

# ICRP

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# 2018

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## PROCEEDING OF 3<sup>rd</sup> INTERNATIONAL CONFERENCE ON REBUILDING PLACE (ICRP) 2018

*Towards Safe Cities & Resilient Communities*

**13 & 14 SEPTEMBER 2018**  
**IMPIANA HOTEL, IPOH, PERAK**

**ORGANIZED BY :**



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# COMPATIBILITY OF VISIBILITY AND HARMONY OF PICTOGRAM: FOCUS ON RESTROOM MARK

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**Abstract** - In recent years, there are many various design signs to guide people. In the signature "pictogram" which enables guidance without using words is often used. However, when looking into a building, a signature using the pictogram is given its own design to match with the indoor space, and signs which are difficult for the user to understand are distributed. It can be thought that these pictograms are being redesigned to adapt to architecture. Therefore, this study aimed for a sign plan which is easy for users to understand, and the necessity in having one standard pictograms harmonizing with various buildings. Visibility is important for pictograms, and in this research, the objective is to study the conditions of pictograms that are compatible in visibility and harmony. For reference to the research conducted for each generation, an experiment using the pictogram of the Japanese Industrial Standard toilet mark, which had high recognition of all generations was conducted. The pictograms were divided based on gender that is pictograms for men and for women. The existing designs filled with colour and new designs with only contour lines are more harmonious using textures of concrete, brick, white wall, wood pictograms were synthesized. The researchers analysed and compared with all of these textures with the pictograms. As a result, the design of the outline of the pictogram for men and the pictogram for women is more harmonious in all scenes. The findings displayed that both male pictograms and female pictograms showed significant differences in the two scenes, and a significant trend was observed in the remaining two scenes. Experiments on the width of the contour line using 4 scenes images were conducted. The same experiment was conducted as comparison on the pictograms of the line widths with the greatest thickness. As a result, there was not much difference in the width of the width of the contour line of the pictogram in all scenes of male pictograms and female pictograms. The study also will highlight the effect on visibility and harmony by shape and color as future prospect.

**Keywords** - pictograms, compatibility, harmony

## 1 INTRODUCTION

### 1.1 Background and Purpose of Research

In recent years sign has been positively designed in Japan. For example, the 2020 Tokyo Olympic Games, Paralympic Games, signages were designed to make it easier for foreigners and tourists as well as Japanese to find objects, concepts, location. One of them was changing 7 kinds of pictograms so as to match the pictogram of the Japanese Industrial Standard (hereinafter referred to as JIS) and the pictogram of the International Organization for Standardization (hereinafter referred to as ISO), and 15 new pictograms and help marks were added. From this change, it could be seen that pictogram, which is a figure that provides information on objects, concepts or states regardless of letters and languages (Traffic Ecology · Mobility Foundation, 2017). Signage plays an important role in communication. Although the number of foreign tourists visiting Japan has declined after the Great East Japan Earthquake due to the visit Japan project, which is a visit to Japan promotion business (Japan Tourism Agency), it aims to increase the number of foreign tourists visiting Japan. Since foreign tourists visiting Japan are expected to increase in the future, the necessity of graphic symbols for guidance using pictograms will also increase. In Japan, there is a standard symbol to follow such as JIS Z 8210 "Public Information Symbols" for the pictograms guide. Public Information Symbols is "Everyone can understand even without professional or occupational training

[JIS Z 8210]" and is "a figure symbolused for guiding for unspecified large number of people [JIS Z 8210] ". However, since JIS is an arbitrary standard, various other redesigned pictograms are often used. For example, you may see only contour line pictograms, angular designs, designs like illustration etc. From these facts, the pictogram of the signature has been redesigned to harmonize with the architecture. Although it is easier for users to unify figure symbols, it is possible to recognise quickly if the pictogram in any place is the same because everyone can understand common signs if signs were unified even if race and age are different. Therefore, I thought that a harmonized and unified pictogram is necessary in modern times where globalization advances. In this paper, the aim of the study was the design of pictogram is in harmony with various architectures. So many people can understand easily the Public Information Symbols.

## 2 COMPARATIVE EXPERIMENT OF PICTOGRAM

### 2.1 Outline of Experiment

Comparative experiments for 10 male students and 10 female students with the indoor space was conducted from December 28, 2017 to January 10, 2018. The researchers used the filled with color pictograms and only contour line pictograms(FIG. 1) and asked which pictograms are in harmony. In this research, I used the pictogram of JIS which was widely used in Japan, and I let test subject answer "which is more assimilated to the background texture filled with color pictograms or only contour line pictograms".

