

platform to work the edge may be not more than 460 millimetres from such face.

Regulation 82. Other suspended scaffolds.

- (c) the platform is-
- (i) not less than 430 millimetres wide;
 - (ii) suspended by ropes or chains which are spaced not more than 3.2 metres apart, are maintained in tension and are properly and securely fastened; and
 - (iii) suspended so as to prevent tipping or tilting of the platform;
- (e) there are devices provided and used where necessary to keep the platform at a sufficient distance from the wall when persons have to work in a sitting position :
- Provided that sub-paragraph (ii) of paragraph (c) of this regulation shall not apply in the case of a scaffold which is securely suspended from fixed anchorages and has a platform more than 635 millimetres wide supported on metal bearers properly and securely connected to raising and lowering tackle (being wire rope or chain tackle which is capable to sustain the load).

Regulation 84. Trestle scaffold.

- (1) No trestle scaffold shall be used-
- (a) if constructed with more than three tiers; or
 - (b) if it has working platform more than 4.5 metres above the ground or floor or other surfaces upon which the scaffold erected.

Regulation 86. Working platforms.

Every working platform from which a person is liable to fall more than 3 metres shall be -

- (a) either closely boarded, planked and plated, or a platform consisting of open metal work having interstices none of which exceeds 3,870 square millimetres in area;
- (b) at least 635 millimetres wide if the platform is used as a footing only and not for the deposit of any materials;
- (c) at least 860 millimetres wide if the platform is used for the deposit of material; and
- (d) at least 1.1 metres wide if the platform is used for the support of any higher platform.

Regulation 87. Boards and planks in working platforms.

- (1) Every board or plank forming part of a working platform or used as a toe-board shall be-
- (a) of a thickness capable of affording adequate security having regard to the distance between the putlogs or standards; and
 - (b) not less than 200 millimetres wide or in the case of boards or planks exceeding 50 millimetres in thickness, not less than 150 millimetres wide.
- (2) No board or plank which forms part of a working platform shall project beyond its end support to a distance exceeding four times the thickness of the board or plank unless it is effectively secured to prevent tipping, or to a distance which, having regard to the thickness and strength of the plank, renders the projecting part of the plank and unsafe support for any weight liable to be upon it.

	<p>(5) Where work has to be done at the end of a wall, the working platform at such wall shall, wherever practicable, extend at least 610 millimetres beyond the end of the wall.</p> <p><u>Regulation 89. Working platforms at building face.</u></p> <p>Where work at the face of a building is done from a working platform, the space between the face of the building and the working platform shall be as small as practicable and where employees sit at the edge of the platform to work, the space shall not exceed 460 millimetres.</p>
<p><u>Bracing system</u></p>	<p><u>Regulation 80. Scaffolds supported by buildings.</u></p> <p>No part of a building shall be used as support for part of a scaffold unless it is sound material and sufficiently stable and of sufficient strength to afford safe support. Over-hanging eaves gutters shall not be used as such support unless they have been specially designed as walkways and are of adequate strength.</p> <p><u>Regulation 97. Bracing.</u></p> <p>Posts shall be kept plumb during erection and the scaffold shall be subsequently kept plumb and rigid by means of adequate bracing.</p>
<p>Checklist</p>	<p>Not available</p>

