

# Lessons from the Landscape Architecture of Ulsan World Cup Stadium\*

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## 울산월드컵경기장 조경의 교훈\*

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### 초록

본 연구는 울산월드컵경기장의 조경현황을 분석함과 동시에 경기가 끝난 후에도 이곳을 찾는 이용자들의 요구를 수렴함으로써, 향후 경기장조경시에 적용할 수 있는 교훈을 얻기 위한 목적을 두고 진행되었다. 조경현황에 대한 분석자료는 월드컵경기장조경을 위한 시공보고서와 도면 및 사진 그리고 현장에서 수집한 제반 자료이며, 이용자요구는 현장에서 조사한 이용행태이다.

연구결과 2002 월드컵대회에 대비해서 만들어진 울산월드컵경기장은 건축공간을 확보하는 과정에서 대규모의 정지작업을 실시하여 과도한 지형변화가 발생하였으나, 친환경적인 법면의 처리와 향토식생의 도입 및 대형목 등의 이식을 통해서 자연과 친화될 수 있는 경관을 조성하고 있었다. 특히 기존의 옥동저수지를 보전·활용하여 친수공간을 확보한 것은 울산월드컵경기장조경에서 주목할만한 특징으로써, 기회요소를 지혜롭게 활용한 좋은 사례가 되고 있다.

한편, 울산월드컵경기장은 시민들이 부담없이 여가공간으로 활용할 수 있는 공원적 기능이 체육시설에 접목됨으로써 기존의 경기장과는 달리 체육, 문화, 교육기능이 복합적으로 기능하는 세계적 수준의 체육공원으로 개발되었다. 또한, 울산이 가진 역사문화적 요소를 상징적인 설계언어로 도입한 것은 역사적 장소성을 중시한 설계방법으로서 이것 역시 울산월드컵경기장조경의 특징으로 손꼽을 수 있는 것이다.

특히 울산월드컵경기장은 경기가 종료된 이후에도 시민들에게 적극적으로 개방되고 있으며, 시민공원의 성격으로 이용될 수 있는 다원적 기능을 가지고 있어서 주목되는 바가 컸다. 이와 같은 경기장

\* : This work was supported by the Dongguk University Research Fund

건설의 개념은 공간의 이용을 시간적으로 확장하는 것으로서 향후 보다 적극적으로 도입되어야 할 현대적 개념의 공간이용으로 볼 수 있다.

연구결과 향후 울산월드컵경기장이 시민의 휴식과 문화공간으로서 보다 적극적으로 기능하기 위해서는 경기장은 물론 공원으로 이용되는 공간에 대한 철저한 유지관리와 운영관리에 대한 노력이 필요할 것으로 생각된다. 특히 자연환경이 훼손된 부분에 대해서는 원래의 생태적 질서가 회복될 수 있도록 더욱 노력하여야 할 것이다.

*Key Words : Ulsan World Cup Stadium, Natural-oriented Landscape, User-oriented Landscape, Public Park, Sense of Place*

## I. INTRODUCTION

Ulsan, one of the cities in which the 2002 Korea-Japan World Cup games were held, constructed a main stadium and an extra field. In the process of this construction, the areas around the stadium and the existing Oak-dong reservoir were changed into public parks. This is good example of a new concept that was imported for various space uses. The precedent for this was the Olympic Park for the 1988 Seoul Olympics which created public parks around stadiums. Most of ten World Cup venues adopted this concept that stadiums have public parks to open to the public. Until recently, many sports facilities have only the function of game sites and foundation facilities. The new concept of the World Cup venues is a progressive and citizen-oriented concept.

It is meaningful that Ulsan World Cup Stadium has multiple function rather than a singular use for the public who wants to use multi-purposed space<sup>1)</sup> because Ulsan has lacked the facilities for sports, cultural events, and leisure that citizen can use freely.<sup>2)</sup>

Ulsan World Cup Stadium has been

constructed with in a beautiful environment including Oak-dong reservoir which provided a potential element to create a natural environment because the area had limited development. However, site preparation was done in the process of the stadium construction. Fortunately, the environmental damage was limited to small area. The utilization of Oak-dong reservoir and the importation of natural landscape, which can recover the damaged environment, were very successful and allowed Ulsan World Cup Stadium to maintain a natural environment. The role of the landscape architecture was very important in this stadium project and this method of landscape architecture that is natural-oriented and user-oriented will have a significant impact on future developments.