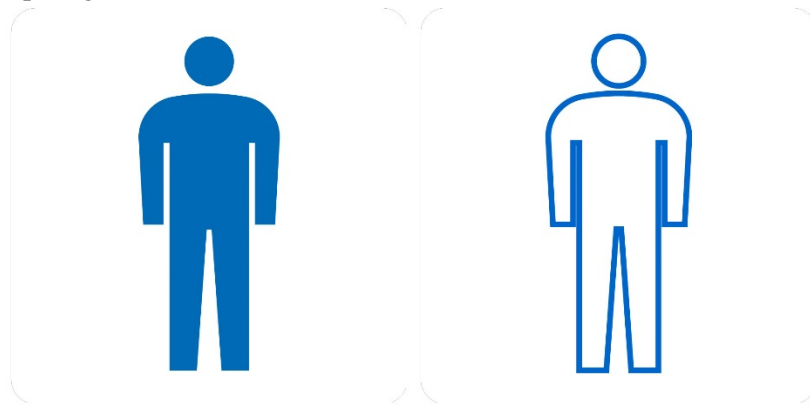


Figure 1 Filled with color pictogram (left) only contour line pictogram (right)

### 2.2 Comparative Experiment Method

Indoor space Computer Graphics, which only the wall texture was different and the other elements are all the same, was created. I synthesized two kinds of pictograms for men's design and women's design which filled with color pictograms and only contour line pictograms for Computer Graphics of four scenes "concrete", "brick", "white wall" and "wood" (Fig. 2). We arranged these images on one display and experimented with the two pictograms harmonized with the texture of the wall of the indoor space.

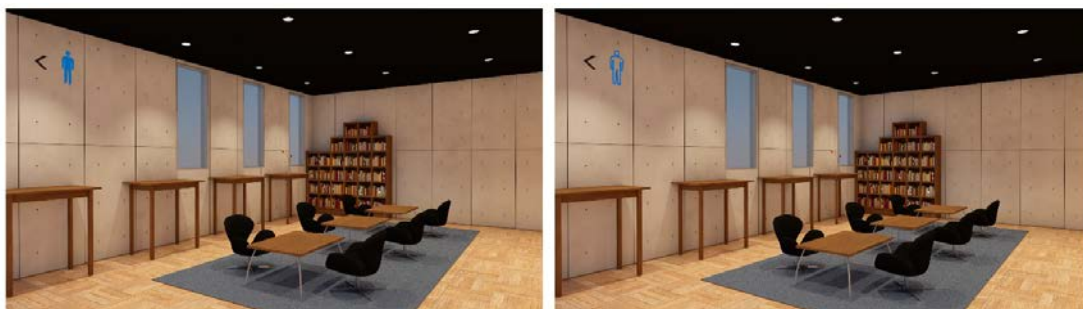


Figure 2 A comparative image (Filled with color pictogram and only contour line pictogram)

### 2.3 Comparative Experimental Results

The experimental results are shown in Table 1 and Table 2. The numbers in the table are the number of people who answered that they are more harmonious compared the two pictograms. There were more responses. The only contour line pictograms are more harmonious than filled with colour pictograms except for the female pictogram on which wall texture is "brick".

Table 1 Experimental result of male pictogram

Male	concrete	brick	white wall	wood
Filled with color(people)	5	6	8	3
Only contour lines(people)	15	14	12	17

Table 2 Experimental result of male pictogram

Female	concrete	brick	white wall	wood
Filled with color(people)	3	11	6	5
Only contour lines(people)	17	9	14	15

### 2.4 Analysis of Experimental Results

The researchers conducted Chi-squared test with the statistically significant result obtained in the experiment or with a significance level of 5%. As a result, there was a significant difference in "concrete" and "wood" in the pictogram for men, and a significant tendency was seen in "bricks". Then, in order to correspond to all scenes, I conducted chi-square test on data of experiments of pictograms for all men, and a significant difference was observed. In female pictograms, there was a significant difference in "concrete" and "wood", and a significant difference was seen in "white wall". Significant differences were also seen in all pictograms for women when all the scenes were integrated. From these results it can be said that the only contour line pictograms are more harmonically than the pictograms filled with color. Therefore, as a next step, we conducted experiments on the width of the optimal contour line for only contour line pictograms.

## 3 EXPERIMENT ON LINE WIDTH OF ONLY CONTOUR LINE PICTOGRAMS

### 3.1 Outline of Experiment

In order to investigate the influence on visibility and harmony by changing the width of the line width of the only contour line pictogram, experiments using the magnitude estimation method (hereinafter referred to as ME method) were conducted. The researchers made test subjects answer about how easy it is to recognize compared to the standard image and how harmonized it is when compared to the standard image.

### 3.2 Experiment Method

5 kinds contour lines male pictgrams and female pictograms, whose line width are all different, were used. The researchers synthesis them into 4 scene images of "concrete", "brick", "white wall", "wood (Fig. 3). These images are all the same without pictograms. In this experiment I covered 20 people in total, 10 men and 10 women. The participants were shown each image randomly every 5 seconds and white image between each image was inserted to avoid the influence of the previous image. The researchers had tested subjects see an image of the standard stimulus, and asked how much visibility and harmony when compared to the standard image.



Figure 3 An example of a scene image

### 3.3 Experimental Results

Function of  $R=kSn$  (R: psychological quantity, S: physical quantity, k: constant, n: exponential exponent) was found for the physical quantity and the psychological quantity using the ME method. The results of the function in each scene regarding line width and visibility, line width and harmony of male and female pictograms were obtained. In this experiment, the line width is a physical quantity, and visibility and harmony are psychological quantities. Experimental results on visibility and harmony are shown in Tables 3 and 4.

