

To Propose a Checklist for Railway Temporary Station Criteria of Gemas-Johor Bharu Electrified Double Track Project

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Abstract: As for now, the construction of the temporary station for the Gemas-Johor Bharu Project was referred and complies with the general standard of Uniform Building By-Law and architecture design, there is no specific standard requirement for the railway temporary station. Without the specific standard requirement and criteria for railway temporary station, the acceptance process might take a longer time due to sudden issues raised during the inspection and migration acceptance process. The main purpose of this study was to identify and design a checklist for railway temporary station, and to develop a general railway temporary station layout. The study adopted the Content Validity Index (CVI) research design which was premised on the content validation of each item listed and the expert panels approach. For data collection, questionnaires were distributed to 9 expert panels to evaluate the items. The development of the CVI was examined using the universal acceptable values of the content validity index. The cut-off for CVI is ≥ 0.78 . As result, a total of 52 items of the temporary station criteria were designed and 43 out of 52 items achieved the acceptable CVI values of ≥ 0.78 . At the end of the content validity study, 43 items on the checklist and a layout of a general temporary station criteria was developed for better implementation in the future. It is recommended to apply more sophisticated analysis, such as interview analysis for elaborating details on items of criteria.

Keywords: Railway Temporary Station, Criteria, Checklist, Content Validity Index

1. Introduction

The Electrified Double Track Project between Gemas and Johor Bharu has been approved as part of the larger attempt to remedy and upgrade the railway network. As the Seremban to Gemas Electrified Double Track project nears completion, the entire southern sector will be a comprehensive network of Electrified Double Track. The construction of this project will offer the option of expanding the existing

commuter service to recent developments, as well as further promoting growth in the Southern region's social and economic sectors. It will also undoubtedly improve intercity and freight services along this route.

The project aims to improve transportation infrastructure by evolving rail facilities to meet future passenger and freight train services, alleviate road traffic congestion problems by implementing a reliable and modern efficient service, shorten travel time and increase train intervals for people commuting from this sector, contribute to a cleaner environment by using electricity as a source of power, and improve public transportation.

1.1 Railway Station Building and Design rationale

The station design describes the minimal requirements for the planning and design of new or renovated stations. It also addresses the various safety and security needs of the passengers, as well as the economical ticket collection method. The goal of each station was to promote and sustain ridership growth, enhance the appearance of the neighborhood, and promote security and public safety [1].

In designing safety-critical infrastructures such as railway systems at the station, engineers often must deal with complex and large-scale designs [2]. On other hand, the systems at the station themselves will affect the rationale design of the station. The number of processes rises, as does the system complexity, and the design process becomes more difficult as more functions were added [3].

Basically, a station must feature site access, parking, platforms, buildings, tracks, and any other facilities required to offer public transit, safety, and information. The station must be a durable, functional, and pleasant station feature that incorporates the character of the neighborhoods and community while preserving the broader railway system identity and recognition [1].

To construct the principles of mandatory technical standards that prescribe topics such as safety, regulations regarding the strength of materials used in facilities and rolling stock, the safety level of buildings, and so on must be established from the design stage. If the designing and building are done in accordance with these guidelines (design standards), unified and reasonable structures and so on may be finished across entire lines [4].

Uniform Building Standards criteria should be followed while designing stations and associated facilities. In Malaysia, it is mandatory that all public buildings must provide facilities for disabled persons (By-laws 34A of the Uniform Building By-Laws). By law, rules, and regulations, as well as any laws, ordinances, rules, regulations, and lawful directives of any public entity affecting the performance of the task. In addition, the Building Construction Regulation in Malaysia does include but is not limited to [5].

1.2 Classification of station

A station is essentially a location where a train comes to a stop to allow passengers or goods to board and depart. Stations vary in size and importance according to the kind and volume of traffic handled, as well as their location in relation to cities or industrial areas. The passenger station and accompanying yard layouts can be roughly categorized into the following types [6].

- (a) Halts: is a type of stop where any train carrying a passenger is scheduled to stop for a given period [7].
- (b) Flag stations: function as a stop-over for trains and is equipped with a station building and staff [6].
- (c) Roadside or crossing stations: concept of a crossing station was initially designed for single-line segments to facilitate the crossing of opposing trains, allowing for faster train movement [6].