Philippines

Categories	Details
<u>Protection from falling</u> <u>Guard rail and Toe board</u>	<p>1414.06: Platform, Runways, Ramps and Stairs:</p> <p>(1) All working platforms, runways and ramps from which workers are liable to fall a distance of more than 2 m. (6 ft.) shall be:</p> <p>(b) provided with strong guard rails up to a height of 91 cm. (35 in.) above the working surface and toeboards of at least 20 cm. (8 in.) in height.</p>
<u>Bracing system</u>	<p>1414.03: Strength and Stability of Scaffolds:</p> <p>Every scaffold shall:</p> <p>(b) have all standards diagonally and horizontally braced to prevent lateral movement</p>
<u>Floor board and Platform</u>	<p>1414.04: Construction of Timber Scaffolds</p> <p>The distance between two consecutive putlogs shall be designed with due regard to anticipated load and the nature of the platform flooring. As a minimum rule, the spacing shall be as follows: for 3.2 cm. thick planks, spacing shall not exceed 1 m. for 3.8 cm. thick planks spacing shall not exceed 1.5 m.</p> <p>1414.06: Platform, Runways, Ramps and Stairs:</p> <p>(1) All working platforms, runways and ramps from which workers are liable to fall a distance of more than 2 m. (6 ft.) shall be:</p> <p>(a) for platform with minimum width of 70 cm. (28 in.) the runways and ramp shall be 45 cm. (18 in.) and if runways are used for the passage of materials, the width shall not be less than 70 cm. (28 in.).</p> <p>(2) The following shall be the minimum width of platform for various types of scaffolds:</p> <p>(a) When the platform is not more than 2 m. (6 ft.) above the ground floor:</p> <p>i. for painters, decorators and similar types of workers, 30 cm. (12 in.);</p> <p>ii. for all other types of workers and tools, 50 cm. (20 in.)</p> <p>(b) When the platform is more than two 2 m. (6 ft.) above the ground or floor:</p> <p>i. for men, tools and materials, 1 m. (3 ft.)</p> <p>ii. for men, tools, materials and vehicles, 1.5 m. (5 ft.)</p> <p>(5) The uniformly distributed minimum design load of platform, runway, ramp or stair shall be 650 kg./sq.m. (133 lbs./sq. ft.). The stress due to concentrated loads at any point in the floor shall not exceed those caused by the uniformly distributed load used in the design. Planking used shall not be less than 3 cm. (2 in.) thick.</p>
<u>Safety Belt</u>	<p>1414.05: Types of Scaffolds:</p> <p>(8) Bamboo Scaffold:</p> <p>(d) when the height or fall is over 6.6 m. (20 ft.), the use of safety belt shall be required;</p>

<p><u>Protection for collapse and falling of equipments</u></p>	<p>1414.06: Platform, Runways, Ramps and Stairs:</p> <p>(8) Slope of runway or ramp shall not exceed 2 in 3.</p> <p>(9) When the slope of runway or ramp requires additional foothold using stepping laths, they shall:</p> <ul style="list-style-type: none"> i. have a minimum section 5 x 8 cm. (2 in. x 3 in.) placed at maximum intervals of 46 cm. (18 in.) on centers; ii, extend to the full width of the runway or ramp except that they may be interrupted over a width of not more than 10 cm. (4 in.) to facilitate the passage of barrows.
<p>Checklist</p>	<p style="text-align: center;">Not available</p>

Appendix E: Pictures on Construction sites in Thailand

Construction sites in Thailand

The following presents the pictures from investigation of various construction sites in Thailand including of Bridge, House, Low rise building, Medium size of building and High rise building.

- **Construction of Highway Bridge**
(Prestressed Concrete Segmental Box girder)

