



Er. H.P. Singh
Executive Engineer

ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ ਜਲੰਧਰ

PTU PUNJAB
TECHNICAL
UNIVERSITY

Estd. Under Punjab Technical University Act, 1996
(Punjab Act No. 1 of 1997)

Ref. No. PTU/EE/1932

Dated 14.10.2014

Sh. D.L. Sharma, President,
Vardhman Spg. & Gen. Mills Ltd.,
Chandigarh Road, Ludhiana.

Sh. S.L. Kaushal,
Chief Architect, Punjab (Retd),
2865, Sector 42-C, Chandigarh.

Dr. A. P. Singh,
Dean (P&D),
Punjab Technical University, Jalandhar.

Sh. A. N. Chowdhry (Special Invitee),
3-B, Jyoti Nagar,
Jalandhar.

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Sh. Inderjit Kumar (Special Invitee),
(PH Experts)
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Sb. Amrit Sagar Mittal
CMD, Sonalika Tractors Ltd,
Hoshiarpur.

Er. A. K. Prabhakar,
OSD to Vice Chancellor,
Punjab Technical University, Jalandhar.

The Director,
Department of Technical Education, Punjab,
Plot No. 1, Sector-36A, Chandigarh.

The Registrar,
Punjab Technical University,
Jalandhar.

Dr. Prabhjot Kaur (Special Invitee),
Officiating Director Mohali Campus,
C102B, Phase-7 Industrial Area, Mohali.

Sh. Rajiv Aggarwal, Architect
M/s Archigroup Architects,
A-14, Sector-15,
Noida -201301.

Sub : Construction of new campuses of Punjab Technical University – 44th meeting of the Standing Building Construction Committee.


Dear Sir/Madam,

44th meeting of the Standing Building Construction Committee shall be held under the Chairmanship of Dr. R. S. Khandpur, Director General, PGSC (Retd) at 1130 hours on 20.10.2014 at PTU's Mohali campus at C-102/B, Industrial Area, Phase VII, (Sector-119), Mohali – 160 059 (Punjab). Agenda and Agenda note for the meeting are enclosed.

You are requested to make it convenient to attend the meeting.

Thanking you

Yours Sincerely,


(H. P. Singh)

Executive Engineer

Copy to : Dr. R. S. Khandpur, DG, PGSC (Retd), Science House, H. No. 2901, Phase 7,
(Sector 61), Mohali.

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Kapurthala Campus : Jalandhar-Kapurthala Highway, Kapurthala-144601

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PUNJAB TECHNICAL UNIVERSITY, JALANDHAR

Sub : Agenda for the 44th meeting of the Standing Building Construction Committee.

- Item No. 44.1 : To confirm the Minutes of 43rd meeting of Standing Building Construction Committee held on 01.08.2014.
- Item No. 44.2 : Action taken on various items discussed during previous meeting of Standing Building Construction Committee.
- Item No. 44.3 : To discuss and approve the manufacturers/specifications for acoustic treatment for proposed auditorium at main campus, Kapurthala.
- Item No. 44.4 : To discuss and approve rough cost estimate for proposed auditorium at main campus, Kapurthala.
- Item No. 44.5 : To discuss and approve the flooring patterns for circulation area and VIP Banquet area of auditorium proposed to be constructed at main campus, Kapurthala.
- Item No. 44.6 : To discuss and approve the revised estimate for construction of boundary wall of Punjab Institute of Technology, Mansa.
- Item No. 44.7 : To discuss and approve the design basis reports submitted by the Architect for Structure, Electrical and Public Health works in respect of Punjab Institute of Technology, Arniwala, Fazilka.
- Item No. 44.8 : Any other point with the permission of the Chair.



PUNJAB TECHNICAL UNIVERSITY, JALANDHAR

Agenda Note for the 44th meeting of the Standing Building Construction Committee.

Item No. 44.1 : To confirm the Minutes of 43rd meeting of Standing Building Construction Committee held on 01.08.2014.

The minutes of 43rd meeting of Standing Building Construction Committee held on 01.08.2014 were circulated on 06.08.2014. The minutes circulated are to be confirmed.

Item No. 44.2 : Action taken on various items discussed during previous meeting of Standing Building Construction Committee.

Actions taken on various items discussed during previous meeting of Standing Building Construction Committee are as under:

- The manufacturers/specifications for acoustic treatment for proposed auditorium at main campus, Kapurthala are to be presented in the present meeting for discussions and approval.
- The flooring patterns for circulation area and VIP Banquet hall of auditorium proposed to be constructed at main campus, Kapurthala are to be presented by the Architect in the present meeting for discussions and approval.
- The comments offered by the committee for Stage lighting system, Sound reinforcement system and audio video system have been incorporated in the design/scheme and the detailed estimate is being presented in this meeting.

Item No. 44.3: To discuss and approve the manufacturers/specifications for acoustic treatment for the proposed auditorium at main campus, Kapurthala.

In 43rd meeting of the committee, it was decided that all the materials proposed to be used for acoustic treatment should be preferably manufactured in India. Accordingly, the Architect will be making the presentation on type of the materials proposed to be used and their cost comparison.

The matter is placed before the Committee for discussions and approval please.



Item No. 44.4: To discuss and approve rough cost estimate for proposed auditorium at main campus, Kapurthala.

In 42nd meeting of the committee, the rough cost estimate for the proposed auditorium was discussed under agenda item No. 42.3 (copy of the estimate discussed in 42nd meeting is placed at Annexure-A). After detailed discussions, the committee agreed for the cost except for specialized items such as Acoustic treatment, Stage lighting system, Sound reinforcement system and audio video system. The Architect will be making presentations on detailed estimate for these items.