- (d) Junction stations: junction stations typically feature numerous platforms faces to allow trains to stop at the station from various destinations at the same time [7].
- (e) Terminal stations: are the point at which a railway line or one of its branches comes to an end [6].

This study discusses the general requirement and criteria for a railway station. As a permanent railway station has standard criteria and general requirements, a temporary station also should have the same even though it is for temporary use only. To construct a good structure and building there must be some standard and specific criteria that we refer to. It is to make sure that the structure is safe for public use.

The objectives of the study are as follows:

- i. To identify and design a checklist for railway temporary station criteria.
- ii. To validate the proposed criteria for the railway temporary station by using Content Validity Index (CVI).
- iii. To develop a general railway temporary station layout using AutoCAD.

2. Methodology

In this study, a content validity approach is performed by considering different aspects and scenarios to get a bigger picture and this approach connects to the idea of data collecting from different respondents. The method used is focused on direct observation to collect the information in a general view of the railway temporary station construction at the Gemas-Johor Bharu Electrified Double Track Project (GJBEDTP). The selection of GJBEDTP was selected as the area of research because the project has quality issues that lead to the high number of railway temporary station construction. Figure 1 depicts a flow chart that is utilized as a project research guide in this methodology.

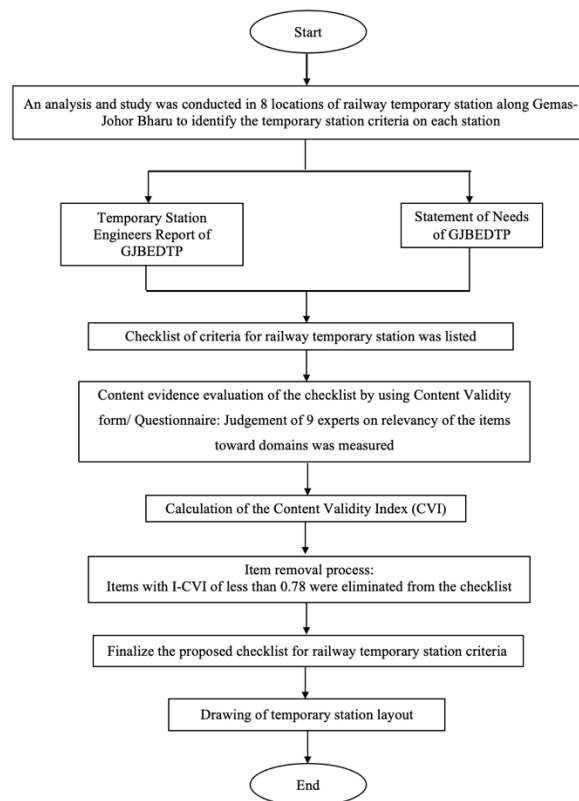


Figure 1: Project flow chart

To achieve the first objective, a comparison between the SON and Temporary Station Engineers report was conducted. In the SON document, the data pertaining to temporary railway station requirements and related facilities were collected. Based on the collected information, a list of general requirements and criteria for the temporary station was designed in comparison with the checklist in the Temporary Station Engineers report. Then, a checklist of temporary station criteria was proposed.

Next, to validate the content validity of the items constructed in the proposed checklist, the CVI method was undertaken in the following manner [10]:

- i. The first stage in content validation is to construct the content validation form to ensure that the review panel of experts has a clear expectation and knowledge of the assignment.
- ii. Second, selecting a review panel of experts should be noted as the number of experts increases, the probability of chance agreement decreases [8]. The selection of an individual to review and fill an assessment tool which is the questionnaire was selected based on their experience in the railway temporary station construction. The criteria of the selected expert panel are focusing on the community and people who have been directly involved in the construction and migration of the temporary station of GJBEDTP. For this study, there are 9 expert panels involved.
- iii. Third, an expert panel meeting was organized for the face-to-face method, and they were guides for the content validation process.
- iv. Fourth, before assigning a score to each item, the experts are asked to critically assess the domain and its components.
- v. Fifth, after studying the domain and items, the experts are asked to submit a score on each item separately using the applicable Likert scale.
- vi. Sixth, calculating CVI values using two methods which are the average of I-CVI scores for all items on the scale (S-CVI/Ave) and the proportion of items on the scale that get a relevance rating of 3 or 4 from all experts (S-CVI/UA) [11].

