ Program appropriate for floating architecture

2) Questions related to marina and marina club

④ Yacht use and ownership
⑤ Outlook on the time of marina facility popularization
⑥ Intention to use marina facility in the future
⑦ Spatial demand by each marina space

3) Questions related to Saemangeum Floating Marina Club

⑧ Contribution of Saemangeum Floating Marina to tourism
⑨ Intention to use Saemangeum Floating Marina
⑩ Time of Saemangeum Floating Marina visit
⑪ Accompanying persons when visiting Saemangeum Floating Marina
⑫ Expected impact of Saemangeum Floating Marina

The survey questions were prepared based on the assumption that a floating marina club will be constructed in the Saemangum region that has been chosen as the best location for a floating architecture in a previous study (Lee Hanseok, 2012). The survey was done over a period from March 29 to April8, 2012. The survey was done through direct collection of questionnaires by researchers placed

Table 2 Outline of Surveyed Respondents

Category	Sub-category	Sex		Total
		Male	Female	
Age	20s	92(34.7%)	65(43.9%)	157(38.0%)
	30s	54(20.4%)	25(16.9%)	79(19.1%)
	40s	70(26.4%)	32(21.6%)	102(24.7%)
	50 and over	49(18.5%)	26(17.6%)	75(18.2%)
Job	Self-employed	42(15.8%)	9(6.1%)	51(12.3%)
	Government worker	37(14.0%)	10(6.8%)	47(11.4%)
	Company worker	72(27.2%)	25(37.2%)	97(23.5%)
	Student	81(30.6%)	55(20.9%)	136(32.9%)
	Homemaker	0(0%)	31(20.9%)	31(7.5%)
	Specialist	15(5.7%)	6(4.1%)	21(5.1%)
	Other	18(%)	12(8.1%)	30(7.3%)
Average Monthly Income	Less than 1 million won	31(11.7%)	32(21.6%)	63(15.3%)
	1~2 million won	32(12.1%)	32(21.6%)	64(15.5%)
	2~3 million won	68(25.7%)	17(11.5%)	85(20.6%)
	3~4 million won	64(24.2%)	29(19.6%)	93(22.5%)
	4~5 million won	27(10.2%)	24(16.2%)	51(12.3%)
	More than 5 million won	43(16.2%)	14(9.5%)	57(13.8%)
Education Level	High school graduate	97(36.6%)	69(46.6%)	166(40.2%)
	University graduate	123(46.4%)	57(38.5%)	180(43.6%)
	Graduate school graduate	21(7.9%)	4(2.7%)	25(6.1%)
	Other	24(9.1%)	18(12.2%)	42(10.2%)
Region	Jeonbuk	136(51.3%)	76(51.4%)	212(51.3%)
	Other than Jeonbuk	129(48.7%)	72(48.6%)	201(48.7%)
Architecture Major	Yes	64(24.2%)	29(19.6%)	93(22.5%)
	No	201(75.8%)	119(80.4%)	320(77.5%)
Total		265(64.2%)	148(35.8%)	413(100%)

at Gunsan area locations with a high volume of visitors and at Jeongok Port[3] and through emails targeted at subjects in the Seoul metropolitan area. Cross-tabulation analysis, variance analysis and t-test were performed on 413 valid survey responses among 426 survey responses by using the SPSS (Windows v.12.01) program.

The demographic characteristics of survey respondents expressed as social variables are presented in Table 2. In terms of sex ratio, males made up 64.2% of the total respondents comprising 265 men and 148 women. The regional distribution of the respondents was relatively even, with 51.3% from Jeonbuk and 48.7% from outside Jeonbuk including Seoul and the Capital region. Respondents majoring in architecture were expected to show different results compared to the general public, and therefore question on whether a respondent majored in architecture was included.

3.2 Spatial Demands of Marina Club

Awareness of floating architecture was shown to be relatively high in the student group and the high-income group with average monthly income of over five million won, and regionally, it was high in the Seoul metropolitan area. This is understood to be due to the impact of people encountering the completed floating island on the Han River. Since 83.1% of the respondents answered that floating architecture will provide a differentiated image and spatial experience compared to ordinary buildings, it can be interpreted that a market for floating architecture has positive potential.