The matter is placed before the Committee for discussions and approval please.

Item No. 44.5 : To discuss and approve the flooring patterns for circulation area and VIP Banquet area of auditorium proposed to be constructed at main campus, Kapurthala.


In 43rd meeting of the committee, it was decided that some more flooring patterns for circulation area and VIP Banquet area of the proposed auditorium may be presented by Architect so that appropriate decision is taken in this regard. Accordingly, the Architect will be presenting some more flooring patterns.

The matter is placed before the Committee for discussions and approval please.

Item No. 44.6 : To discuss and approve the revised estimate for construction of boundary wall of Punjab Institute of Technology, Mansa.

In 30th meeting (Agenda item No. 30.7) of the Standing Building Construction Committee, estimate for construction of boundary wall of Punjab Institute of Technology, Mansa for an amount of Rs. 300.0 lacs was approved. This estimate was based upon a tentative design prepared by the Architect. Additionally, at the time of approval of this estimate, the length of the boundary wall was considered as 4224 metre. However, as per site conditions, the actual length of the boundary wall is about 4870 metre. It has been confirmed by the Architect that by mistake length of boundary wall for one site was not included in the approved estimate. There has been substantial increase in size of the foundations from that considered at the time of preparation of original estimate. Moreover, there are some increase in the quantities as per site conditions also. By considering all these factors, the revised estimated cost for the boundary wall works out to be Rs. 409.27 lacs i.e. increase in cost by 36.42%. In addition to this, price escalation as per clause 10cc of CPWD already approved in building committee and BOG meetings, shall be payable to the contractor.

This matter was also discussed in 42nd meeting of the committee and it was decided that works upto award value of the works is got executed from the contractor to avoid any litigation with the contractor and contract is foreclosed by considering the facts that Punjab Cabinet has approved constitution of new technical university at Bathinda and district Mansa will fall under the jurisdiction of new university and it was opinioned by the committee that new university may have different requirements for this campus.



The matter has again discussed at University level and by considering the facts that final decision is still to be taken by Punjab Govt. on new University and to avoid trespasses, theft and misuse/encroachment of the campus area, boundary wall works are got completed from the existing contractor.

The matter is placed before the Committee for discussions and approval please.

Item No. 44.7 : **To discuss and approve the design basis reports submitted by the Architect for Structure, Electrical and Public Health works in respect of Punjab Institute of Technology, Arniwala, Fazilka.**

The Architect has submitted design basis reports of Structure, Electrical and Public Health works in respect of Punjab Institute of Technology, Arniwala, Fazilka (Annexure-B). The same will be presented by the Architect in the meeting.

The matter is placed before the Committee for discussions and approval of the reports.

Item No. 44.8 : **Any other point with the permission of the Chair.**



ANNEXURE-A

PREAMBLE TO PRELIMINARY ESTIMATE

1. **State:** PUNJAB

2. **Name of Work**

2.1. Construction of Punjab Technical University, Kapurthala.

2.2. This preliminary estimate of probable cost of Rs. 217,596,646/- (Rs. Twenty one crore, seventy five lacs, ninty six thousand, six hundred & forty six only) excluding contingencies, cost of external development and departmental charges has been framed by Archigroup Architects (Regd.)

3. **Hlstory**

3.1. This preliminary estimate covers the probable cost of construction of Convention Centre. This scope of work was finalized in the meeting held on 7th May 2014 at Chandigarh. This estimate is submitted for accord of Administrative approval and expenditure sanction by the competent authority.

4. **Design & Scope:**

4.1. The proposed buildings shall be constructed as RCC structure. The present estimate consists of:

4.1.1. Convention center: - The block is G+1 consisting of 800 capacity auditorium, 2 green rooms, 1 control room, 1 no. VIP lounge with kitchen, 1 no. VIP suites, Student's verandah with kitchen, 2 offices, toilets etc.

5. **Civil works:** Most of the items to be executed in these buildings are already included in the provisions in the PAR – CPWD for year 2012.

6. The salient features of various provisions are as under:

6.1. **Building:** - The building shall be of R.C.C. framed structure with raft and combined footing.

6.2. **Foundation:** - As per structural design based on soil investigation.

6.3. **Flooring :-**

Auditorium	Carpet
Stage	Wooden flooring
VIP lounge, suites, lobby, corridor	Granite
Staircase	Granite
Student's verandah	Kota stone
Toilets	Vitrified tiles

6.4. **Doors and windows: -**

6.4.1. Door frames shall be of Aluminium with pre-laminated shutter. Doors of auditorium shall be acoustic doors. Windows shall be of Aluminium sections & shutter as per architectural drawings. Structural glazing has been provided at places in the elevation. Fitting shall be steel or aluminum as per architect's requirements.

6.5. **Staircase Railing:** Stainless steel railing has been provided.

6.6. Toilets: Floor vitrified tiles and dado up to door level height with glazed ceramic tiles, vitreous china WC, washbasin and urinals.

6.7. Roofing: - Terrace shall have brick bat coba treatment and acoustical false ceiling shall be provided in auditorium as per architectural drawing & gypsum false ceiling in VIP lounge & suites.

6.8. Internal Finishing: cement plaster, oil bound distemper and acrylic emulsion paint and plastic emulsion with putty, doors shall be enamel/ spirit polish finish. Walls of auditorium will have acoustic paneling.