To calculate the computation for the CVI indices equations below are used:

- i. **Experts in agreement:** just sum up the necessary ratings supplied by all experts for each item.

$$= \Sigma \text{ ratings supplied by all experts for each item}$$

- ii. **Universal agreement (UA):** score '1' is allotted to the item that accomplished 100 percent experts in arrangement, a score of 0 in light of the fact that not every one of the experts gave a significance rating of 1.

- iii. **I-CVI:** the expert in agreement separated by the number of experts panel, for instance the I-CVI is

$$\text{I-CVI} = \frac{\text{Expert in agreement}}{\text{Number of experts panel}}$$

- iv. **Proportion relevance:** the total ratings by an expert for each item separated by the total number of items, the proportion relevance for Expert 1:

$$= \frac{\text{Total ratings by expert for each item}}{\text{Total number of items}}$$

v. **S-CVI/Ave** (based on I-CVI): the average of I-CVI scores across all items, for instance, the S-CVI/Ave :

$$\text{S-CVI/Ave} = \frac{\text{Sum of the scores of experts in agreement}}{\text{Total number of items}}$$

vi. **S-CVI/Ave or Average proportion** (based on proportion relevance): the average of proportion relevance scores across all experts, for example the S-CVI/Ave:

$$\text{S-CVI/Ave} = \frac{\text{Total number of proportion relevance of all experts}}{\text{Total number of experts}}$$

vii. **S-CVI/UA**: the average of UA scores across all items, for example, the S-CVI/ UA:

$$\text{S-CVI/UA} = \frac{\text{Total number of UA of all items}}{\text{Total number of items}}$$

After calculating the CVI value, a general temporary station layout was developed using AutoCAD software developed to give a bigger and clear illustration of the temporary station criteria.

3. Results and Discussion

The case study research was conducted on eight temporary railway stations of the GJBEDTP. Cover all the temporary railway stations from Segamat station until Kulai Stations. All the stations are within the Johor State.

3.1 Data Analysis

A checklist for railway temporary station criteria was identified after analysis and comparison between the Statement of Needs (SON) and temporary station engineers report of GJBEDTP was done. Then, the checklist was presented as the Content Evidence of Validity of general requirements for railway temporary stations (Questionnaires). The proposed checklist of items has been distributed into three domains to make sure that the criteria for each domain were specifically identified. Domain 1 focuses on the passenger facilities which refer to the facilities that were provided at a certain station to ease and serve the public in manner. It contains a total of 10 items for example, the ticketing office, prayer room, and passenger waiting area.

Next, domain 2 is the station facilities which is a provision of specifications that apply to the station requirements. Domain 2 contains a total of 16 items for example, utilities room, and station signage. Lastly is domain 3 which cover station furniture and fittings. It is the items that are not permanently affixed to a building and are consequently easily removable from their respective locations such as chairs, cabinets, and whiteboards.

3.2 Interpretation of Content Validity Index

After the distribution of the questionnaires, the values of the CVI for each item were calculated. Selections of 9 expert panels include KTMB experts (three people) and the YTL design and coordination team (six people). A total of 52 items were evaluated to identify the CVI values of each item. For 9 expert panels, the acceptable I-CVI numerical value of the Lawshe table is 0.78 [9].

Each item in the domain with I-CVI values equal to or above 0.78 would be considered appropriate and excellent. If it is less than 0.78, it is eliminated [12]. Table 1 below interpretation of the content

validity index based on the rating of the relevancy of items by 9 experts. An average CVI value above 8 indicates most of the items are appropriate.

Table 1: interpretation of content validity index

Domain	Items	Average CVI values	Interpretation
1	Q1-Q10	8.7	Appropriates
2	Q1-Q6 Q7-Q9 Q10-Q15 Q16	7.06	Appropriates Eliminated Appropriates Eliminated
3	Station Master Office a-j k-n	7	Appropriates Eliminated
	Ticketing Office a-f	8.83	Appropriates
	Passenger waiting area a-d	8.5	Appropriates
	Station platform a b	7.5	Appropriate Eliminated

The analysis of 52 items of the temporary station criteria and facilities revealed that 43 items out of 52 achieved an I-CVI value of 0.78 and above, which gives an interpretation of appropriate items. Of 52 items, 9 items failed to achieve an I-CVI value of 0.78, hence, they were eliminated and not included in the proposed checklist of this study. Likewise, all 43 achieved an I-CVI of more than 0.78, and all these items retained to be listed in the proposed checklist of temporary station criteria.

