**Assesment for Plumbing Competency Instrument**

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**Abstrac.** This study aims to determine competency element of plumbing instruments for water supply system. This assesment was conducted from January to February 2020. The assesment of this instrument involved 3 elements of competency, such as: skill, knowledge of installation and plumbing system, and plumbing worker attitude. The results of this study would be the basic improvement and development of plumbing instruments for water supply system for the next future.

**Keyword :** Instrument, Competence, Plumbing

1. **Introduction**

To do building installation and maintenance work in Indonesia, good competency of construction workers is required[1]**,** Based on Law Number 18 of 1999 concerning Construction Services and their implementing regulations state that workers who carry out planning, implementation and supervision of construction must have certificates of expertise and / or skills. Must have a "Certificate of Expertise and / or Skills": reflects the demands of the quality of a competent workforce. These conditions require concrete steps in preparing the tools (standard standards) needed to measure the quality of construction service work. (in the SKKNI Construction Category).

In the current certification period is becoming something so important, some functions of certification are as supporting elements of infrastructure development[2], and certification is also an effort to protect the law[3]. Therefore certification must be one of the priorities in improving the quality of the workforce. Assessment and measurement of competence are needed by measuring instruments with valid, objective, and consistent quality[4]. The competency measurement tools of the plumber must be of good quality so that certified workers can be responsible for their abilities[5]. The very small number of plumbers compared to the needs of the community is a strong indicator in assessing how well the assessment process and instruments are used to measure plumber competence in Indonesia.

The right strategy to improve the performance (competency) of construction workers is through improving the competency and quality of workers 'resources through training and certification of workers' expertise[6]. One factor that can improve performance on construction projects is the competence of workers on construction projects[7]. Wages, work skills and work experience have a significant effect on the performance of the implementation of formwork (construction) work[8].

Based on the problems that have been described, there is a need for standardization in the certification process of construction workers skills. Therefore, instruments are needed to measure, assess, and determine employee competencies, competency assessment includes three aspects, namely cognitive aspects, psychomotor aspects, and affective aspects.[9], that there needs to be a balance between competency assessment of attitudes, knowledge, and skills that is adjusted to the development of the characteristics of students in accordance with their level[10].

1. **Topic 1**
2. *Method*

This research method is based on descriptive design. Use 4 expert assessments with national qualification frameworks as a guide. Data collection was carried out by questionnaire assessment and expert assessment in the field of instruments (2 experts) and plumbing (2 experts) using the semantic scale differential. After collecting the data, a validation test using the V-Aiken formula is carried out on the plumber competency instrument. The analysis in this study was broken down into 2 components, namely: content validity and instrument construction.

* 1. *Result*

The results of the study are divided into 2 (two) main parts, namely: content validation and the construction of plumber competency instruments. In both parts, there are 3 (three) parts in the instrument, namely: a test of knowledge, a test of attitude and skills (performance). The V-Aiken range obtained is between 0 and 1.00 with categorizations <0.6 (low / bad), 0.6 - 0.8 (moderate / good) and> 0.8 (high / very good)[11].

* + 1. *Content Validity*

Based on the results of the assessment of experts obtained the results of the validity of the content as follows:

| No | Performance Test | Coeficient Validity | Knowledge Test | Coeficient Validity | Observation | Coeficient Validity |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Preparing pipeline schematic Drawing | 1 | Danger and risk of accident | 0,916 | Choosing the pipe as needed | 1 |
| 2 | Making Pipeline | 1 | Personal Protective Equipment (PPE) needed according to work | 1 | Prepare the pipe in accordance with the amount | 1 |
| 3 | Connecting with solvent liquid | 1 | Ways to store material | 0,75 | Select a pipe according to its size | 0,833 |
| 4 | Installing Screw Connection | 0,75 | How to maintain plumbing work equipment | 0,916 | Work according to the picture | 0,916 |
| 5 | Make a Compression Connection | 1 | How to install a clean water pipe installation | 0,916 | Marking of the pipeline is carried out in accordance with work instructions | 0,833 |
| 6 | Making the Solder Connection | 0,416 |  |  | Check the complete material needs of clean water pipes | 1 |
| 7 | Making a Copper Connection | 0,416 |  |  | Determine the number and type of tools needed | 0,833 |
| 8 | install the Socket Fusion Joint | 0,416 |  |  | Check the completeness of clean water pipe work equipment | 1 |
| 9 | Making Connections | 0,833 |  |  | Check the quality of the pipe connection | 1 |
| 10 | Install the Electrofusion Joint | 0,75 |  |  | Clean pipe joints from remaining pipe glue | 0,916 |
| 11 | Installing water pipes | 0,583 |  |  | Work Pipeline connection Clean from the remaining material | 1 |
| 12 | Installing a Clean Water Pipe Valve | 1 |  |  | Workers tidy up the remaining materials | 0,916 |
| 13 | Installing a Water Faucet | 1 |  |  | The remaining materials are stored in a storage warehouse | 0,916 |
| 14 | Installing the Pipe Support | 0,916 |  |  | Workers clean plumbing work equipment after use | 0,916 |
| 15 | Checking Pipe Joints | 0,916 |  |  | Work equipment is tidied up and stored in a storage area | 1 |
| 16 | Checking Plumbing Installation Work | 1 |  |  | Report the progress of the work | 0,916 |
| 17 | Oversees Plumbing Installation Work | 1 |  |  |  |  |
| 18 | Preparing Procurement in the Workplace | 1 |  |  |  |  |
| 19 | Preparing Work Progress Claims | 1 |  |  |  |  |