6.9. External Finishing: Weather proof paint, structural glazing, Stone cladding as per architectural drawings.

6.10. Furniture: Chairs of auditorium has been included in this estimate.

7. Services:

7.1. Following provisions have been made in this preliminary estimate.

7.1.1. Fire prevention system as/ NBC have been provided. Sprinklers system has been considered

7.1.2. Internal Electrical Installation, telephone data, networking, power plugs etc.

7.1.3. Video presentation & sound reinforcement system has been considered in this estimate.

8. Exclusions:

8.1. No provisions have been made in the preliminary estimate for interior decorations, façade lighting, for external development works like roads, rain water harvesting bulk services such as tube wells, pumps, extension of lines, HT- substation equipments, LT distribution system. DG sets, external lighting, IBMS and CCTV access control system etc.

9. Rates

9.1. Rates are based on CPWD PAR of 1.10.2012. For the items not covered under PAR 2007, rates have been derived from market rate analysis, PTU-III, Kapurthala approved estimates and CSR of Punjab.

10. T & P : No special T&P is required all other shall be arranged by the contractor.

11. Land : Available.

12. Method : By contract after call of tenders.

SUMMARY- PRELIMINARY ESTIMATE				
S. No.	Building / Component	Plinth Area (Sqm)	Total Cost of building in Rs	Reference
1	2	3	4	5
1	Convention centre	3,746.70	150,760,218.60	Ref. Detailed calculation
2	Other Building Expenses(Richer Specifications)		45,537,006.40	Ref. Annexure 1
3	AC cost		21,299,421.06	Ref. Annexure 2
4	Total (1+2+3)		217,596,646.06	
5	SAY		217,596,646	
Twenty one crore, seventy five lacs, ninety six thousand, six hundred & forty six only				

Auditorium		Assembly		Refer Drg No. PTU-IV/PRE/AC/01-01 to 09			
Type of Building -							
Total Plinth Area -		3,746.70 sq.m					
Plinth area on ground floor		3,178.00 sq.m					
Total covered area-		3,821.50 sq.m					
No. of storeys-		G+1					
Floor height		13.50 m					

Sr.No.	Description	Unit	Qty	Nos	Rate	Amt	Explanation
1	2	3	4	5	6	7 = (4*5*6)	8
1	R.C.C. FRAMED STRUCTURE						
1.1	RCC framed structure upto 2 storeys						
1.1.1	Floor height 3.35m						
a.	Floors	sqm	3,746.70	1.0	23,500.00	88,047,450.00	
1.2	Extra for						
1.2.1	Every 0.3m additional height of floor above normal floor height of 3.35m.						
a.	Ceiling at 12.9m	sqm	430.69	31.83	270.00	3,701,780.55	Ceiling height at different levels. Refer dwg no. PTU-IV/PRE/AC/01-07 & 08
b.	Ceiling at 11.4m	sqm	264.23	26.83	270.00	1,914,346.35	
c.	Ceiling at 6.3m	sqm	300.29	9.83	270.00	797,269.95	
d.	Ceiling at 6m	sqm	638.30	8.83	270.00	1,522,345.50	
e.	Ceiling at 5.3m	sqm	327.95	6.50	270.00	575,552.25	
f.	Ceiling at 4.2m	sqm	274.53	2.83	270.00	210,015.45	
g.	Ceiling at 4m	sqm	607.36	2.17	270.00	355,305.60	
1.2.3	Every 0.3m deeper foundation over normal depth of 1.20m (on G.F. area only)	sqm	3,178.00	4.33	270.00	3,718,260.00	
1.2.4	Every 0.3m higher plinth over normal plinth height of 0.6 mt. (on G.F. area only)						
a.	Plinth at 0.8m	sqm	1,274.00	1.00	270.00	343,980.00	
b.	Plinth at 1.6m	sqm	567.70	3.33	270.00	510,930.00	
1.2.5	Resisting Earthquake forces	sqm	3,746.70	1.00	1,140.00	4,271,238.00	
1.2.6	Large modules over 35 sq m	sqm	1,169.60	1.00	1,500.00	1,754,400.00	Auditorium & lounges
1.2.7	Fire fighting						
1.2.7.1	With wet riser system	sqm	3,746.70		500.00	1,873,350.00	
1.2.7.2	With sprinkler system	sqm	3,178.00		750.00	2,383,500.00	
1.2.8	Fire Alarm						
1.2.8.1	Automatic Fire alarm system	sqm	3,746.70		500.00	1,873,350.00	
	Total A (1.1.1.a + 1.2.1) =					97,124,065.65	
	Total B (1.2.3 to 1.2.8) =					16,728,008.00	
2	SERVICES						
2.1	Internal water supply & sanitary installations	% of A			@ 15%	14,568,609.85	
2.2	External service connections	% of A			@ 5%	4,856,203.28	
2.3	Internal Electrical Installation	% of A			@ 12.5%	12,140,508.21	
2.4	Extras for						
2.4.1	Data network conduits	% of A			@ 0.5%	485,620.33	
2.4.2	Power wiring & plugs	% of A			@ 4%	3,884,962.63	
2.4.3	Telephone conduits	% of A			@ 0.5%	485,620.33	
2.5	Lightning conductors						
2.5.1	Upto 4 storeyed building	% of A			@ 0.5%	485,620.33	
	Total C (2.1 to 2.5.1) =					36,907,144.95	
	Grand Total E = A+B+C					150,780,218.60	