The purpose of this study is to understand concretely the role of landscape architecture in this project. The study shows the treatment method for the damaged environment caused by site preparation and the method of space organization and landscaping and attempts to understand the problems and potentiality of landscape architecture in the process for future projects.

## II. THE SITE AND RESEARCH METHODS

### 1. The Site

Ulsan World Cup Stadium is located in Oak-dong, Nam-gu and 668,637m<sup>2</sup> of the overall planned area of 912,310m<sup>2</sup> was completed. The first stage of construction was completed in thirty and half month from December 18, 1998 to June 30, 2001 and opened on April 28, 2001. The total cost of the construction was 151 400 million Won (116.46 million dollars) included the cost of the site purchase and preparation. 15,700 million Won (12.07 million dollars) of the whole cost was partial cost for landscape architecture. The amount of vegetation included 290,673 trees, shrubs, and undergrowth.

The main facilities are a stadium and extra field. The subsidiary facilities are a marronnier Plaza, plaza of water falls, lakeside plaza, amphitheater, high-jet fountain, lakeside walkway, and a ecology study walkway. A ballpark having 21,000 seats, a swimming pool, a roller-skating rink, an ice-skating rink, and a tennis court will be built at the rest areas(Figure 1, 2).

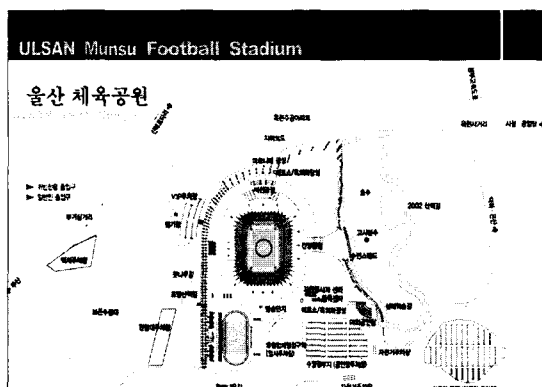


Figure 1. Master plan of Ulsan World Cup Stadium



Figure 2. Overall view of Ulsan World Cup Stadium

### 2. Confines and Methods of Study

#### 1) Confines of Study

The confines of this study are limited to the outdoor space of Ulsan World Cup Stadium. The contents include the concept of landscape design and analysis of the current situation. This study provides a new guideline of future stadium design with the distinguished characteristics of landscape.

#### 2) Research Methods

##### (1) Methods of investigation

The documents review is the main method of this study and field survey is other method that supplements the literature review.

The design concept, site preparation, space organization, circulation pattern, facility arrangement, and planting are understood from the construction report and drawing, and picture data. The focus is on how the topography has been changed and this is for the understanding that this site was environmentally developed with landscape architecture.

The field survey took place July 5 to July 7 in 2002. The location, variety, material, and function of the landscape elements including planting, facilities, objects, paving, and water facilities are investigated around the World Cup

Stadium. User's patterns and questionnaire are additionally surveyed for the frequency and pattern of the user in each area. The result of investigation are applied to analysis data as well as subsidiary a drawing and pictures.

#### (2) Methods of analysis

The landscape analysis is base on the result of the document review and field survey. There are distinguished elements in the landscape of the World Cup Stadium. First of all, general contents (planting, facilities, objects, paving, location of water facility, variety, material, and function) and special contents of landscape are identified and then, new guidelines for similar projects in the future are determined. The frequency and pattern of user from questionnaire and analysis of use pattern are used for preference rate.

### III. RESULT AND REVIEW

#### 1. Concept of Landscape Architecture

##### 1) Basic Concept and Direction

The basic concept of the World Cup Stadium is creation of a cultural space and an offer of open space for citizens. The project direction is as follows:

First, existing reservoir and hill are preserved, and these natural environmental features are used in design.