Table 3 Experimental results on visibility of pictogram

	Male pictogram	Female pictogram
Concrete	$R=159.7350S^{0.7312}$	$R=160.8052S^{0.735}$
Brick	$R=166.1116S^{0.9063}$	$R=163.0797S^{0.6706}$
White Wall	$R=164.3993S^{0.7365}$	$R=164.7404S^{0.7201}$
Wood	$R=172.3058S^{0.8551}$	$R=157.7611S^{0.8742}$

Table 4 Experimental results on harmony of pictogram

	Male pictogram	Female pictogram
Concrete	$R=55.0174S-0.6966$	$R=64.5952S-0.5893$
Brick	$R=64.1800S-0.6259$	$R=64.4614S-0.5717$
White Wall	$R=60.7016S-0.6238$	$R=62.7191S-0.6752$
Wood	$R=60.9256S-0.6517$	$R=64.4614S-0.5717$

### 3.4 Analysis of Results

The purpose of this research was to clarify the design which visibility and harmony are compatible. Therefore, cases which only visibility or harmony of the values strongly works were excluded. Specifically, the difference between visibility and harmony on the function was found, and numerical values smaller than the average numerical value were adopted. The numerical value that takes the maximum numerical value in the function of the sum of visibility and harmony within the range below the average numerical value is the numerical value of this research. The results are shown in Table 5.

Table 5 Result of line width of pictogram with integrated scene

Line Width	Male pictogram(mm)	Female pictogram(mm)	Male pictogram(%)	Female pictogram(%)
Concrete	0.75	0.8	2.14	2.29
Brick	0.8	0.75	2.29	2.14
White Wall	0.8	0.8	2.29	2.29
Wood	0.8	0.85	2.29	2.43

In order to obtain the general-purpose numerical value of the line width, a percentage with respect to the length of the reference frame line of the pictogram (Fig. 4) was calculated. As a result, the pictogram for men has a line width of 2.14% in "concrete", the line width of 2.29% in the other three scenes with respect to the length of the reference frame line of the pictogram. In the pictogram for women, the line width of 2.29% in "concrete", "white wall", the line width of 2.14% in "brick", the line width of 2.43% in "wood". Figure 4 shows the pictogram of line width that is easier to see and match with architecture obtained in this research.

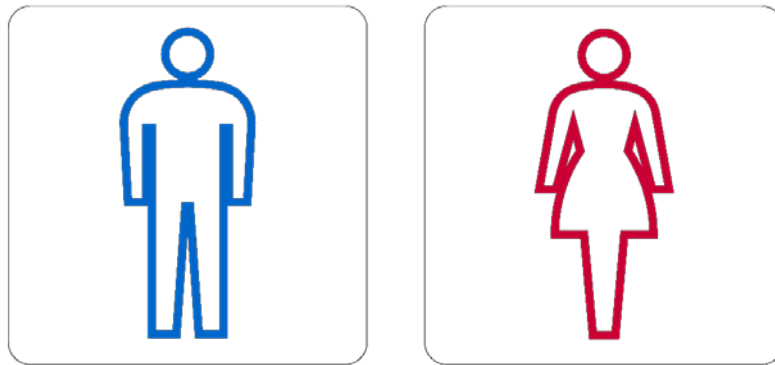


Figure 4 Pictogram with line width of 2.29% obtained from research

#### 4 CONCLUSION

In conclusion, the pictograms were compared and analyzed filled with colour. The only contour lines pictograms we found in this study are more harmonic with the texture of the architecture than the pictograms filled with colour. Pictograms that were compatible with visibility and harmony was 2.29% of the line width compared to the reference frame of the pictogram in Figure 4. Furthermore, analysis of the experimental results suggest that there is little possibility that colours and shapes have influence on visibility and harmony because the results show little difference in the results between male pictograms and female pictograms. Likewise, because the results for each scene were similar in this experiment, the possibility that the visibility and harmony may not be influenced by the architectural texture may be considered.

#### 5 FUTURE PERSPECTIVE

The researchers used four scenes in this experiment, but it did not correspond to the texture of various other architectures. Therefore, it is necessary to conduct experiments with various textures and standardize pictograms. In addition, the researchers used the toilet mark which is the male pictogram or the female pictogram in this experiment, they are relatively similar. Thus, it is necessary to confirm to what extent, shape and colour of the pictogram influences visibility and harmony strongly, conducting experiments with a pictogram showing an airport representing an airport, a pictogram showing a railroad representing a train station, a pictogram "P" representing a parking lot and a pictogram "i" representing an information corner which is completely different from a pictogram of a human type. Finally, there are color hue, saturation, and brightness as elements that improve the compatibility of visibility and harmony more. I think that by changing these color elements, we can obtain a pictogram suitable for further research purpose. According to the research of [Kishimoto et al. (2013)], since it is indicated that saturation has the most influence on attractiveness among hue, lightness, and saturation, I would like to clarify in future research for saturation.

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