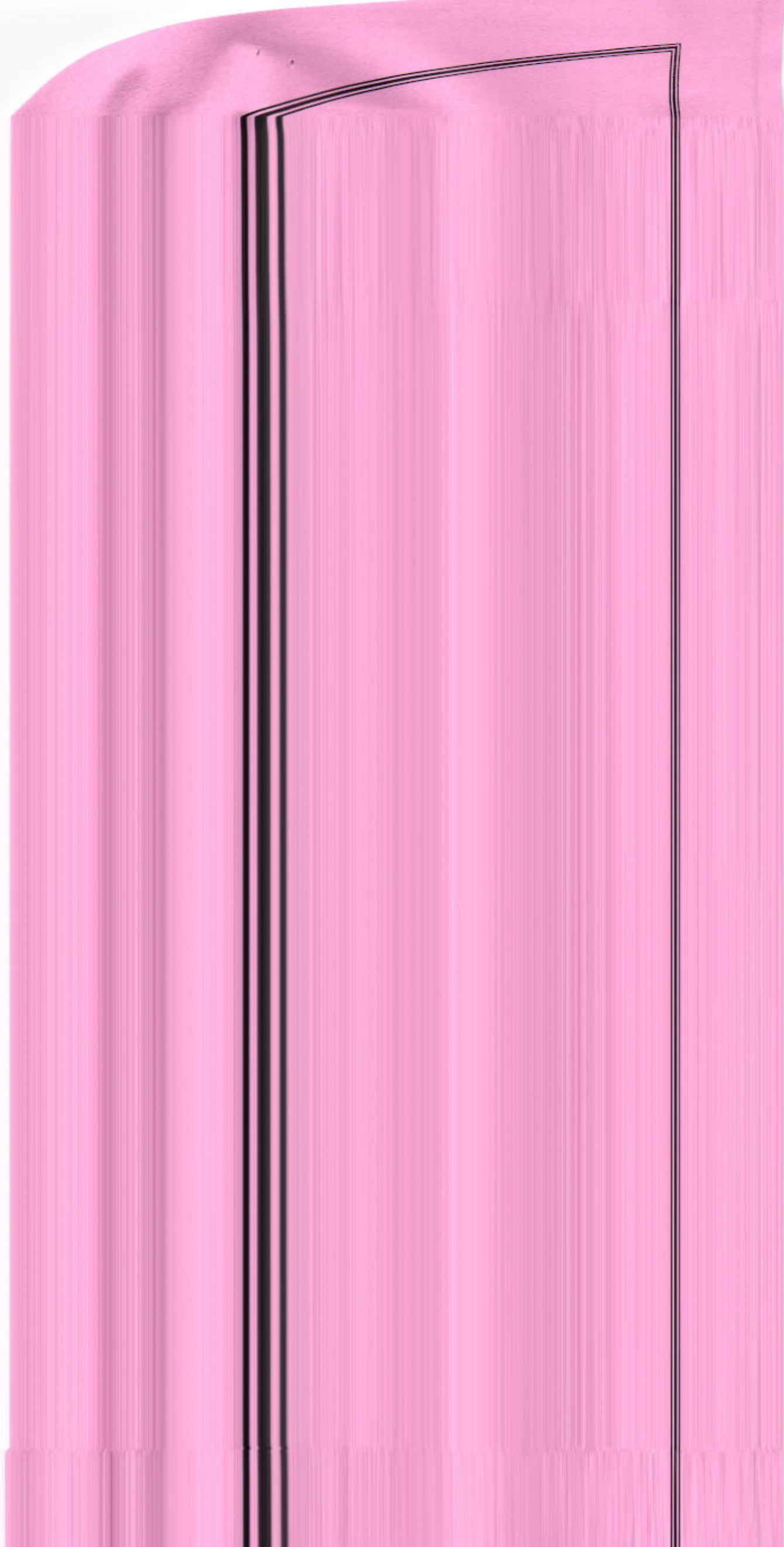
OTHER BUILDING EXPENSES

Annexure-1

S. No.	Description	Unit	Quantity	Rate	Amount (INR)	Explanation
1	2	3	4	5	6	7
Richter Specifications						
1	Wooden Flooring	sqm	273.72	11,850.00	3,246,319.20	On stage
2	Carpet -	sqm	935.00	2,058.61	1,924,800.35	Rates derived from preliminary estimate of auditorium submitted in 2007
3	Chairs	No.	800.00	5,800.00	4,640,000.00	
4	False ceiling & panelling					
4.1	Acoustic tiles for lobby (600x600) 0.9 NRC	sqm	306.60	2,282.24	699,734.78	Market rate analysis of Anutone ceiling for 0.9 & 0.7 NRC
4.2	Acoustic ceiling for hall	sqm	1,208.72	3,847.44	4,650,477.68	
4.3	Wall panelling	sqm	1,058.00	5,318.99	5,625,375.42	
5	PA system				1,250,000.00	
6	Stage lighting				3,000,000.00	Rates considered from acoustic report of auditorium submitted in 2007
7	Sound reinforcement system				10,000,000.00	
8	Video presentation system				10,500,000.00	
	Total				45,537,006.40	

Cost of Airconditioning					Annexure-2
S.No.	Building	Unit	Area	Refrigeration Provided @ 1 TR/100sq.ft	Cost @ 95,000/ TR
1	2	3	4	5	6
	AC areas	Sqm.	2,082.91	224.20	21,299,421.08

AREA CALCULATION		Annexure-3		
		Building block/ Function		
		Convention centre		
		Covered Area (sqm)	Additional Area (sqm)	Plinth Area $1(a)+1(b)$ (sqm)
S.NO.		1 (a)	1(b)	1(c)
1	Ground Floor	3,052.80	125.20	3,178.00
2	First floor	568.70	-	568.70
3	Total Area	3,621.50	125.20	3,746.70
4	Total Ground Coverage	3,191.78 sq.m		



ANNEXURE-B

Introduction

Punjab Technical University is a growth oriented University established by the Government of Punjab as an affiliating and teaching University to facilitate and promote studies, research and extension work with a focus on professional education in emerging areas of higher education in the fields of Engineering, Technology, Management, Medicine, Pharmacy, Nursing, Education and Law etc. In a brief span of existence, the University has made a significant progress and has multiplied its activities, manifold. In its endeavor to impart education from high school level upto engineering degree level it has been decided to construct campuses in different parts of Punjab under PTU. The campuses at Arniwala & Sikhwala are among such campuses.