3.3 Proposed checklist of railway temporary station

The results of the checklist from the validation of CVI are summarized in Table 2 below. The details presented are the proposed general criteria and facilities for the railway temporary station to be used as a guide only.

Table 2: Checklist of railway temporary station

1. Station Facilities

Item	Facilities
1	Station Master Office
2	Utility room
3	System cabin
4	Station fencing
5	Station signage
6	Fire extinguisher
7	Public litter box/dustbin with cover
8	Generator
9	Electrical power point

- | | |
|----|---|
| 10 | Sufficient lighting with multiple switches |
| 11 | Public Address (PA) system for announcement |
| 12 | Adequate signage |

2. Passenger facilities

Item	Facilities
1	Ticketing Office
2	Passenger waiting area
3	Station platform
4	Covered waiting area at platform level
5	Toilet facilities
6	Disabled toilet
7	Car and motorcycle parking
8	Prayer room complete with ablution (male and female)
9	OKU ramp & carpark
10	Road Signage

3. Station furniture and fittings

Items	Facilities
1	Station Master room
	a. Walkie Talkie
	b. Table with pedestal drawer
	c. Chairs
	d. Computer table complete with chairs
	e. Safe box
	f. Cabinet
	g. Air-conditioner
	h. File rack
	i. Whiteboard
	j. Stand fan
2	Ticketing Office
	a. Telephone
	b. PABX telephone
	c. Intranet
	d. Internet
	e. Desktop computer
	f. Printer
3	Station platform
	a. Yellow/warning line
4	Passenger waiting area
	a. Chairs
	b. Ceiling fans
	c. Notice boards
	d. Emergency evacuation plan

3.4 General railway temporary station layout

After the checklist of temporary station criteria is validated, a drawing of the temporary station layout was developed by using Computer-Aided Design (AutoCAD) software. The purpose of this drawing is to show an example of the layout of a railway temporary station which includes all the criteria and facilities such as station master office, toilet and utility room, and other relevant criteria. The details drawing on general criteria and facilities of the temporary station are shown in Figure 2.

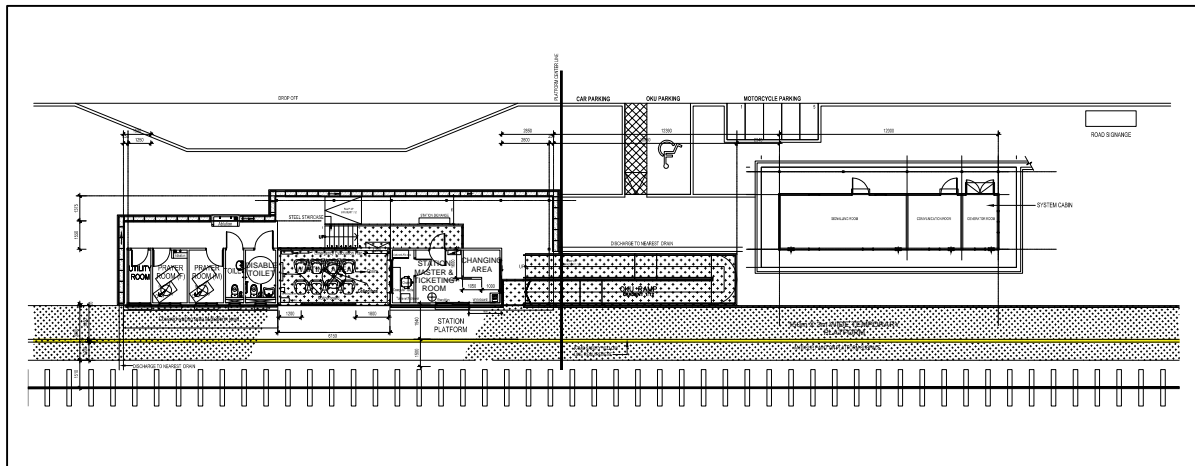


Figure 2: General temporary station layout

The results of this study have been endorsed by one of the experts who has more than 36 years of experience in the railway industry. The final checklist of items for the temporary station criteria was considered sufficient for implementation in the future. The temporary station layout also has been approved by an architect who has been involved in the construction of the temporary station of GJEDTP from the beginning of the project.

3.5 Discussions

This section presents the findings from the first objective, which is to identify and design a checklist for the railway temporary station criteria. The discussion then moves on to the second objective, which is to validate the proposed criteria for the railway temporary station by using the Content Validity Index (CVI). Finally, the discussion continues with a third objective to develop a general railway temporary station layout using AutoCAD.