Second, art objects and facilities coinciding with building and structure are set up.

Third, the cultural identity of space is created with plants that have seasonal and native characteristics.

Fourth, outdoor spaces that players and audiences have no obstacles to activity are made and the landscape that can give some

amusement of visual and perceptive experience is created.

Fifth, the stadium can be used as a recreation space for non-game periods. Some facilities for convenience and rest can help user's activity.

Sixth, this stadium can be called a natural-oriented facility because damaged from construction was recovered.

#### 2) Concept of Each Section

##### (1) Planting concept

① Creation of space emphasizing the dynamic image and simplicity of the stadium and athletic parks

② Creation of rest and guidance space around plaza of main and subsidiary entrance

③ Planting of big zelkova trees for meditation and a natural view from the road

④ Creation of space using the existing woods and establishment of walks

⑤ Planting of fragrant trees around lake and amphitheater

⑥ Application of multi-storied planting pattern with trees and shrubs

⑦ Landscape planting using existing and donation plants

##### (2) Installation concept of landscaping facility

① Selection of form and texture according to the whole design concept

② Embodiment of simple image for functional purpose

##### (3) Installation concept of object and paving

① Arrangement of circulation pattern and facility considered by image of athletic park (lakeside plaza stand)

② Development of the water-oriented space around lakeside and walks (lakeside walk)

③ Creation of natural-oriented spaces preserving existing woods (ecology walk observation deck)

④ Selection of natural-oriented materials (clay brick)

⑤ Enhancement of identity of the living conditions of Ulsan in the prehistoric age and historical consciousness through creation of educational space explaining the cultural inheritance (reappearance of Ban-gu-dae stone-carving drawing and Chun-jeon-ree stone-carving)

⑥ Importation of the colors accorded with image of the football stadium (selection of the natural color for emphasizing stadium)

⑦ Creation of distinguished fundamentals considered with function of sidewalk, plaza, and street (concrete placing of street-extra fundamental)

⑧ Natural-oriented clay paving of lakeside walk (lakeside walk)

⑨ Selection of materials for the trees (no concrete placing of extra fundamental around planting areas)

(4) Installation concept of water facility

① Devising for easiness for construction and management (management of whole systems in the stadium)

② Creation of contrast effect between static natural landscape and dynamic high-jet fountain of lake, and installment of high-jet fountain that avoids a stagnant condition of lake construction of water falls for image creation of main entrance plaza creation of hard stone stairway and plaza to rest space by importation of Glass-blocked waterway and cascade

## 2. Current Condition of Landscape Architecture

### 1) Land Readjustment

This site has topographically three level; lake and neighboring park level, stadium and parking level, and restricted woods and hill level. Each

level was differently accomplished. In the process of site preparation, the stadium area located in center of site was the heart of work. The stadium and neighboring plaza needed a big flat space and this was a reason why this area had lots of change of topography. The primary areas of grading were the stadium area, western entrance, road for observation, and reserved parking area. In addition, the extra field and parking area required much work. However, Oak-dong reservoir had almost been preserved but the lakeside plaza and walk were set up in the western area of lake that had deep slope. The amount of earth removed was 1,392,945 m<sup>3</sup> and the amount of additional ground was 989,976 m<sup>2</sup>. The rest amount of the soil, 402,969 m<sup>3</sup>, was used for Oak-hyun housing construction and Mun-su-ro construction.

The slope of the cutting side had stable degree, 1:1.5 (34°), and laminated hardening was applied for stability at the foundation of the adding side. Seed spray was applied at the slope of the exposure side and evergreen shrubs were used for making forms that have stability of slope and symbolic characteristics of landscaping. The density of trees and shrubs around facility and areas of possible observation are high. The grass can enhance the continuity of image in planting areas. Last of all, country shrubs, that were seeded, can provide stability in the rest areas of slope and trees were planted at the small terrace after adding soil to improve the ground(Ulsan-City, 1998).

