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Analysis of new Waterproofing System for the PJ EPF building

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ABSTRACT

The waterproofing system of EPF Building was chosen as the case study for this paper. Situated at Jalan Gasing, Petaling Jaya, Selangor, the EPF Building reflects the image of advanced technology in architectural style, after its latest renovation from 1960's modern architecture. Further understanding on the waterproofing system selected for the concrete flat roof and also the wet areas as exemplified for this building can be further elaborated; the materials, the advantages and disadvantages of certain types of the systems and the way they are applied. The paper emphasizes on the construction players to be more conscious, appreciative and truly understand the viability and suitability of the waterproofing system to suit in our local building and local context.

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INTRODUCTION

The EPF (Employees Provident Fund Board/Kumpulan Wang Simpanan Pekerja-KWSP) building at Jalan Gasing, Petaling Jaya, Selangor, is strategically located beside the Federal Highway. Built in the 1970's, designed by S.P.M. Merer from BEP Architect firm, it was recently upgraded to cater the need of additional space and also portray the corporate image of the EPF board. The six-storey high office building consists of a square plan with a central service core. The gross floor area is approximately 14,279 m^2. From an aluminium grilled double façade building, the design featured a modern image with curtain walling and lightweight façade. Meanwhile the interior is partially changed by integrating internal partitions and upgrading the finishes of the floor, wall, ceiling and roof. Mechanical and electrical services are also upgraded in this renovation work. A new lift core is provided to replace the demolished one. There are other minor structural upgradings including extended entrance porch and new roof. The design aims to create a commanding character for the building, which is achieved in Neo-classical style.

Methodology:

The study was conducted based on qualitative method; hence, the data was collected through gathering related literature review, visual observation and interview. Literature review is mainly based from published books, research paper, journals and from the internet. Type of interview used in this study is an unstructured interview and focus group interview.

RESULTS AND DISCUSSION

(i) Waterproofing System:

Building structures need protection from the environment. This need is either to prevent ingress of water into the building or to stop water borne salts from entering and damaging the concrete structure, or its reinforcement. Normally waterproofing systems are applied to the areas that exposed to the water, both from exterior and the earth, including rooftop, toilets and basement [2]. In the existing EPF building, certain waterproofing systems were applied for the flat rooftop, toilets and lift pits. During the rectification renovation works, because there are additional flat roofs, gutters, toilets and lift pit, new waterproofing systems are

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proposed to protect these areas. For this report, the research is focus on the new waterproofing systems that is applied during the upgrading and renovation works.

For the entire new flat rooftops of the building, the membrane type of waterproofing system, product by AXTER, is proposed. (Fig.1) The product name is FORCE LINE 4, which is a membrane, based on elastomer SBS bitumen. Its thickness is 4mm plain sheet, whereby the membrane is reinforced with a polyester reinforcement [6]. The system proposed here is actually a self-protected system, where the membrane is covered with a plastic film and the surface with natural grey slates. Therefore there will be no extra protection layers above it, such as concrete paving, tiles, gravels, and aluminium. The 4mm thick membrane comes with the size of 10m x 1m in a roll. The roll weight is 44kg whereby the selvedge thickness is 3.5mm. The composition of the membrane and the performance finished product are shown in Table 1 as below.

Table 1: The composition of the membrane waterproofing system

Composite	Weight (kg/m^3)	Performance		
		Resistance to point loading	Tensile strength	Elongation
Non-woven polyester	0.180	20kg	600N/5cm	40%
Elastomeric bitumen	3.400			
Mineral slates	0.800			
Plastic film	0.010			

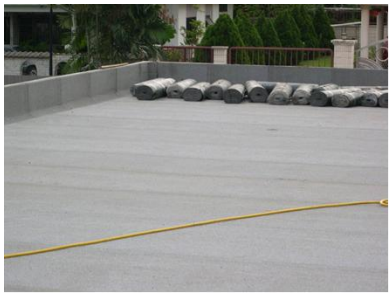

Fig. 1: The self-protected membrane waterproofing system.

