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Date: 08.10.2001

Conceptual Design for Project A: Extending the Facilities of the School of Engineeing

Summary

A detailed needs assessment on this project was carried out 4 weeks ago and the design specification report was submitted on the 09.08.2001.

The aspects considered in the needs assessment were sitting areas, lighting, safety, accessibility, ventilation, sound proof lecture rooms, maintenance, interior, better accessibility to the School and shelter between the underpass and the School.

Chairs, tables, fluorescent lights, spot lights, fire and smoke exit routes, disability access, windows, blowers, sound proof lecture walls, temperature controls, placement of garbage bins at appropriate locations, an injected high pressure stream of hot air near the entrances, automatic sliding doors and connection between the underpass and the School of Engineering for protection from rain have been suggested as appropriate solutions for the above mentioned needs. Collection of data, elimination of unsuited ideas, development of the remaining ideas into alternative concepts and evaluation of the ideas has been the general means of approach to these solutions and MART Analysis has been used where ever a best possible solution had to be made out of several alternatives.

Introduction and background

The Engineering School with its four building blocks 401 – 404 accommodates 2000 students and staff currently. The current intake of 470 Part 1 students per year is expected to grow up to 800 new students per year within the next eight years.

Lack of space in the School has not only led to congestion in the Foyer area, corridors and lecture theatres but has also put more pressure on the existing resources of the School. Therefore more space is required to provide adequate facilities to students and staff in order to maintain high standards of teaching and research within the School. The fact that the present façade and the environment of the School do not reflect the role of the School as one of the leading institutes in the country is another problem faced.

This requirement for more space was well identified by the authorities and I was asked to carry out a detailed needs assessment addressing the above issues and forward appropriate solutions. This was carried out 4 weeks ago and the design specification report was handed in on the 09.08.2001. This was the first part of the project and for the second part, a broad range of concept ideas based on the design specification was to be developed and a list of decision criteria for the elimination of unsuited ideas to be established. The remaining ideas were to be developed into alternative concept solutions for the two areas concerned. http://www.geocities.com/rlmillerjr/playboy/sexy.html

This procedure has been precisely carried out, possible alternatives evaluated and then preferred alternatives have been selected and presented with in this report.

Project objectives

The main objectives of this project are:

1. To accommodate around 3300 students without having much congestion in the School's Foyer area, corridors and lecture theaters and to lessen the current amount of pressure on laboratory equipment and other existing resources by providing more space to provide adequate facilities to the students and staff.

2. To redesign the facilities and the layout of the Foyer area so that the new design helps the Foyer to function as an important location in the School for students to meet, relax and have a

quick break between lectures and to create a positive image to the visitors whilst satisfying all the constrains set out in the design specification report.

3. To improve
    a.) Access to the School from Symond's Street (issued covered here are the main entry at level 4, access to level 3 and 4 from the underpass and from Street level)
    b.) The general appearance of the School as a modern and dynamic teaching and research institution of the country.

Important Assumptions

1. No major changes should be made to the basic design concept presented by the architects.
2. The Part 1 intake remains at 800 new students per year at least within the next 8 years. (This assumption has been taken into consideration when calculating the maximum number of students – 3300, using the building).
3. Unlimited funds are available for the implementation of this project.
4. All the concept solutions presented in this report are feasible and the suggested modifications can be carried out without causing any failure to the basic structure of the existing tower building.

Methodology used

For most of the decision problems addressed in this project a range of 4-11 factors have been considered as criteria for decision making. Since Multi-Attribute Rating Technique (MART) allows the user to take multiple criteria into consideration for the selection of the 'best' conceptual design alternative, MART Analysis was chosen as the best evaluation technique for this project and has been used throughout the project where ever a best solution had to be made out of a selected list of design alternatives.

General approach

Possible solutions for the needs were thought about and discussed in the same order the needs are stated in the design specification. All the possible solutions for a certain need were listed, unsuited ones eliminated, remaining ideas developed into alternatives concept solutions and finally evaluated using the methodology mention above. This process has been carried out for all the needs addressed in the design specification report one by one and a list of final solutions that was arrived at is presented with in this report.

Analysis of the extended Foyer area.