### 2) Space Organization and Circulation Pattern

There are two big areas, the stadium area and the lake area.

The Stadium area contains the stadium and spare field. Marronnier plaza and the plaza of

water falls are placed in the northern area from Mun-su-ro to stadium entrance and the southern area has spare field and parking spaces on both sides. Also, there is a lakeside plaza in the eastern area between the lake and the stadium, and the road for observation, reserved parking, and the Rose garden are located in the western area.

The lakeside walkway(2,002m), high-jet fountain, and the ecology walk are spaces for citizen's well being. Lakeside plaza and the amphitheater near the lake are two of the most important spaces for Ulsan citizen who do not have enough spaces of cultural facility.

Mun-su-ro in the northern area and the southern beltline in the eastern area were extended. This makes easier access to the site, and users can enter simply to the site using the interchange and south-western access road of inside site.

Mun-su-ro as a main access road was widened from 25m to 50m (eight lanes). An interchange that provides easy to access from the city and an underground pathway for the pedestrians were created. The southern beltline was widened from 20m to 45m (eight lanes) and an interchange was added for easy connection to the inside road. The inside entrance roads were created in the western and southern areas. The entryway of the western area connected to the reserved parking has 30~35m (six lanes) and this road is connected to the southern street by a 'T' shape crossroad. The entrance road in the southern area is connected to a parking lot has 25m (four lanes) and is also connected to the southern beltline by an interchange (Ulsan-City, 2002).

The circulation pattern which separates vehicle and pedestrians has a radial form from the

entrance plaza, parking area, and lakeside park to the stadium. The observation walkway is set up in the western area of stadium and is connected with the entrance plaza, stadium, and spare field. The lakeside walkway is located around the lake and is connected with the lakeside plaza, amphitheater, and ecology walk.

### 3) Current Condition of Landscape in Each Area

#### (1) Stadium area

##### ① Marronnier plaza

Marronnier plaza, near Mun-su-ro, is identified as a main entrance plaza 98 marronnier trees have been planted on both side of the walk. *Pinus rigida*, *Prunus sargentii*, and maple on the hill creates the image of natural environment. *Hydragea macrophylla*, ivy, and *Pachysandra terminalis* planted at the bottom stabilizes the view. Bamboo planted nearby the walk serves as an image of evergreen and provides a Korean atmosphere. Sedum for the effect of four seasons was planted on the roof of the ticket kiosk located on the left side of plaza and the rest room. This shows the new format of roof garden.

The main facilities are the ticket kiosk and the rest room, information signs, flowerpots, and benches are set up on both sides of plaza. There are two art objects, the standing stone of the athletic park in the middle of plaza and the flower like object in a cylinder form. The paving material is small-high-pressure brick that is used to pave the main entrance plaza.

##### ② Plaza of water falls

The water falls that height 6m, length 24.6m and is for image of main entrance plaza was placed in the middle of plaza. The Ban-gu-dae stone-carving drawing and Chun-jeon-ree stone-

carving was reproduced and set up on both sides of the water falls. These reproductions of carvings that had been made in the prehistoric age can show the historical identity in Ulsan.<sup>3)</sup> The water falls was created with the method of Go-heung stone masonry. Bubbles and natural flowing can assist to raise the image of sight and hearing. The grass-block waterway (length 29.6m) and cascade (height 9.5m, length 15.6m) were applied on the axis in front of water falls. These facilities make the stairway and plaza to the rest area. The plaza and stairway were paved with the plated-granite stone.

#### ③ Observation walkway

The big zelkova was planted on both sides of a walk in double rows and pergola and benches are placed along it. This area was paved with small-high-pressure block.

#### ④ Rose garden

The Rose garden is located on both sides of the stairway from the walk for observation to the western entrance of stadium. Rose trees (7,449) including *Rosa hybrida* 'angella' and other 32 species were planted in the Rose garden. The users can enjoy the roses between April and November.