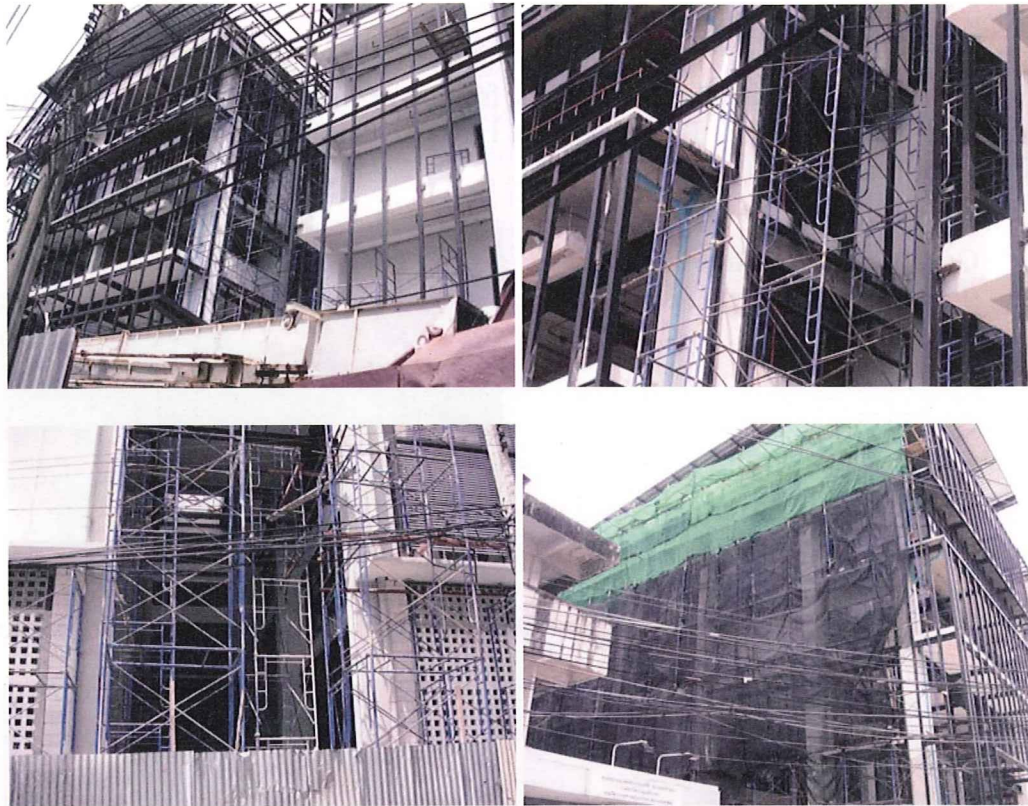


Overview with Scaffold and Shoring systems



From the pictures, it can be seen that there is no any safety provided for workers. They are working with their own risk. Some wears Safety helmet, but for prevention of fall accidents, nothing at all.

- **Low rise building** (Concrete beam column structure with claddings, About 5 stories and Height not more than 21 m)



For this building, the typical steel scaffolds in Thailand are used. The front side scaffolds are very close to the power lines. The plastic meshes are attached on only some sides of building and the guard rails are installed only in some floors of building. Moreover, there is no floor board to be seen.

- **Medium size building** (Concrete beam column structure with Brick and Masonry walls, About 8 stories)

The plastic meshes can be seen from upper stories of building. The scaffolds are installed in front of building but no bracing or tie with the building. The guard rail also is not to be seen from pictures.





- **High rise building** (Concrete beam column structure with precast concrete wall, About 20 stories)





The plastic meshes are provided in some floors to prevent fall accidents, especially in upper floors about top floor of building together with guard rails and bracings. However, in some floors that workers are still working, no safety protection can be observed. Moreover, worker who hanged himself sitting on panel board seems very unsafe.

- **Low size building (Precast bearing wall structure, About 5 stories)**

There is no plastic sheet or mesh. This may be due to structure of building as it is bearing wall type so it seems there is no large opening around building. Also, the scaffolds cannot be seen, in which there are special structures to be bolted with concrete wall for placing panel board to work outside and the guard rails are provided with such attached structures. However, worker who is sitting on top of wall panel at rear side of building seems unsafe.

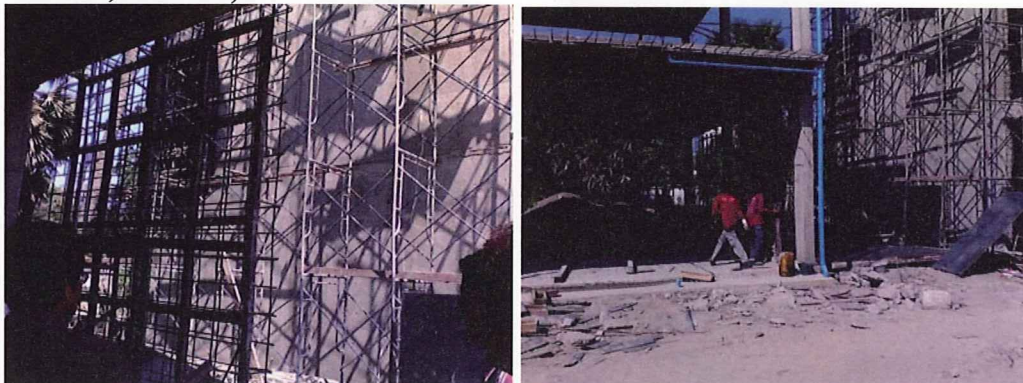


- **Housing** (Precast bearing wall structure, 2 stories)



The bamboo scaffolds are used in this case for painting work. However, the guard rail and floor board cannot be seen from pictures.