The campus at Arniwala & Sikhwala are to become cohesive and an integrated unit, construction of the required infra-structural facilities like academic functions, students and staff accommodation, playing fields etc. on plots measuring about 12.27 acres at Arniwala and 13.3 acres at Sikhwala.

Phase I for PIT Arniwala & Sikhwala

Phase I of the project consists of a college building of G+1 floors with an approximate area of 3,700 sq. mts.. These proposed college buildings will house classrooms, labs, tutorial, and seminar hall & faculty rooms.

Since the area constructed in current phase is only 8% of the total F.A.R available, hence designing of services on modular basis is not a feasible & viable solution which is evident from the reports attached.

Finlshing works:

The salient features of various provisions are as under:

Flooring:-

Main entrance	Kota stone flooring with marble pattern
Circulation	Kota stone
Rooms	Kota Stone
Toilets	Vitrified Tiles
Staircases	Kota stones

Doors and windows: - Door frames shall be in Pressed Steel sections with flush door shutters. Windows shall be of Aluminum frames and shutters as per architectural drawings. Structural glazing has been provided at places in the elevation. Fittings shall be of aluminum as per architectural drawings/specifications.

Staircase Railing: Mild Steel railing finished with approved synthetic enamel has been proposed.

Toilets: Matt finish ceramic tiles dado up to door level height, vitreous china WC, wash basin and urinals as/ requirement.

Roofing: - Terrace shall have brick coba treatment with polyurethane insulation.

False ceiling: - Proposed in the Seminar Hall and partially in classrooms for acoustical treatment.

Internal Finishing: Cement plaster, oil bound distempers, Plastic emulsion and acrylic emulsion paint with POP, doors shall be enamel painted. Corridors will have 4 ft. high ceramic tile cladding.

External Finishing:

Arniwala- Exposed concrete finish in architectural features, Weather proof paint, grooves in plaster, Red sandstone cill in windows.

Sikhwala- Texture paint in architectural features, Weather proof paint, grooves in plaster, Red sandstone cill in windows.

This report is submitted for accord of Administrative approval of the design basis for Electrical, plumbing, Firefighting & HVAC services in the building.

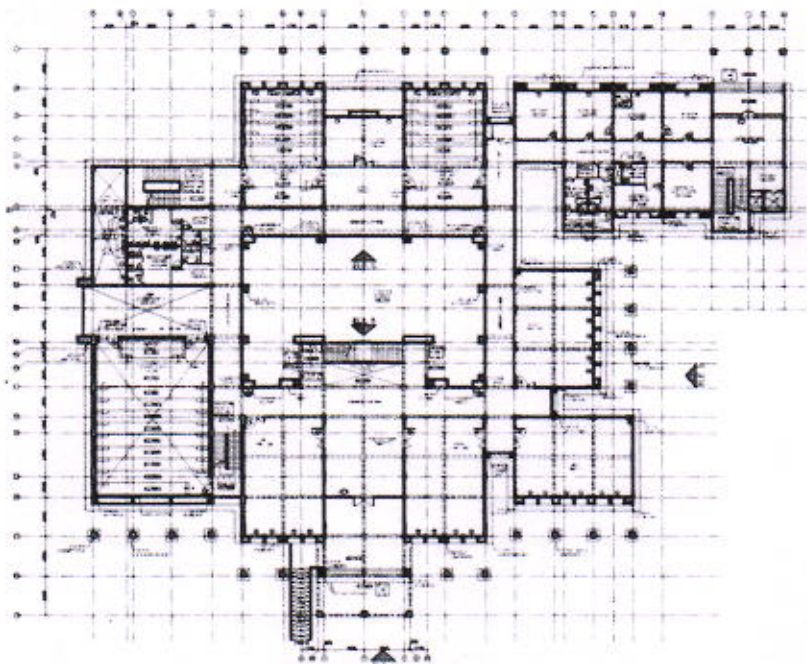
DESIGN BASIS REPORT FOR STRUCTURE FOR PIT- ARNIWALA

Type of Buildings: - RCC framed structure.
The proposed building is Ground+1 storey.

1.0 Structural Design:-

The main considerations followed for the design of structure are:

- (a) Structure safety and stability.
- (b) To meet the demands of aesthetics conceived by the architect.
- (c) Availability of material, equipment and expertise.
- (d) Constructability and ease of maintenance.
- (e) Durability.
- (f) Economy.



2.0 Structural System:

All the Buildings have been designed as RCC framed structure with RCC slab, beams and columns. The buildings has been designed as slab beam arrangement in accordance with the relevant Indian

Code of Practice for civil works i.e. IS: 456, IS: 875, IS: 1893-2002, IS: 4326-1976 and IS -13920-1993.

2.1 Design Approach:

Structural Modeling: Three dimensional model of building will be generated using STAAD- Pro software. All the beams and columns have been idealized as beam elements. The structure is analyzed and designed for all possible combinations of gravity loads (dead & live loads), and lateral loads (earthquake loads). Fatigue effects of persistent cyclic loads are not anticipated therefore ignored, if any.

2.2 Foundation System:-

Isolated/combined footings are proposed for the Phase-1. The net soil bearing capacity for isolated/combined foundation is considered 15.0 t/sqm at a depth of 2 m below NGL. The settlement of 50 mm has been considered in the design of isolated/combined footings.