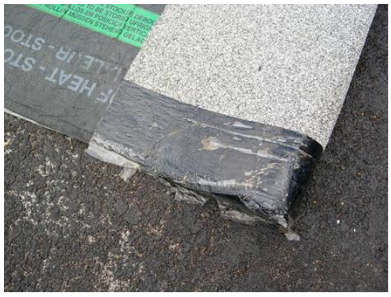

Fig. 2: The composition of the membrane waterproofing system.

Table 2: The properties of the cementitious waterproofing slurry used.

Specifications	Criterias
Colour	Grey
Density	Approximately 2.0 kg/litre
No. of Components	2
Mixing Ratio	Part A to Part B, 1 to 2 parts by weight.
Consumption Rate	2 kg/m^2/coat
No of Coat	2 coats
Pot Life	30 minutes
Packing Size	Part A (liquid) -10kg
	Part B (powder)-20kg

For the new 16 toilets and one lift pit in the building, the flexible cementitious waterproofing slurry is proposed and been applied. The product used is called SURECEM 1005 WP, from PLC Laboratory [6]. This waterproofing system is a polymer modified cementitious waterproofing slurry, which is a mixture of Portland cement, quartz powder, polymer latex and other chemical constituents to provide excellent water tightness, adhesion, and flexibility. The product (see Table 2) comes in a package consists of 10kg liquid and 20kg powder, which is to be mixed and then applied to the areas concerned. It is used to fill, seal, waterproof and protect a variety of mineral substrates, including cast-in-place and pre-cast concrete, lightweight blocks, bricks,

and other masonry surfaces. It can be used for positive and negative side of waterproofing, which the positive side waterproofing is used for the toilets and lift pit in the EPF building.

(ii) Advantages and Disadvanteges of the Waterproofing Systems:

The decision making to choose the types of waterproofing systems depends on the advantages and disadvantages of the waterproofing systems themselves. This decision making is actually a choice among criteria such as quality, performance, and cost. For the new flat rooftop, the self-protected membrane waterproofing system is chosen due to the condition that it will be left expose to the external weather, both the rainwater and direct sunlight [1]. There is a layer of mineral slates on top of the plain membrane sheet as protection, so there will be unnecessary to cover the membrane with other protection layers such as concrete paving, tiles, gravels, and aluminium [5]. Therefore the waterproofing system chosen is cost-effective as well as high performance. Other than that, it is also safe and strong from improved stability due to stabilized polyester reinforcement. This makes the membrane good resistance to tearing, puncture and ageing. According to the supplier, this type of waterproofing membrane is long-lasting guaranteed for 20 years

In addition, the membrane type waterproofing system is easy to be applied and the thickness of the whole system is proven the same and even, which is 4mm for the entire area, compare to the liquid type of waterproofing system [4]. It is highly depending on the workmanship of the workers application and the membrane torching process.

The membrane is protected by a thin layer of mineral slates, to protect the membrane from the direct sunlight. In mid hot afternoon, the membrane can be partially melted and become sticky because the membrane can be very sensitive to the heat. This may affect the performance and lasting of the waterproofing system.

(iii) Comment and Analysis:

Analysis and observations shows that the decision making of choosing types of waterproofing system is good. The decision taken considers the quality and performance of the waterproofing system and also inexpensive. For example the self-protected membrane waterproofing system is chosen for its high quality and cost saving without other protections such as concrete paving and tiles.

The application of the membrane system on the concrete beams supported the water tanks ~~to~~ stop at the 300mm high from the rooftop level is sufficient; without any treatment ~~on~~ at the edge. This practice is not critical because the edge seems not a highly possible point where the rain water to seep into the gap. Therefore no sealing along the edge to prevent the water intrusion required.

Summary:

After the completion of the research analysis on the waterproofing system in EPF Building, some lessons are learned and to be shared. From the quick survey, the paper hope to make the construction players be more aware and conscious on choosing the correct system for buildings flat roof as well as the wet areas

The new EPF building has a very bold design concept and the design intentions are successfully achieved but on other aspects of the architectural design and maintenance issues, especially on the waterproofing system, the study discovered that the decision making of choosing the right waterproofing system is as important as the application method of the system.

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