- **Apartment building** (Concrete beam column structure with Brick and Masonry walls, 3 stories)

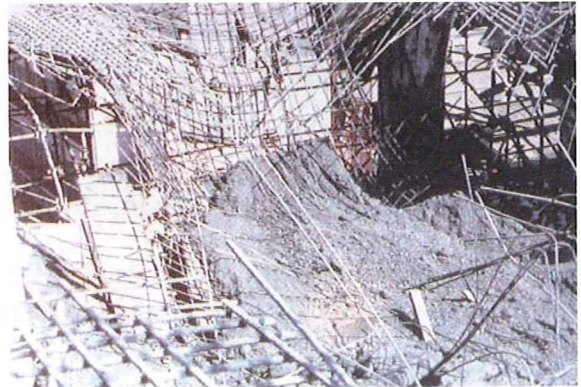


The typical steel scaffolds are used for masonry and painting works. The scaffolds are not braced or tied with the building structure. Also, the guard rail and floor board cannot be observed.

- **Collapse of scaffolds (Metal scaffolds and Bamboo scaffolds)**

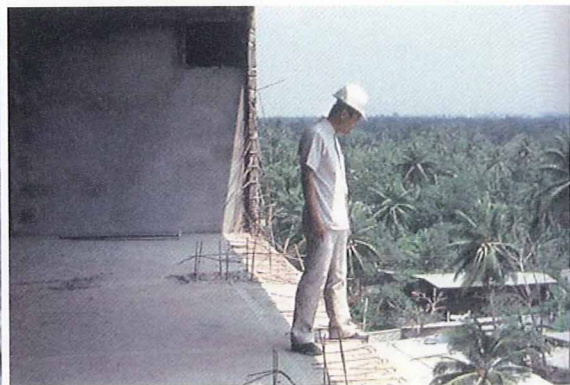


Collapse of scaffolds can be found on both metal scaffolds and bamboo scaffolds in Thailand as shown in the following figures.



- **Lack of accident protection**

The following figures show the construction sites those do not concern safety. The protections to fall accidents are not provided or not in good condition. Workers on the overhang scaffolds are not equipped with fall protections. These present the situation with very risky and dangerous cases.





- **Good protection** (Example of Construction sites with very good protections and preventions to fall accident)



Some construction sites as shown in the following figures provide with very good protections and preventions to accident including guard rails, Toe board and Floor boards, even more than those required in Japan. The meshes are also provided all around the building similar to Japan.