3.0 Computer Programs Used:

Name	Purpose	Producer
STAAD Pro	Structural and Design Analysis	BENTLEY
AUTOCAD	Drafting Works	Autodesk

4.0 Material Dead Loads:

All the permanent loads on the structure are applied as dead load. The dead load in a building shall comprise of self weight of beams, columns, walls, partitions, floors, roofs and also include the weight of all other permanent constructions in the building and shall conform to IS: 1911-Schedule of unit weights of buildings materials. Unit weight of various materials considered on the structural members is as follows:

S.No.	Item	Density
1	Concrete	2.50 T/m ³
2	115mm Brick Work with 25mm Plaster	0.275 T/m ²
3	230mm Brick Work with 25mm Plaster	0.50 T/ m ²

Following loads has been considered in structure for analysis:-

- I. Self wt of structure
- II. Slab thickness and floor finish – as per actual
- III. Wall loads – as per actual

5.0 LIVE LOAD:

Live loads on the entire floor shall comprise all loads other than dead loads. The minimum live loads on different occupancies have been considered as per IS: 875 (Part 2).

Live load shall be considered in design as per Table 1 of IS: 875 (Part 2)-1987 as follows:

5.1 Educational Building:

(a)	Class rooms & Lecture rooms	0.4 T / m ²
(b)	Cafeteria	0.3 T / m ²
(c)	Office and Staffrooms	0.25T / m ²
(d)	Toilets and bathrooms	0.2 T / m ²
(e)	Kitchen, Laboratories	0.3T / m ²
(f)	Corridors, passages, staircases including Fire escapes, lobbies, balconies	0.5T / m ²
(g)	Libraries	
	i) Reading rooms (without separate Storage)	0.4T / m ²
	ii) Reading rooms (with separate Storage)	0.3T / m ²
(g)	Terrace	0.15 T / m ² 0.50 T/m ² usable Terrace for services

6.0 Seismic Load:

Response spectrum method was used as code with the following data:

$$\text{Design horizontal seismic coefficient (Ah)} = \frac{Z I S_a}{2R_g}$$

Zone factor $Z = 0.24$ corresponding to zone IV.

Importance factor $I = 1.5$

Response reduction factor $R = 5$

(S_a/g) = Curve given for medium soil

T = Time period = $0.075 (h)^{0.75}$

h = Height of building from foundation Level

7.0 Materials

Concrete: -

Concrete mix of M25 conforming with IS: 456 and CPWD specifications are used.

Steel Reinforcement: -

Fe 500 Grade (TMT - bars) conforming with IS: 1786.

Structural steel: -

$(F_y 250 / F_y 345) \text{ N/mm}^2$

8.0 Design Limit States

The Limit state design method is used for the structural design of concrete member. For design of the individual members loads are combined in accordance with the loading combinations specified in IS 875 to achieve the respective limit state. These are listed below:

S. No.	Dead Load	Live Load	Earthquake/ Wind load
--------	-----------	-----------	--------------------------

1	1.5	1.5	-
2	1.2	1.2	1.2
3	1.5	-	1.5
4	0.9		1.5

9.0 LOAD COMBINATIONS:

1. $1.5^* (DL + LL)$
2. $1.5^* (DL +/- EQX)$
3. $1.5^* (DL +/- EQZ)$
4. $0.9^* DL +/- 1.5EQ$
5. $0.9^* DL +/- 1.5EQZ$
6. $1.2^* (DL + LL +/- EQX)$
7. $1.2^* (DL + LL +/- EQZ)$

For non orthogonal Columns following additional load combination has been used in the design.

14. $1.2(DL + LL +/- EQX +/- 0.30EQZ)$
15. $1.2(DL + LL +/- EQZ +/- 0.30EQX)$
16. $1.5(DL +/- EQX +/- 0.30EQZ)$
17. $1.5(DL +/- EQZ +/- 0.30EQX)$
18. $\{0.9DL\} + 1.5\{+/-EQX +/- 0.30EQZ\}$
19. $\{0.9DL\} + 1.5\{+/-EQZ +/- 0.30EQX\}$

Notations

DL	=	Dead Load
LL	=	Live Load
RLL	=	Reduced Live Load
EQX	=	Earthquake Load in X-direction
EQZ	=	Earthquake Load in Z-direction

Whereas X & Z are two principal axes.

10.0 Requirements for Durability and Fire

Concrete cover requirements is governed by Indian Code. The values in the following table are appropriate for a fire rating of 2 hours.

The following classification also applies in the design of structural elements:

Exposure	Classification
Members in contact with the ground	Very Severe
Members in interior environments	Mild
Members in above-ground exterior environments	Moderate

In general, adopting the minimum concrete strengths and reinforcement covers will ensure the durability and fire resistance of concrete elements. Values shown on the drawings shall not be less than the following:

Element/Location	Minimum Cover (mm)	Minimum Thickness (mm)	Minimum Concrete Design (used in the design)
Cast In Place Concrete			
1. Concrete cast against and permanently exposed to earth	75	200	M25
2. Concrete exposed to weather and not in contact with ground (moderate)			
a.) RC slabs	25	125	M25
b.) RC walls	25	200	M25
c.) RC beams	30	230	M25
d.) RC columns	40	230	M25