The demands of users who own yachts or participate as members in a yacht association are important in determining the spatial demands related to a marina club. Among the survey respondents, 18 owned a yacht or participated in a yacht association, and 93 had experience of using a yacht. The distribution of yacht owners and users was markedly noticeable in the self-employed group with high income and high education level. The public also responded positively to using a marina facility if it is built in the future, indicating a possibility of attracting the general population as prospective marina facility customers. Also most respondents answered that marine leisure-sports and marina popularization will take five to ten years. A majority desired marina clubs to be operated as public clubs rather than private membership clubs in order to secure easy accessibility and openness. Public club was preferred by 89.0% of the respondents, while membership-based club was chosen by 11.0%.

In particular, variance analysis and t-Test were used to interpret the results from question 7, to which a 5-point scoring was applied for measuring the marina club spatial demands. Overall, the need for education space, shower and dressing room space, convenience space and food and drink space which constitute a pure marina club was shown to be great, whereas the demand for meeting and culture space, as well as lodging and shopping space, which are applied when developing a complex based on marina club expansion, was shown to be relatively low. The variance analysis results showed differences in the need for education space by job and education level, and differences in the need for shower and dressing room space by age and job. There were noticeable differences in convenience space demand, depending on jobs and whether one majored in architecture, and there were greater demand for meeting and culture space by Jeonbuk residents. The results of the t-Test performed on the basis of differentiation between yacht owners and the general public and between those with yacht experience and the general public revealed that the spatial demands by each group were significant. The specific average values of spatial demands by group are given in Table 3, and these can be expressed as a graph like Figure 2. The demand for most marina club spaces on average was greater than 3.75, and the spatial demand of yacht users for each item except for lodging space was shown to be higher

Table 3 t-Test of Spatial Demands

Spatial Composition	Category	N	Mean± Standard Deviation	t
Education Space	Yacht user	18	4.33±0.767	2.092*
	Public	323	3.88±0.903	
Shower & Dressing Room Space	Yacht user	18	4.56±0.676	2.334*
	Public	323	4.20±0.880	
Convenience Space	Yacht user	18	4.44±0.616	2.657*
	Public	323	4.04±0.887	
Food & Drink Space	Yacht user	18	4.06±1.056	0.317
	Public	323	3.98±0.885	
Meeting & Culture Space	Yacht user	18	3.67±1.237	0.931
	Public	323	3.39±1.017	
Lodging Space	Yacht user	18	3.67±1.237	-0.153
	Public	323	3.71±1.084	
Shopping Mall	Yacht user	18	3.06±1.434	0.009
	Public	323	3.05±1.145	
Total		341	3.90±0.90	

3) The survey was taken at Gunsan Modern History Museum, Saemangeum Public Relations Center, Saemangeum Tourism Center and the intercity bus terminal, and in order to measure the spatial demands of yacht users, the survey were also taken at Jeongok Port.

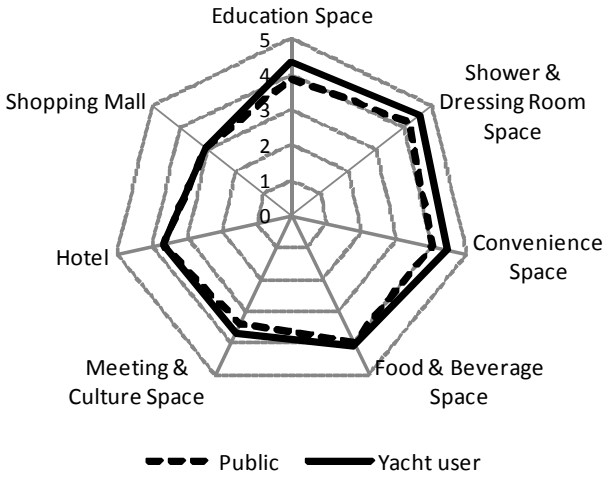

Fig. 2 Graph showing Difference of Spatial Demands between Yacht User and Public

compared to the general public Spatial demands for yacht owners were shown to be in the order of shower and dressing room space > convenience space > education space, and for the public in the order of shower and dressing room space > convenience space > food and drink space.