Appendix F: Pictures on Construction sites in Japan

Construction sites in Japan

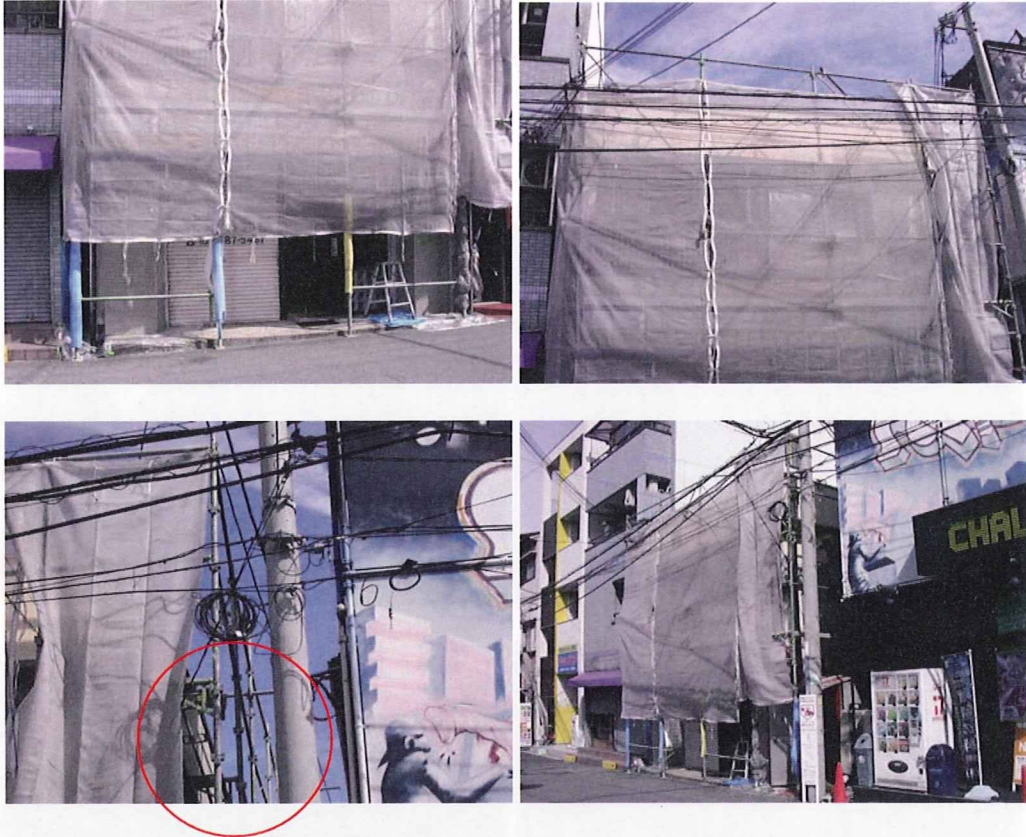
The following pictures show the construction sites with fall protections in Japan, Osaka and Tokyo, for low rise building, apartment and railway station.

- **Low rise building**



The steel scaffolds are used. The plastic sheet and guard rails to prevent fall accidents can be seen from pictures. Truss frame structure is used to support scaffolds at scaffolds opening. Also the diagonal members can be observed.

- **Low rise building (about 3 stories)**



The plastic sheet is installed only on front of building. The floor boards and guard rails are provided for workers to work on scaffolds.

- **Medium size of building (about 10 stories)**



The plastic sheet can be seen on one side of building. The guard rails, floor board can be seen on every floor of scaffolds. Workers seem to work easily and walk freely on scaffolds.

- **Low size building (About 6 stories)**

Workers are installing side board panel from ground to top of scaffolds. For the parts the boards have not yet been installed, the guard rail cannot be observed. The scaffolds are tied with building structure.