11.0 Design Codes, Standards and Reference Documents

11.1 Codes, Standards and Commentaries

S. No.	CODE	NAME
1	IS: 1893 – 2002	Criteria for Earthquake resistant design of Structures
2	IS: 13920	Ductile detailing of Reinforced Concrete Structures subjected to Seismic forces.
3	IS: 4326 – 1993	Earthquake resistant Design and construction of Buildings
4	IS: 875 – 1987 (Part I to III & Part V)	Code and Practice for Design Loads (Other than earthquake) for Building and Structures like Dead, Imposed, Wind and other Loads
5	IS: 456 – 2000	Plain and Reinforced Concrete (Code of practice)
6	SP: 16	Design aids for Reinforced concrete Structure.
7	SP: 34	Handbook on Concrete Reinforcement and Detailing
8	IS: 3370 Part I, Part II and Part IV	Code of practice for Concrete structures for the storage of liquids.
9	IS: 1786	Specification for High Strength Deformed Steel bars and wires for concrete reinforcement
10	IS: 1904	Code and Practice for design and Construction of Foundations in Soils
11	IS: 2950	Code and Practice for Design and Construction of Raft Foundations
12	IS: 800-1984	Code of Practice for general Construction in Steel.
13	IS: 1343-1980	Code of Practice for Prestressed Concrete.

12.0 Design References and Hand Books:

S.No.	Name of Book	Author
1	Reinforced Concrete Design	W.H.Mosley
2	Foundation Analysis & Design (4th Edition)	Bowles
3	Foundation Design and Construction	Tomlinson
4	Concrete Structures	Warner, Rangan, Hall & Faulkes (Longman, 1998)
5	Reinforced Concrete Designers Handbook	Fourth Edition, Reynolds & Steedman
6	Reinforced Concrete Design (Second Edition)	S Unnikrishna Pillai, Devdas Menon
7	Reinforced Concrete	S. N. Sinha
8	Reinforced Concrete	O. P. Jain
9	Design of steel structure	P. Dayaratnam
10	Prestress Concrete Structure	P. Dayaratnam
11	Handbook of concrete, Engineering	Mark Fintel
12	Properties of concrete	A.M.Neville
13	Dynamic of Structures: Theory and Application to Earthquake Engineering	Anil K. Chopra
14	Tall building structures: Analysis and design	B.S.Smith & Caull
15	Structural Analysis	C.S.Reddy

DESIGN BASIS REPORT FOR PHASE-I ELECTRICAL INSTALLATION
WORKS FOR PIT, ARNIWALA & SIKHWALA

OBJECTIVES

The objective of this report is to present the design considerations for various elements of the electrical systems and low voltage systems like Electronic Fire Detection, provisions only for Voice & Data Networks, Public Address and Electronic Security systems. This will form a basis for the process of development and approval of the final design for electrical systems to suit the client's brief, purpose and budget before final preparation of design, tenders and Schedules of Quantities.

The intent will be to provide a robust, reliable and safe electrical power distribution system based on principles of ready-to-use energy efficient practices and clean energy technologies wherever feasible, and to ensure an easy-to-maintain, cost effective and flexible system in line with the best available in local and international markets.

STANDARDS + CODES

All aspects of design shall conform to relevant portions of the following:

- National Building Code of India 2005
- Energy Conservation Building Code 2007
- Bureau of Indian Standards
- International Electro technical Commission
- CPWD General Specifications for Electrical Works (Internal) 2005

The electrical load requirement for lighting and small power (e.g. computers, servers, photocopiers, scanners, faxes and other lab equipment's), HVAC load have been estimated empirically based on the areas proposed and considering the approximate load for External Lighting & Plumbing for phase-I. The conclusions have been tabulated below, while the details for individual buildings are listed later.

SUMMARY OF ELECTRICAL LOADS AT PIT ARNIWALA & SIKHWALA					
S. No.	Description	Connected Load (KW)	Diversity	Maximum Demand Load (KW)	Emergency Load (KW)
1	College building				
i	Light load	34.76	0.70	24.33	6.61
ii	Power load	40.40	0.50	20.20	7.50
2)	Air conditioning				
i	Seminar Hall for 28.7 tonns	40.00	0.50	20.00	20.00
ii	Office area for 15 tonns	25.00	0.70	17.50	
3	External Development Including borewell	25.00	0.50	12.50	3.13
4	Sewerage Treatment Plant	5.00	0.50	2.50	
	Total	170.16		97.03	37.24
Transformer Capacity:					
Adopting over all diversity factor 0.9, Maximum Demand in K.W				87.33	33.51
As the maximum demand load comes out to be less than 100 KW, LT connection of 90 KW will be demanded from the SEB/authority					
DG Set Capacity					
Adopting over all diversity factor 0.9, Maximum Demand in K.W			=	33.51	
Adopting DG Set loading 0.8 and Power factor 0.8					
DG Set Capacity works out to be			=	52.36	
Selection of DG SET for college building			1x 50 KVA		

DESIGN CONSIDERATIONS

This is covered under the following subheads:

Subhead A	Substation & Power Distribution Plan.
Subhead B	Point Wiring
Subhead C	Illumination system
Subhead D	LV Services: Voice, Data, & Security System
Subhead E	External Development (Electrical) Substation & Power Distribution Plan, Lighting & Fan

SUBHEAD A- Substation & Power Distribution Plan

In Phase I, the LT connection of 90 KW meter for 0.433kV LT supply will be installed and commissioned at the entry of the site. LT connection will feed phase-I i.e college building-1 & external development for phase-I

As the load increases than 100 KW connection for HT metering will be applied to PSEB/authority & based on the load 11 KV substation will be installed, keeping in mind space provisioning for the 11 KV substation has been done with the consultation of the architect.