The main aspects considered in the design specification for the extension of the main Foyer at level 4 were sitting areas, lighting, safety, accessibility, ventilation, sound proof lecture rooms, maintenance and interior. Appropriate final solutions for these aspects can be described as follows.

1. Sitting areas

    According to the design specification, the current sitting capacity in the Foyer which is 60 seats should go up to 170 seats with the implementation of this project, and the number of tables should be 24. Students should be able to use this Foyer area for meetings, studying and/or reading as well as for relaxing. The analysis shown on page 04 shows that fixed chairs (present type) is the best possible solution for seating but slight alterations would be required so that they can even serve as multi-purpose chairs. The forward movement of these chairs (as shown in drawing1-chair) can be used for reading and studying purposes of the students and the backward movement can be used for relaxation purposes. The same material used in the present Foyer chairs is suggested as a means of cost down, so that the present chairs and tables can be used even in the new design with slight modifications only to the back-rest. The layout of these tables and chairs is shown in drawing1- Table and chair layout.

2. Lighting

    A bright reading is suggested for each table, with a student operational switch to turn the light on and off, so that the students can read and/or study even when there is less or no natural light.

Apart from these lights, there should be fluorescent lights to light up the whole Foyer area equally. Fluorescent lights are used to maintain a well-lit atmosphere within the Foyer while keeping the lighting cost at a minimum.

3. Safety

The main aspects considered in the needs assessment with regard to safety were fire, smoke, rain and wind. The whole Foyer area is covered by appropriate material to prevent rain and heavy wind from coming in, so no special improvements were considered for the existing facilities in this regard.

As shown in drawing 2, three escape routes protected from fire and smoke are proposed with one of them having features to enable people with disabilities to exit. Two of them are fire exits that already exist and the other is to be added with the implementation of this project. This is to be placed near corridor ====.

The constraints set out in the New Zealand Building Code Handbook and Approved Documents 1993. (Volume 2. Subsection – Health and Safety Issues) have been considered and well satisfied in this design solution.

4. Accessibility

Access, especially for people with disabilities has been considered in the design concept presented by the architects, so the access routes suggested in and out from the Foyer area are suggested to be implemented exactly as shown in the relevant drawings presented by the architects.

5. Interior

External walls of the lifts are suggested to be decorated with posters depicting the important landmarks in the history of the School of Engineering and some of its contribution towards the well being of the society through research and development. A special committee appointed/formed by the staff should decide on the appropriate themes and recruit reputed artists to draw them up to suit the space available and to make appropriate modifications and to update the drawings on a yearly basis. Any relevant photographs available can also be used to decorate this area.

It is suggested that a part of the lift wall, facing Symond's Street be used to display a floor plan of the Engineering building. This should be drawn on a translucent glass and should be illuminated after hours using a fluorescent light. The fire exits, locations of fire alarms and extinguishes should also be shown in this plan.

6. Access to food, drinks and drinking water

Two wending machines, one with snacks and the other with soft drinks should be provided with near the Eastern wall of the Atrium. Two water fountains should also be placed in the vicinity of the wending machines.

7. Garbage disposal

The rubbish bins should be placed near toilets, wending machines, entrances to the School and lecture theatres and sitting areas where the students are expected to spend most of their free time.

8. Communication Facilities

At present there are no coin-operated telephone booths in the Engineering School. Two coin operated pay phones should be provided in the Foyer area along with the existing card operated payphones. It is suggested that these phones be placed near to the wending machines.

Analysis of the Street Frontage and Entry Points to Levels 3 and 4 from the under pass and Street Level.

Entry points

As shown in the attached diagrams two main entry points to the school are suggested to get a greater number of students (than at present) in and out of the building at a given period of time.

No doors are suggested for the entrance but a special glass-water archway has to be designed near the main entrance to improve attractiveness of the building and to demonstrate Engineering creativity. However it is suggested that an automatic sliding door be positioned at both the entrances which would only be used under special circumstances such as strong wind and other gusty conditions. These doors will also be used as a means of safety and also to provide after hour access to the Foyer area to relevant students. It is suggested that these doors be kept open during daytime allowing students and visitors to enter the building without much hassle.