- **Medium size of building (about 12 stories)**



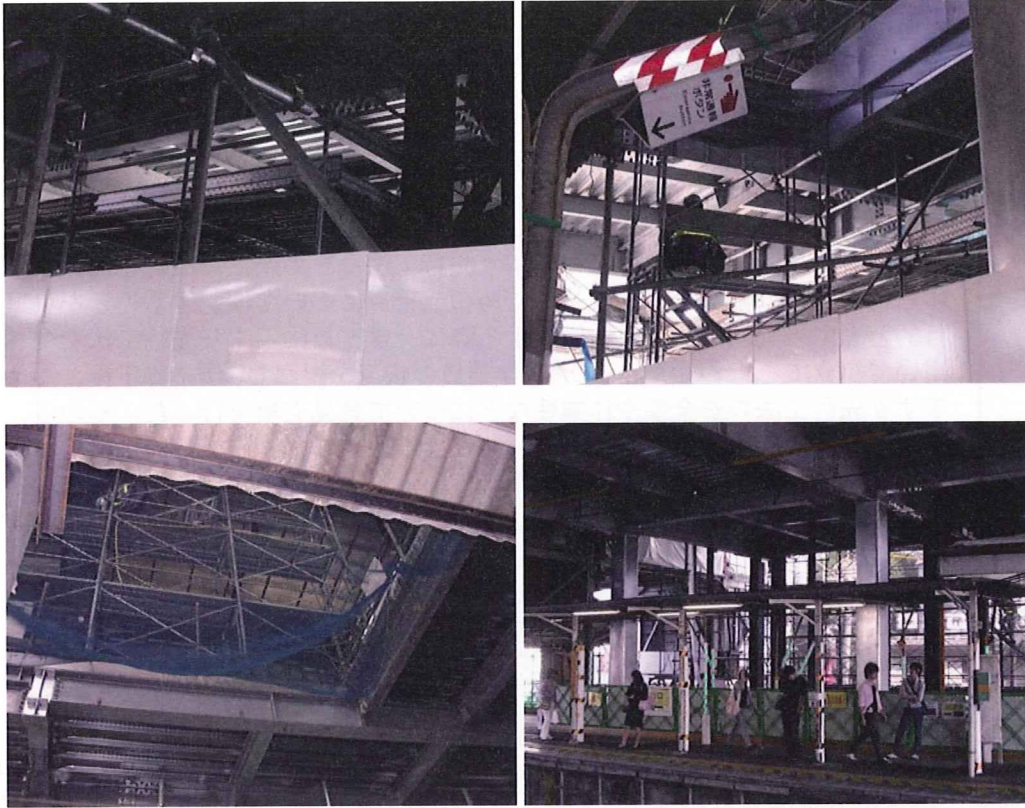
The guard rails can be seen all along opening of buildings even though the scaffolds are not used. The plastic meshes are also installed along all openings of building.

- **Medium size of building**



The plastic meshes are provided in all floors with the plastic sheets for some locations to prevent fall accidents. The guard rails also can be seen all along opening of buildings even though the scaffolds are not used.

- **Railway station**



The pictures show construction inside railway station where people and pedestrians are always passing by. It can be seen that the plastic meshes are provided in all openings those having construction, also with guard rails and side panel board to prevent fall accident.

厚生労働科学研究費補助金（労働安全衛生総合研究事業）
分担研究報告書

2. 手すり先行工法などガイドライン等に示されている工法の評価

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研究要旨 建設作業所において手すり先行工法などの新たな機材を導入するにあたり、幅広く普及させるための改善点について検討することを目的として、実験用の足場を設置する際に、作業員に手すり先行工法を用いて組立てを行わせた。その際、作業員の状況を観察し、作業終了後、手すり先行工法の安全性や作業性などについて意見交換を行った。その結果、実際に使用することにより、昨年度と比較して、作業性については抵抗を感じる作業員の割合が低下していた。よって、昨年度得られた結果である、「作業性等を考慮して、まずは作業者に使っていただくことを考えた改良が、手すり先行工法など新しい機材の普及に有益である」ということが裏付けられた。しかし、新しい機材の普及に関して重要である、使用したいかどうかについては、否定的な意見が多く、これに関しては改良すべき点であると考えられる。

A. 研究目的

建設業では墜落災害による死亡者数が最も多いため、その対策として、足場先行工法（軒の高さ10m未満の住宅等の建方前に足場を先行して設置する工法）や手すり先行工法（足場の組立・解体時に常に先行して手すりを設置する工法、構造物の高さに関係なく全ての建設工事に適用されている）のガイドライン制定（それぞれ平成18年、平成21年に改正）など順次強化され、死亡災害が減少するなど一定の効果が表れている。

前者における普及率は90%以上と非常に高く、墜落災害の防止に大きく寄与している。しかし、後者においては、安全性の向上は見られるものの、必ずしも広く普及していないのが現状である。

このような状況から、本研究では、建設作業所において手すり先行工法などの新たな機材を導入するにあたり、幅広く普及させるための改善点について検討することを目的とした。具体的には、普及の点で問題が残る手すり先行工法について、作業員に対する意見聴取や、実際に同工法を用いた足場の組立て作業の観察等により評価を行