### (2) Lake area

#### ① Lakeside plaza

The users have performing a panoramic view of the lake. The lakeside plaza has a plaza and stand that are for the function of outdoor plays and a playing area for teenagers. The stairway between the stadium and lakeside plaza can be used as a seating area (5,200 seats) and can accommodate 10,000 people for a play.<sup>4)</sup>

The plaza was paved with small-high-pressure blocks of artificial granite and the stand was paved with clay brick. *Quercus acuta*, *Prunus sargentii*, *Styrax japonica*, *Daphniphyllum*

*macropodium*, and *Neolitsea sericea* were planted near the plaza and two pergolas were placed near the lake.

#### ② Amphitheater

The lakeside plaza, as an open space, accommodates plays and pop concerts but the amphitheater is a space for classic concerts. This has a stage and a fan-shaped stand that people can see the lake during the public performance. *Gardenia jasminoides*, *Osmanthus fragrans*, and *Daphne odora* that can be harmonized with a sense of place were planted around the amphitheater. The slope of the amphitheater was treated by planting trees that have the form of whale and other animal form Ban-gu-dae stone-carving drawing. This treatment expresses the history symbolically. This amphitheater has 1,600 seats and was paved with clay brick.

#### ③ Ecology study walkway

This is a natural-oriented space created while preserving the existing woods. The wood deck was placed for observing the lake view and wild birds. There are *Nymphaea hybrida*, *Iris ensata*, and *Phragmites communis* in this area.

#### ④ Lakeside walkway

The lakeside walkway has a length of 2,002m that symbolizes the 2002 Korea-Japan World Cup. The walkway was paved with clay as a natural-oriented material and is harmonized with the surroundings. The natural stone was imported for the shore of the lake and a wood fence was set up between the walk and lake.

#### ⑤ High-jet fountain and music fountain

The high-jet fountain and music fountain as a vertical element were constructed and are linked with the axis of plaza of observation located in the west area of stadium. These facilities have the functions of providing a view and water purification. The high-jet fountain has been

arranged with one of the high-jets set at 60m and three others at 30m. The music fountain (H 20m x W 25m x D 8m) and water screen also was set up.

### 3. The Characteristics of Landscape in World Cup Stadium

#### 1) Natural-oriented Landscape

The construction of the Ulsan World Cup Stadium damaged the natural environment of the site preparation for establishing the stadium and other facilities. However, an effort of recovering the damaged nature brings the environment almost back to its former condition. The most important thing for recovering the damaged nature caused by site preparation is the treatment of the slope. The word forms using evergreen shrubs were created on the slope as a meaning of canvas and applied evergreen trees also assisted in recovering nature's former condition. The animals shown from Ban-gu-dae stone-carving drawing were formed by using *Rhododendron lateritium*, *Ilex crenata*, and *Buxus microphylla* on the slope near the lake. The big whale and the ameba shape were applied another slope. This kind of slope treatment improves on the existing method that makes simply the stability of a slope, because it shows symbolically the history of Ulsan. This can be a new precedent of the role of landscape architecture.

The rest and educational space achieved by preserving Oak-dong reservoir are a result of natural-oriented landscape. The maintenance of the shoreline and importation of water plants are the methods applied on the reservoir. This kind of use of reservoir is similar to the pond of the 88 Olympic Park where the hazard of

Mong-cheon mud fortification had been changed and this place serves as a rest and water front space for the citizen (Seoul, 1984). However, Daegu World Cup Stadium where the existing reservoir was filled up is a different case from Ulsan. Therefore, it is clear that the approach to landscape of Ulsan World Cup Stadium is advanced. Meanwhile, the lakeside plaza, amphitheater, and walk of ecology study offered the space of culture and education for the public. The Ulsan World Cup Stadium has many functions including enjoying the view, the rest, a walk, seeing the play, and studying ecology. This shows that this place is the space of life-type exercise as well as the rest space and the space of culture and education for the citizen.

The transplantation of abundant big trees helped to make the natural-oriented environmental condition and this is a distinctive characteristics in this place (Figure 3).