The results of content validity generally show high scores. Poorly classified items are Making the Solder Connection, Making a Copper Connection, installing the Socket Fusion Joint and Installing water pipes. If reviewed further, the contents of the instrument are sufficient to meet the accuracy in the actual plumbing work.

The experts who became validators revealed that the instrument developed still had to be improved in several sections, such as an increase in the assessment rubric and the addition of items for aspects of knowledge to conform to the established standards. by SKKNI.

* + 1. *Construct Validity*

Based on the expert judgment which was then analyzed by the V-Aiken formula the results of the instrument construction validity were as follows.

| No | Performance Test | Coeficient Validity | Knowledge Test | Coeficient Validity | | Observation | Coeficient Validity |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | Preparing pipeline schematic Drawing | 0,916 | Danger and risk of accident | 0,916 | Choosing the pipe as needed | | 0,75 |
| 2 | Making Pipeline | 0,75 | Personal Protective Equipment (PPE) needed according to work | 1 | Prepare the pipe in accordance with the amount | | 0,916 |
| 3 | Connecting with solvent liquid | 1 | Ways to store material | 0,833 | Select a pipe according to its size | | 0,833 |
| 4 | Installing Screw Connection | 0,75 | How to maintain plumbing work equipment | 0,75 | Work according to the picture | | 0,916 |
| 5 | Make a Compression Connection | 0.583 | How to install a clean water pipe installation | 0,583 | Marking of the pipeline is carried out in accordance with work instructions | | 0,583 |
| 6 | Making the Solder Connection | 0,416 |  |  | Check the complete material needs of clean water pipes | | 0,75 |
| 7 | Making a Copper Connection | 0,75 |  |  | Determine the number and type of tools needed | | 0,916 |
| 8 | install the Socket Fusion Joint | 0,75 |  |  | Check the completeness of clean water pipe work equipment | | 0,75 |
| 9 | Making Connections | 0,833 |  |  | Check the quality of the pipe connection | | 0,75 |
| 10 | Install the Electrofusion Joint | 0,833 |  |  | Clean pipe joints from remaining pipe glue | | 0,916 |
| 11 | Installing water pipes | 0,916 |  |  | Work Pipeline connection Clean from the remaining material | | 0,833 |
| 12 | Installing a Clean Water Pipe Valve | 0,75 |  |  | Workers tidy up the remaining materials | | 0,75 |
| 13 | Installing a Water Faucet | 1 |  |  | The remaining materials are stored in a storage warehouse | | 0,583 |
| 14 | Installing the Pipe Support | 0,916 |  |  | Workers clean plumbing work equipment after use | | 0,833 |
| 15 | Checking Pipe Joints | 0,916 |  |  | Work equipment is tidied up and stored in a storage area | | 0,75 |
| 16 | Checking Plumbing Installation Work | 0,916 |  |  | Report the progress of the work | | 0,833 |
| 17 | Oversees Plumbing Installation Work | 0,916 |  |  |  | |  |
| 18 | Preparing Procurement in the Workplace | 0,75 |  |  |  | |  |
| 19 | Preparing Work Progress Claims | 0,75 |  |  |  | |  |

Overall validation results for the construct of the instrument from experts have shown a high value, but in some items the experts consider that the items developed still have low validity. This means there is still a need for improvements to the instrument in order to get a better construct validity. this result is better than the previous instrument [12], The results of the contract validation show a fairly good result as a form of instrument that measures the competency of plumbing workers.

1. **Topic 2**

Indicators of achievement of plumbers are divided into several elements of competence. High results indicate that the instrument has items that can measure all expected competency indicators reaching a plumber, but some parts still need improvement because of the low validity. experts who judge instruments are practitioners in the plumbing field. So it is fair to say that the contents of the water channel instruments are stated to be quite relevant to the work in the field. In the field implementation, it is important to understand that all instruments must be made as well as possible and comprehensively to accommodate the competency needs that workers should have[12].