Based on the analysis results, applying a weight of about 1.2 to the marina-exclusive facility part in the current spatial composition is judged to be reasonable for designing a marina club capable of supporting marine leisure and sports in the future.[4)]

Most of the respondents to the survey on the Saemangeum Floating Marina gave very positive responses to the facility construction, and 83.5% predicted that it will contribute to Saemangeum tourism and development. This is a result that can be actively incorporated when drawing up a Saemangeum master plan or considering facilities to be introduced.[5)]

4. Space Program of Marina Club

4.1 Space Program Estimation Standards

Based on the current state of domestic marina club spatial composition and the survey results discussed above, the space program estimation standards for a Korean marina club can be derived.

The labels for areas by space, which are the key components of the space program, are set as follows. Marina-exclusive facility is mFA, commercial facility cFA, public space pFA, management space emFA, total floor area TFA, deck area DA, and pontoon area PA.

Generally when a space program for architecture design is constructed, public space takes up 30% and management space 5% of the total floor area. While maintaining this proportion, the remaining space can be divided into marina-exclusive facility and commercial facility. At this point, correction is made by adding weight to the marina-exclusive facility part in the current average ratio of 21%:79% and then the total area composition ratio is derived. Accordingly, for a Korean marina club, it is possible to have a spatial composition ratio of 16~18% marina-exclusive facility (mFA), 47~49% commercial facility (cFA), 27~30% public space (pFA) and 5~8% management space (emFA). The spatial composition ratio presented in this study results from the current domestic regulatory conditions, and it can be applied to a composite-type marina. With the rise in marine leisure-sports population and the growth of marina development in the future, it is expected in the long term that changes in space use will lead to leisure-sports-type marinas. In other words, there is a possibility of change toward the direction of strengthening the marina-exclusive facility.

The marina-exclusive facility area (mFA), which serves as the starting point of the space program, is calculated with the corrected equation in 2.1 that reflects the number of people on board. Regarding the values to be applied in the calculations, using the Japanese standards is judged to be acceptable based on the interview with the operator of Jeon-Gok Port. Specifically the following values can be applied:

1) Number of boats in storage by type : number of moored boats depending on the scale of the planned marina
2) Peak day concentration rate : 0.3~0.5
3) Number of visiting boats by type : 0.1~0.15

4) This is a value obtained by comparing the differences in response results depending on the 5-point scale, and it will be useful when adjusting the ratio of the domestic marina club spatial composition which currently is weighted excessively toward commercial facility placement. The weight application is verified through the process of consultation with expert group of designers with experience in domestic marina club design. This numerical value includes the possibility of change depending on increase in demand for marina clubs and changes in other conditions.

5) The Mega Resort development project, a part of the Saemangum seawall attraction project led by the Korea Rural Community Corporation, is a massive mixed development project planned for 195ha of land next to the Shinsido and Yamido area seawall, and it includes a marina facility. At the stage of making the master plan specific, strong consideration should be given to introducing the idea of constructing a floating marina club.

4) Average number of people on board : 2~5 person/boat

5) Area per person: 2~3㎡/person

After estimating the total floor area, area by floor can be calculated by taking into account the characteristics of the floating architecture being constructed on a scale of three stories or less. By adding 30~35% making up the deck area to the first floor area of the marina clubhouse, it is possible to estimate the pontoon area of the floating marina club.

4.2 Space Program Estimation Process

By applying the standards and the values established in 4.1, it is possible to construct a space program of Korean marina club suitable for domestic conditions. The overall space program estimation process can be summarized as given in Figure 2.