The southern entrance of the stadium and the other main entrance area have one big pine as a

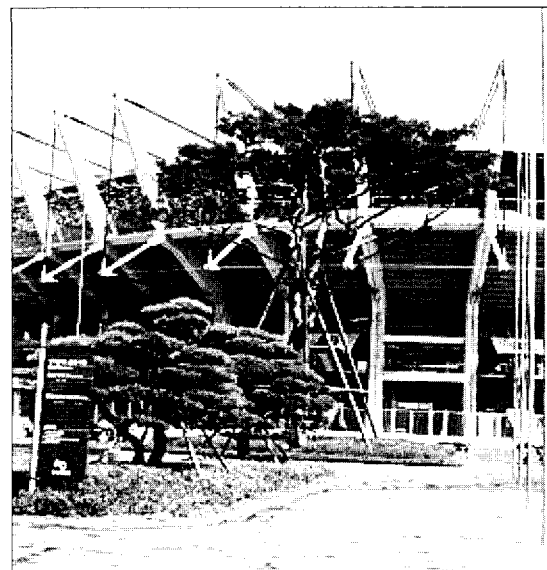


Figure 3. Big tree planted in the worldcup stadium



landmark that is 200 years old. Two hundred thirty four pine trees that have a 13~15m height and 5~8m width were planted around a big tree. These big trees can show Korean emotion as a symbol and creating harmony with the mass facilities. Three thousand one hundred twenty nine trees including the big pine and another 30 species from the submerged area of Dae-gok dam and redevelopment area of apartments were planted around the stadium. The procurement of these trees saved 1,700 million Won.

The planting of evergreen trees, *Quercus acuta*, *Abelia grandiflora*, *Camellia sasanqua*, *Neolitsea sericea*, *Ilex rotunda*, *Castanopsis cuspidata*, *Quercus myrsinaefolia*, *Phyllostachys bambusoides*, *Rhododendron lateritium*, *Gardenia jasminoides*, *Osmanthus fragrans*, *Daphne odora*, *Persea thunbergii*, *Cedrus deodara*, *Daphniphyllum macropodum*, *Viburnum awabuki* can indicate a method of showing the identity of Ulsan.

## 2) User-oriented Landscape

The Ulsan World Cup Stadium has various spaces like a public park around the stadium. These spaces offer a public park that has sports and culture facilities for the citizens. The marronnier plaza, located in the northern area of the stadium, has the character of a rest area with lots of trees. The plaza of water falls offers a water facility and a chance of studying history through with wall drawings. In the area of lake, the lakeside walk, high-jet fountain, and the ecology study walkway have functions of a rest place and ecology study(Figure 4). The amphitheater and plaza offer space for various cultural plays to the citizens. The neighboring plaza and parking, which has easy access, are also used for in-line skating and badminton. The lakeside walkway and bicycle road are popular

places. The creation of space that the public wants gives the World Cup Stadium the sense of place and purpose.

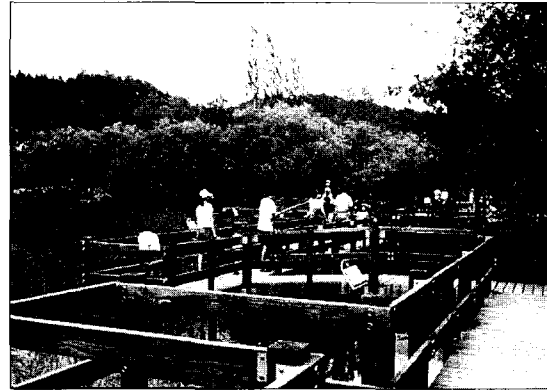


Figure 4. Ecology study of walkway

## 3) Landscape for offering the Sense of Place

In the plaza of water falls, the prehistoric heritage, Ban-gu-dae stone-carving drawing and Chun-jeon-ree stone-carving that can show the identity of Ulsan, were reproduced on both sides of the wall. The forms of whales and animals from Ban-gu-dae stone-carving drawing were carved on the slope of the amphitheater and a Rose garden(Figure 5). These wall drawings and decorations on the slope express symbolically the history of Ulsan and are a method of expressing the sense of place.