The ability of plumbers to implement their competencies in the form of sanitation work is the most important thing. Ability to prepare materials and tools, cut and connect, group and select pipes and implement piping systems for both clean water, waste and dirty water[13]. Therefore each instrument that measures knowledge, attitudes, and skills should be separated according to needs and made as effective as possible so that it does not require a long time in its application[14].

Based on the discussion above, a good competency instrument is an instrument that can measure the competency of workers in accordance with the national qualifications framework that is relevant to the needs of the labor market, and efforts to improve quality need to be carried out together with education and industry practitioners to match the type, construction, and content covers the realm of knowledge, attitudes, skills and teamwork. The instruments are arranged based on real needs and in accordance with the performance characteristics to be measured

1. **Conclusion**

Instruments that are assessed with low validity, must be improved. The competence of the instrument must not only see the final result but also can assess the criteria, content and each process carried out [15]. This plumbing competency instrument can be said to represent the framework of national qualifications. The strong relevance between education and training and industry needs is the most important thing at present. Therefore, a good instrument is needed to measure plumber competence with high relevance to the industry.

1. **References**

[1] M. E. Castellano, G. B. Richardson, K. Sundell, and J. R. Stone, “Preparing Students for College and Career in the United States: the Effects of Career-Themed Programs of Study on High School Performance,” *Vocat. Learn.*, 2017, doi: 10.1007/s12186-016-9162-7.

[2] H. P. Adi and S. U. Adillah, “Sertifikasi Tenaga Kerja Konstruksi sebagai Unsur Pendukung Pembangunan Infrastruktur,” *Semin. Nas. Fak. Tek. Unissula*, p. , 2012.

[3] R. Iskandar, “Sertifikasi Kompetensi Sebagai Upaya Perlindungan Hukum Bagi Lulusan Perguruan Tinggi Pariwisata Dalam Menyambut Mea,” *BARISTA J. Kaji. Bhs. dan Pariwisata*, vol. 2No2Dec15, p. 236, 2015.

[4] D. Leutner, J. Fleischer, J. Grünkorn, and E. Klieme, “Competence Assessment in Education,” *Res. Model. instruments. Hambg. Springer*, 2017.

[5] A. O. Afolabi, R. A. Ojelabi, I. Omuh, P. Tunji-Olayeni, and A. Afolabi, “Building designs and plumbing facilities: The implication for rising maintenance cost,” *Int. J. Mech. Eng. Technol.*, 2018.

[6] U. Utomo Tegar Adhi, Handayani Fajar S, Sugiyarto, “Strategi Peningkatan Kinerja Tenaga Kerja Proyek Konstruksi dalam Menghadapi Persaingan Masyarakat Ekonomi ASEAN,” *J. Adm. Publik*, vol. 1, no. 2, pp. 131–139, 2011, doi: 10.1002/14356007.a13.

[7] W. Y. Christina, L. Djakfar, and A. Thoyib, “Pengaruh Budaya Keselamatan Dan Kesehatan Kerja ( K3 ) Terhadap Kinerja Proyek Konstruksi,” *J. Rekayasa Sipil*, vol. 6, no. 1, pp. 83–95, 2012.

[8] S. P. B. V. Amin Zainullah, Agus Suharyanto, “Pengaruh upah, kemampuan dan pengalaman kerja terhadap kinerja pekerja pelaksanaan bekisting pada pekerjaan beton,” *J. Rekayasa Sipil*, vol. 6, no. 2, 2012.

[9] S. R. Sunarti, “Penilaian Dalam Kurikulum 2013,” *Yogyakarta CV Andi Offset*, 2014.

[10] P. A. Kunandar, “Penilaian Hasil Belajar Peserta Didik Berdasarkan Kurikulum 2013,” *Jakarta Raja Graf. Persada*, 2013.

[11] S. Azwar, “Reliabilitas dan validitas edisi 4,” *Yogyakarta: Pustaka Pelajar*, 2012.

[12] R. Arthur, F. A. Rouf, H. Rahmayanti, and A. Maulana, “Plumbing work competence instrument in the field of civil engineering,” in *Journal of Physics: Conference Series*, 2019, vol. 1402, no. 2, doi: 10.1088/1742-6596/1402/2/022019.

[13] A. Arfandi, “Relevansi kompetensi lulusan Diploma Tiga teknik sipil di dunia kerja,” *J. Pendidik. Vokasi*, 2013, doi: 10.21831/jpv.v3i3.1843.

[14] R. Arthur, “Evaluasi program diklat karya tulis ilmiah untuk widyaiswara Pusbangtendik Kemdikbud,” *J. Penelit. dan Eval. Pendidik.*, 2018, doi: 10.21831/pep.v22i1.16749.

[15] C. Ford, “Effective practice instructional strategies: Design of an instrument to assess teachers’ perception of implementation,” *Stud. Educ. Eval.*, vol. 56, pp. 154–163, 2018.