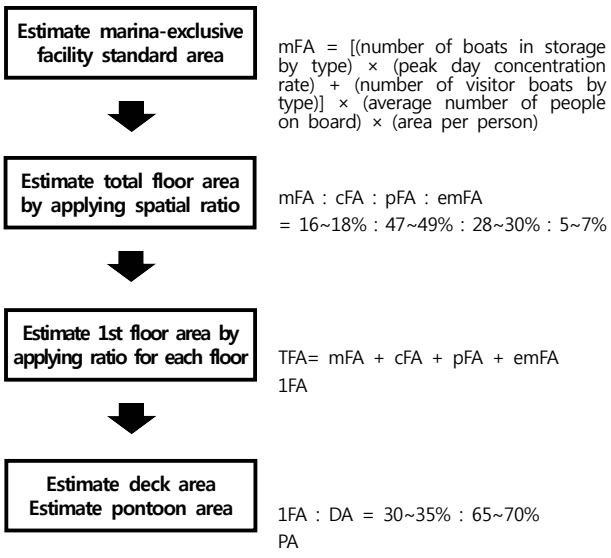

Fig. 2 Process for Space Program

First, the marina-exclusive facility area is derived. The most important variable at this point, the number of boats in storage, can be derived by referring to the First Marina Harbor Basic Plan of the Ministry of Land, Transport and Maritime Affairs which forecasted the scale of each domestic marina, The project feasibility study data or expansion plans by stage for each marina can also be used as references. Second, after estimating the marina-exclusive facility area, from the result, the commercial facility area (cFA), public space area (pFA), and management space area (emFA) are estimated in order according to the major space composition ratio of the marina. As the most important stage in constructing the space program of a Korean marina club, the spatial ratio obtained from the study is applied. Also, by adding up the marina-exclusive facility area, commercial facility area, public area and management area, the total floor area can be obtained. Third, by appropriately allocating the total floor area according to the expected number of building floors, the first floor area (1FA) is estimated. Here, the area allocation is done based on the consideration that generally a floating architecture is constructed as a building with 3 stories or less. Fourth, since the first floor area and deck area mostly have a ratio of 30~35%:65~70%, the deck area (DA) is obtained based on this. The pontoon area (PA), or the area of the floating hall, can be estimated by totaling the first floor area and the deck area.

4.3 Space Program of Saemangum Floating Marina Club

In order to estimate a marina club space program by forecasting an actual marina club construction and following a process, a few preconditions need to be presented as follows.

- Number of moored ships: 200[6)]
- Type: Medium-sized composite
- Location: Saemangeum Bieung Port area or Mega Resort

1) The marina facility area mFA can be estimated based on the corrected equation presented above, and the results are distributed across a range of 600~1,200㎡ depending on the numerical value applied for each factor. Here 600㎡ is appropriately chosen for current conditions.

mFA = [(number of boats in storage by type) × (peak day concentration rate) + (number of visitor boats by type)] × (average number of people on board) × (area per person)

[200 × 0.4 + 200 x 0.1] × 3 × 2 = 600㎡

[200 × 0.4 + 200 x 0.1] × 4 × 3 = 1,200㎡

2) In accordance with the spatial composition proportion of mFA : cFA : pFA : emFA = 16~18% : 47~49% : 28~30% : 5~7%, the area of each space can be estimated. So the commercial facility area cFA is 1,800㎡, the public space area pFA 1,100㎡, the management space area emFA 200㎡, and

6) This size was chosen in accordance with the First Marina Harbor Basic Plan announced by the Ministry of Land, Transport and Maritime Affairs.

the total of each space area or the total marina club floor area TFA is 3,700㎡.

3) If the scale of a marina club is planned to be two stories, and the first floor area is assumed to be 60% of the total floor area, then each floor area can be obtained. The first floor area 1FA is 2,200㎡ and the second floor area is 1,500㎡.

4) The external deck area can be estimated based on the ratio 1FA : DA = 30~35% : 65~70%. Therefore the deck area is 1,200㎡, and it can confirmed that ultimately the pontoon area PA must be planned to be around 3,300~3,500 ㎡.

The Saemangeum Marina Club with a capacity of 200 boats and planned as a medium-sized, composite-type marina can be designed based on the space program summarized in Table 4. Since this marina has the potential to change into a leisure-sports-type marina in the long term, consideration should be given to future marina-exclusive facility expansion and introduction of composite development ideas like condominiums, hotels and shopping malls.