った。

その結果より、手すり先行工法を使用した場合に起こりうる問題点を抽出し、墜落防止のための新たな機材を開発する上での必要な改善点について検討した。

B. 研究方法

昨年度は、代表的な種類の手すり先行工法に関して、建設作業従事者18名に各種先行手すり機材の取り付け取り外しを体験していただいた（実際の足場の組立ては行わない）後、アンケート型式による意見聴取を行うことによりこの工法の問題点の検討を行った。

今年度は、当研究所内で実験用の足場を設置する機会を利用し、作業員に一部手すり先行工法を用いて組立てを行わせ、その際に作業員の状況（安全性、作業性）を観察するとともに、作業終了後、作業員の同意が得られたため、アンケート型式による意見聴取を行った。手すり先行工法により組立てた、実験用足場を写真1に示す。

なお、当該足場の組立ての際には、手すり先行工法の種類の一つである手すり据置き方式を行わせた。しかし、平成21年に改

正された「手すり先行工法等に関するガイドライン」に規定されている、「働きやすい安心感のある足場」に関する部材については、足場設置の本来の目的である実験時の作業性等を考慮して設置しなかった。

組立てを行った作業員は4名で、年齢構成と足場作業の経験年数は以下のとおりである。また、4名の作業員は全員、手すり先行工法について使用した経験が少ないとのことであった。

- ①年齢 30代、経験年数 7年
- ②年齢 30代、経験年数 15年
- ③年齢 50代、経験年数 25年
- ④年齢 60代、経験年数 42年

アンケートの内容は、先行手すり機材の使用感、安全になるかどうか、使用したいかどうかの三点に絞って質問した。

以上の方法による、手すり先行工法使用時の作業員の状況の観察、アンケート型式による意見聴取の結果より、昨年度のアンケート結果を踏まえ、墜落防止のための新たな機材を開発する上での必要な改善点について検討した。

C. 研究結果

図1および図2は、手すり先行工法の作業性に関し、「取付け時間がかかるか否か」、「取り付け方が複雑であるか否か」、「重たいか否か」の3項目についての質問に対する、それぞれ昨年度と今年度のアンケート結果を示す。昨年度の結果については、今年度と同じ手すり据置き方式に対するものである。

両図を比較すると、昨年度に比べ明らかに今年度の方が、3項目とも「NO」と回答した作業員の割合が高くなっている。すなわち、実際に手すり先行工法による組立てを行わせた結果、作業性に関し抵抗を感じる作業員の割合が低下したものと考えられる。

次に、図3および図4は、手すり先行工法を使用した場合において、「安全になるか否か」についての質問に対する、それぞれ昨年度と今年度のアンケート結果を示す。

図5および図6は、手すり先行工法を、「使用したいか否か」についての質問に対する、



写真1 一部手すり先行工法により組立てた足場

それぞれ昨年度と今年度のアンケート結果を示す。

「安全になるか否か」、「使用したいか否か」については、昨年度も今年度も大部分の作業員が手すり先行工法により安全になると考えているが、手すり先行工法を使用したいと回答した作業員は約半数であった。今年度は意見聴取した作業員が少ないが、実際に手すり先行工法による組立てを行わせた場合、これらの傾向に大きな変化はなかった。

その他、手すり先行工法に対して以下のような意見が得られた。

(改良につながる意見)

- ・妻面にも最初から手すりがあればよいと思った。
- ・手すりわくを折りたためるようすればよいと思う。(運搬面で)
- ・手すりわくを伸縮できるようにすればよいと思う。(運搬面で)

(否定的な意見)