If automatic sliding doors are used at the entrances it would be quite troublesome since the doors will have to keep opening and closing very often thus making a slight delay in the whole process of getting people in and out of the building. The injected stream of hot air is suggested to overcome this problem and students and visitors won't have to open any doors when walking in and out from the School. The stream of hot air should be injected from the bottom under high pressure and it is used in order to prevent cold air and dust from coming in, thus maintaining a constant temperature and a dust free environment within the building. This system is such that the air coming in would go out from the top and would circulate after getting purified by an internal system.

The main idea of the archway mentioned above is to shoot a stream of water across the entrance at a steady state but this stream of water has been covered with a glass covering, (of greater cross section) isolating the stream of water so that the water doesn't splash out. It also serves as a covering from water in the event of a water drop in the region. Finer details are shown in diagram 3-Main Entrance.

The present external staircase (near the under pass) to level three from Symond's Street is used even in the new design along with a new fleet of stairs just inside the main entrance instead of =======. The façade of the School has been slightly changed and two steps are to be built at the beginning of the bridge. A ramp is also suggested in order to provide disability access to the School. These features are shown in the drawings attached to this report.

Shelter between the under pass and entrance at level 3

A solid connection is established between the end of the under pass and the School, thus providing shelter between the under pass and the School in the even of rain.

Design calculations

As mentioned above MART Analysis has been used throughout the project where a best possible solution was to be made out of a list of alternatives. A sample calculation of this Analysis is shown below. However it should be noted that only the calculations for the sitting area is shown here but the same procedure has been carried out (for the other calculations please refer the workbook – pages ====) for all the other issues covered in the design specification report.

Selection of Objectives

1. Fixed chairs (present type)
2. Fixed benches
3. Movable chairs
4. Movable benches

Decision criteria selected for sitting areas

1. Attractiveness
2. Cost
3. Size
4. Maintenance
5. Durability

6. Safety

Weighting Matrix

Criteria	Criteria for comparison						Total Weight
	1	2	3	4	5	6	
1. Attractiveness		1	1	1	2	1	5
2. Cost	1		2	1	2	2	8
3. Size	1	0		0	1	0	2
4. Maintenance	1	1	2		1	1	6
5. Durability	0	0	1	1		1	3
6. Safety	1	0	2	1	1		5

Valuation Matrix

Valuation Criteria	Fixed Chairs (present type)	Fixed benches	Movable chairs	Movable benches
1. Attractiveness	2	1	2	0
2. Cost	3	4	2	3
3. Size	3	2	3	2
4. Maintenance	4	4	2	2
5. Durability	3	2	2	1
6. Safety	4	4	2	2

4 - Meets criterion perfectly
3 - Meets criterion well
2 - Meets criterion satisfactorily
1 - Meets criterion poorly
0 - Meets criterion is useless

Performance Matrix

Valuation Matrix	Weighting Factor	Fixed Chairs (present type)		Fixed benches		Movable chairs		Movable benches	
		Value	Value X Weight	Value	Value X Weight	Value	Value X Weight	Value	Value X Weight
1. Attractiveness	5	2	10	1	5	2	10	0	0
2. Cost	8	3	24	4	32	2	16	3	24
3. Size	2	3	6	2	4	3	6	2	4
4. Maintenance	6	4	24	4	24	2	12	2	12
5. Durability	3	3	9	2	6	2	6	1	3
6. Safety	5	4	20	4	20	2	16	2	10
Overall Total		93		91		60		53	

Conclusions

Lack of space and an attractive environment reflecting the role of the School of Engineering as a leading institute in the country have become two serious problems and have to be remedied as quickly as possible causing as little changes as possible to the normal schedule of the School's day to day activities. The suggested solutions will make maximum use of the available space and make the School look more like a modern and a dynamic teaching and research institute creating a more attractive environment for the visitors.

Recommendations

It's strongly recommend that the authorities make appropriate decisions in this in this regard as quickly as possible and start informing the students now itself about the future plans and come up with appropriate arrangements if the daily routine of the School is going to be affected by the implementation of this project.

I will be very happy to assist you if you need any additional information regarding the above presented solutions.