Table 4 Space Program of Saemangum Marina Club

Category			Area(㎡)
Marina Club	Marina-exclusive Facility	Education space	600
		Shower & dressing room space	
		Convenience space	
	Commercial Facility	Food & beverage space	1,800
		Meeting & culture space	
	Public space		1,100
	Management space		200
	Total Area		**3,700**
Deck Area			**1,200**
Pontoon Area			**3,400**

5. Conclusion

Domestic marinas are developed as public projects because of regulatory restrictions, and as such, a marina club which is central to a marina has a particular space composition. That is, the marina-exclusive facility area is relatively small compared to the commercial facility area. But space program standards that reflect the actual conditions are non-existent for designing a domestic marina club. In the case of floating architecture, there is a big advantage in that, unlike on-land development, a marina development can be done with active utilization of water space and minimization of environmental pollution due to land reclamation.

Hence the spatial composition ratio of marina-exclusive facility, commercial facility, public space and management space was established based on case studies of domestic clubs which have been recently completed or have a finalized design. After assessing the awareness and the spatial demands regarding floating marina clubs through a survey, a new spatial composition ratio was presented. It was confirmed through the survey that the demand for marina-exclusive facility is relatively large, and a weight based on this was applied. For a composite-type marina club expected in the short term, currently it is possible to have a space program composition with a proportion of 16~18% marina-exclusive facility (mFA), 47~49% commercial facility (cFA), 27~30% public space (pFA) and 5~8% management space (emFA).

The space program is completed through a process of ① calculating the marina-exclusive facility area based on the number of boats that can be accepted, ② calculating the area by space and the total floor area according to the presented standards, ③ estimating the first floor area by allotting the total area to each floor of a typical floating architecture with a scale of 3 stories or less, and ④ estimating the deck area and the pontoon area.

Through this study, it is possible to present a space program that can provide standards for designing a Korean marina showing a particular spatial composition, and the design process can take place according to the space program. In a follow-up study, a floating marine club will be designed for the target location of Saemangeum and the possibility of actual construction will be considered.

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References

[1] Kim, H. S.(2010), “A Study on the introduction & expansion Strategy of New Maritime Culture in Korea”, Journal of Korea Port Economic Association, Vol. 27, No. 4, pp. 269-288.

[2] Lee, H. S., Cho, H. J., Kang, Y. H.(2007), “A Study on Site Selection for Marine Recreational Floating Architecture ”, Journal of Navigation and Port Research, Vol. 36, No. 1, pp. 27-34.

[3] Pak, S. S.(2011), “A Study on Architectural Type and Design Characteristics of Floating Architecture”, Journal of Navigation and Port Research, Vol. 35, No. 5, pp. 407-414.
[4] Pak, S. S.(2012), “A Study on Present Condition and Spatial Organization of Domestic Marina Club to Design Leisure Floating Architecture”, Journal of Navigation and Port Research, Vol. 36, No. 3, pp. 253-259.
[5] Park, S. H.(2005), “Problem and Status of Yacht Industry in Korea”, Journal of the Korean Society of Marine Environment & Safety, Vol. 11, No. 1, pp. 47-52.
[6] Ji, S. U.(2008), Development Plan for Marina, Daekyung books
[7] Olthuis, K. and Keuning, D.(2010), Float!: Building on Water to Combat Urban Congestion and Climate Change, Frame Publishers
[8] Jeonbuk Development Institute(2007), Strategies of Jeonbuk Yacht Industry
[9] Jeonbuk Development Institute(2008), Promotion Plan of Jeonbuk Marine Tourism
[10] Korea Maritime Institute(2006), Constitution of Marine Tourism Infrastructure
[11] Ministry of Land, Transport and Maritime Affairs(2010), The First Marina Harbor Basic Plan
[12] Seoul Hangang Park Office(2008), A Feasibility Study on Composition and Operation of Han River Yacht Marina
[13] Interview with Akio Kuroyanagi on August 7th, 2012

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