However, the small and simple method of evergreen shrubs and wall drawings is not enough to express the historical identity and image. The overall design pattern of the whole stadium can be understood to the unified image and the place or facility of traditional pavilion, flower wall, and small pond located in the lower part of the pine woods of western area of central plaza can offer the characteristics of Korean traditional place. It is also a good that traditional color, five direction color, puts into

each facility and sign (Cho, 2002). This is the clue for expressing the historic sense of the place in Ulsan.

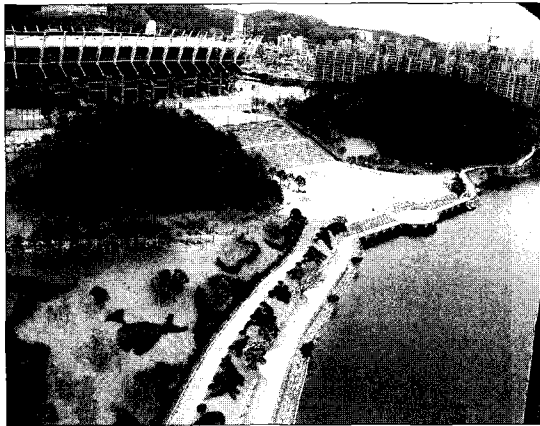


Figure 5. Wall drawings carved on the slope of the amphitheater

#### 4) Landscape of participation of Citizen

The design cost of the planting construction was only 1,300 million Won. However, the cost was increased to 7,000 million Won and the quality of this project was upgraded.<sup>5)</sup>

Donation from the public totalled 1,300 million Won. It was used for the transplantation of the big pine tree that is 200 years old (73 million Won) and 234 big pine trees (260 million Won, Figure 6), 11 special-shaped pine trees (330 million Won), and the Rose garden



Figure 6. Big trees planted around the stadium

originating from the southern province (200 million Won). This is a new example of participation of the citizen and will be a good strategy for public construction of the future in landscaping.

## IV. CONCLUSION

The purpose of this study is to understand the role of landscape in the process of pre-construction of Ulsan World Cup Stadium. The study of basic ideas and design direction and the analysis of existing condition in landscape architecture are done. The result are as follows:

First, the treatment of the slope occurred because of construction, the preservation and use of Oak-dong reservoir, the transplantation of big trees, and importation of country species could make the natural-oriented landscape.

Second, the construction of various spaces having the characteristics of a park around the stadium offered the public parks as well as sports and culture facilities. The place could interest the users after the games.

Third, the carved wall and word forms using evergreen shrubs could show the history of Ulsan and identity of place.

Fourth, donation of trees could encourage the public participation.

There are several guidelines that are natural-oriented landscape, user-oriented landscape, landscape for offering the sense of place, and landscape for participation of citizens. These guidelines should not only be applied to stadium landscape but other various construction. In the process of development, if landscape is considered in the first level of the planning, the

project will be better. In this case, Ulsan World Cup Stadium, landscape architects were limited to architecture to pro-actively problems created from the civil and architecture. Development systems that allow landscape can join the project are needed for the future. Finally, this study is for only Ulsan World Cup Stadium. In future, further concrete and detailed study is necessary for comparison.

#### NOTES

1. Many program have been operated by Ulsan City and the city is trying to find programs by which people can be attracted. In fact, it is demonstrated that the stadium and surroundings have been used after the World Cup games.
2. Now, 1997, the area of public parks is 1.1m<sup>2</sup>/person in Ulsan and this is less than other cities. This situation got

- better after completion of Ulsan Public Park (Ulsan-City, 1997).
3. The questionnaire shows that the rate of utilization is lower than other places because this place is separated by Mun-su-ro and accessibility is not good. So, this place exists as a symbolic entrance.
4. The questionnaire and survey show the lakeside plaza is the most used area in the Ulsan World Cup Stadium.
5. The total cost of landscape construction was about 16,000 million Won.

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원고접수: 2002년 7월 14일

최종수정본 접수: 2002년 11월 20일

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