- ・コストの問題がある。
- ・取り付けに時間がかかる。

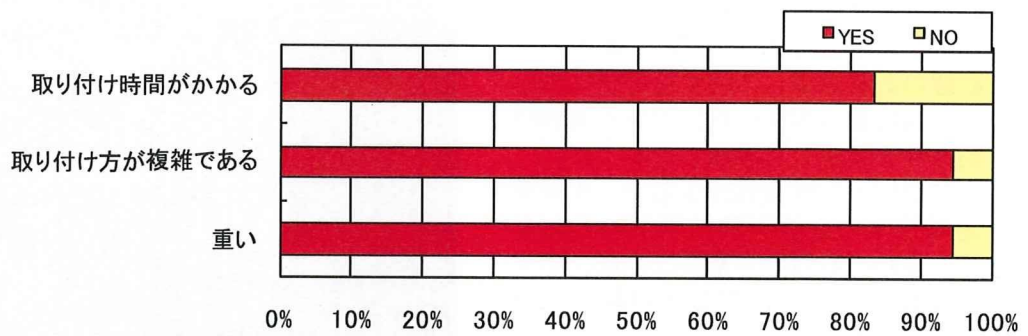


図1 手すり先行工法の作業性に対するアンケート結果（昨年度）

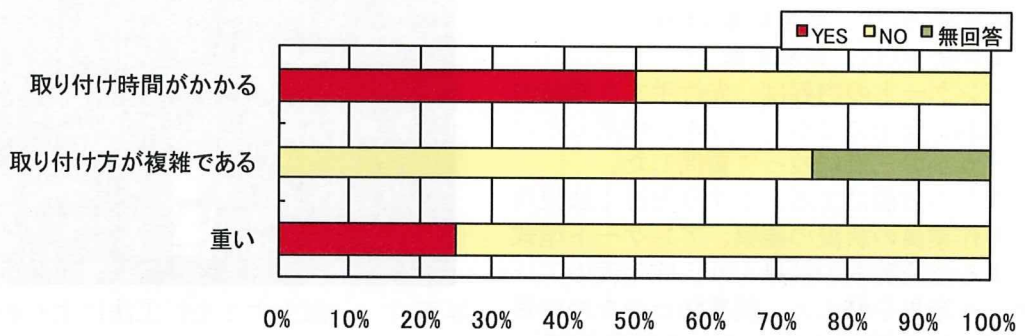


図2 手すり先行工法の作業性に対するアンケート結果（今年度）

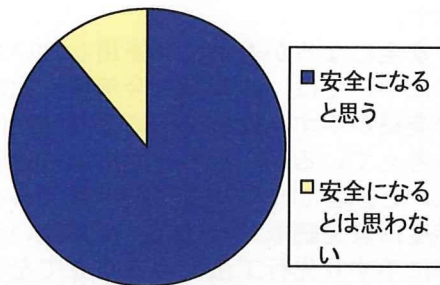


図3 手すり先行工法により安全になると思うかどうかのアンケート結果（昨年度）

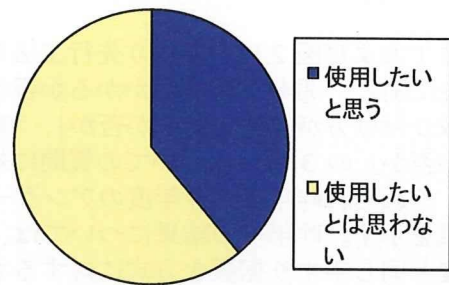


図5 手すり先行工法を使用したいと思うかどうかのアンケート結果（昨年度）

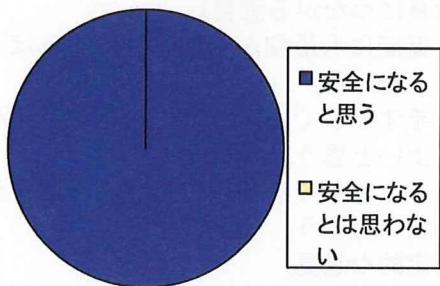


図4 手すり先行工法により安全になると思うかどうかのアンケート結果（今年度）

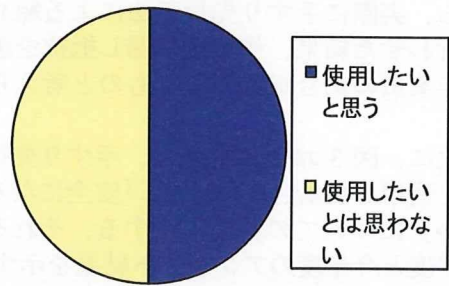


図6 手すり先行工法を使用したいと思うかどうかのアンケート結果（今年度）