3.5.1 First objective

For the first objective, a total of 52 items for temporary station criteria were analyzed. All items were the most relevant items that must be provided at the temporary station for better operation and safety purposes. The items were identified to make sure that it meets the requirements of station construction. A total of 10 items in domain 1 (passenger facilities) are revised by an expert panel and it is listed in the checklist to ensure that passengers have a satisfactory facility that they can use while waiting at the station. For domain 2 (station facilities), a total of 16 items were listed that were highly relevant and meet the requirement of station construction and operation. Without all the items the station can be operating because it might risk the safety of the passenger and station operation.

In addition, a total of 26 items were listed in domain 3 (station furniture and fittings). This domain consists of the most item of elimination because some of the items was not relevant based on expert judgment. For example, the eliminated items are the fax machines complete with a line for ticketing. A very few expert panels evaluated these items as relevant but most of the panel judged them as not relevant because nowadays people are purchasing tickets using online websites and few people

purchasing the paper ticket, so it is enough to just provide a computer and printer. The station master can just access the ticket purchasing system on the website and print out a ticket for a walk-in passenger using the printer. With this, technology also proved that the fax machine for temporary station purposes is not crucial.

3.5.2 Second objective

The second objective is achieved through the calculation of the Content Validity Index. The content validity of the items may be shown by the content validity measure of CVI. By proving content validity with CVI, it is feasible to support the validity of an evaluation tool. Furthermore, previous research has provided the optimal strategies for evaluating an assessment instrument's content validity as it performs CVI. It was evident from this study that the final 43 items of temporary station criteria are constructed valid, as the inventory was demonstrated to display good content, response process, and internal structure of validity evidence. Although the content evidence items were constructed using a current GJBEDTP temporary station criterion, the original 52 items had extensive item removal. A total of 9 items were eliminated from the list because all those items failed to achieve an I-CVI value above 0.78.

Several items were removed along the development process primarily due to poor CVI values. Item in domain 2, Q7, Q8, Q9, and Q16 was eliminated. Because, during a meeting with the expert, a few experts mentioned that all the eliminated items are not actually necessary, and it is needed only when there is a demand to meet the needs of the station itself. Item k, l, m, n from station master office and item b in station platform in domain 3 were considered not relevant by the expert panel as knowing the provision of such goods is not mandatory for the temporary station. Despite the removal of the items, the main objective remains the same as this tool focuses on assessing the criteria of railway temporary stations. The final number of items at the end of the development stage was 43 items of criteria. The 43 items were referred the following domains: 10 items in passenger facilities (Domain 1), 12 items in station facilities (Domain 2), and 21 items in station furniture and fittings (Domain 3).

3.5.3 Third objective

The third objective is achieved by developing the 2-Dimensions (2D) drawing layout for general temporary station criteria. As the items for the checklist were finalized, a layout was designed, and all-purpose items were included in the drawing to indicate the location and position of each item. This method would be helpful for the future construction of railway temporary stations. The site engineers or architects can refer to the layout as an additional way to improve their work at the construction site.

The layout also can give a clear illustration to the cabin suppliers. As known, most of the materials for the temporary station building were used a metal cabin from certified suppliers. So, with this layout, the suppliers can estimate the perfect size for the station building based on the cost and safety aspects. It also can help improve the migration process, if there are any issues during the migration, architect or engineers can just refer to the drawing and proves that the issue should not arise if it is not included and proposed in the drawing. All these implementations could improve the performance of temporary station construction in the future.

4. Conclusion

To overall summarize the study, at the end of the content validity the 43 items of the checklist and a 2D layout of general temporary station criteria were comprising clearly defined. The findings show that majority of the proposed items in the checklist indicate very good content and validation. As a result, this study proved relevant since the researcher was able to finalize the checklist for a railway temporary station criteria together with the layout drawing. Furthermore, future studies will be better equipped to understand the general requirements for railway temporary stations. From the study analysis and discussion, the proposed checklist may help to improve and avoid unwanted issues that occur during the migration and acceptance process of the temporary stations in the future. Finally, here are some

recommendations for future researchers to consider: Interviews with individuals involved in the construction of temporary station can be conducted to obtain more accurate research findings and understand the genuine condition of temporary station criteria and requirements.

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