A.1. D.G Sets and Power Back-up Facilities

It is proposed to back-up power for generators for the following:

- 50% of AC load in Seminar hall load is being considered on generator back-up
- For other buildings, 25% of lighting, fans and small power is being considered on generator back up

It is therefore proposed to have a final configuration of **1 no. 50kVA D.G. Set**. For Phase – I now we would suggest 1nos 50kVA D.G. Sets be installed and the remaining set will be installed later as the load increases in next phase. The DG set will be provided with individual AMF panel for automatic starting in case of power failure. It is not intended to either synchronize the sets or share the loads in future for smaller DG sets. There will be a manual selection of sets to run for various load conditions. The AMF panels will also be supplied with manual override facilities.

It is proposed to locate the set on ground floor level so that servicing, operation and maintenance is consolidated for more efficiency. The sets would be located in open

Cables

All wires shall be PVC insulated FRZHS with copper conductor. All conduits will be PVC and MS conduits will be provided in the basement and on places subject to mechanical damage.

A.3. Earthing Systems

Earthing system including earthing strips/cables and earth pits will be provided.

It is proposed to provide electrolytic, chemical earthing system. This type of earthing system has:

- Low electrical resistance to earth
- Good Corrosion resistance
- Ability to carry high currents repeatedly
- Reliable long life system
- Low Maintenance

Main earth electrode will be suitable to achieve a maximum resistance to earth of 1 Ohm.

Proper Grounding will be provided for

- Normal AC supply
- All apparatus and metal pieces
- Each laboratory

Separate systems of earthing shall be provided in the building for:

- UPS/Inverter
- Telephone / EPABX
- Servers and computer
- AV Systems

SUBHEAD B- Point Wiring

Point wiring shall be carried out using Fire Resistant (FR) grade PVC insulated wire with multi-stranded copper conductors carried in Medium/heavy duty PVC conduit. Switches proposed to be used are contemporary modular type switches

Cables

All wires shall be PVC insulated FRZHLs with copper conductor. All conduits will be PVC and MS conduits will be provided in the basement and on places subject to mechanical damage.

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Earthing system including earthing strips/cables and earth pits will be provided.

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- Telephone / EPABX
- Servers and computer
- AV Systems

SUBHEAD B- Point Wiring

Point wiring shall be carried out using Fire Resistant (FR) grade PVC insulated wire with multi-stranded copper conductors carried in Medium/heavy duty PVC conduit. Switches proposed to be used are contemporary modular type switches

There shall be separate DBs for "Normal" power (which will feed the power outlets and some lights) and for "Emergency" power (which will lead 25% of fans and lights)

SUBHEAD C- Point Wiring

The provision of luminaries in various areas of the building to be designed to achieve the illumination levels as per relevant standards and site requirement. The luminaries will be selected keeping in mind Aesthetics, location requirement, ease of maintenance and energy conservation.

S. No.	Description of Space	Type of Lighting	Illumination (LUX Level)
i)	Corridors and circulation spaces	CFL/T5	100-150
ii)	Toilets	CFL	100-150
iii)	Staircases	CFL	100-150
iv)	Office Areas	T5	300-500
v)	Service Areas	T5 Lamps	150-300
vi)	Terrace & External Lighting	MH/CFL Lamps	20

CFL will be the preferred source of light for maximum lumen/ watt package. Fittings with conversion efficiencies of 65% and above are selected for areas requiring 300 lux and above. Suitable mirror optic louvers have considered minimizing the cut-off angle of direct light incident on the screens. Compact fluorescent light has been selected for corridors and lobbies as they are the highest usage areas.

Fans will be provided for all rooms - including rooms with AC.

C.1. Telephone System, Cable TV and Internet Net Work

Telephone wiring connections are proposed to be provided in the offices, labs, seminar halls. Telephone, Data/Internet points will also be provided in the office areas. All the voice points will be connected through telephone cable from the MDF. All the tag blocks in turn shall be connected to the main tag block located in the LV room. Only conduits for 2 Pairs telephone wires, internet. Provision for signal boosters will also be made as per the requirement of the various service providers.

C.2. Security System

Provision for installing a CCTV system would be made to monitor the Main Entries & Exits of the building. The system itself – the cameras, monitors and cabling - will not be included in the scope of design and execution as it would be best to be integrated at

the time of commissioning and handing over.

SUBHEAD D- External Development

External lighting would be designed for in a manner to ensure the security of people at various hours on all roads, pedestrian paths. In addition lighting for the landscaped areas would be integrated so that the luminaries blend and contribute to the aesthetic nature of the landscape design. Particular care would be taken to minimize upward spill of light to ensure compliance with "Night Sky" criterion.

Lamp sources with maximum efficiency and high colour rendering index would be selected. For larger lumen packages Metal Halide (MH) lamps would be used, for medium level requirements CFLs would be used.

**DESIGN BASIS REPORT FOR PHASE-I SANITARY ENGINEERING AND
FIRE FIGHTING SERVICES FOR PIT, ARNIWALA & SIKHWALA**

1.0 INTRODUCTION

- 1.1 Water supply and wastewater disposal constitute a very important part of the services in a building. Maintenance of hygiene and cleanliness are indispensable to the wellbeing of the occupants as a whole.
- 1.2 This report intends to highlight the details of the following proposed services, which are to be provided from the point of view of Sanitary Engineering, Fire Fighting and other allied services.
 - Water Supply System
 - Wastewater Disposal System
 - Sewerage and drainage system including disposal
 - Sewage Treatment Plant and Recycling of Waste Water
 - Rain Water Harvesting
 - Firefighting system
- 1.3 It is proposed to design the services, storage capacities and piping network of the buildings in totality.

2.0 WATER SUPPLY SYSTEM

2.1 **Total Water Requirement Calculation:** The consolidated and distributed water requirement as per I.S. specifications and Govt. manuals for phase I shall be as below:

Punjab Institute of Technology ,Arniwala & Sikhwala-Calculation for Dally Water Requirement						
S. No.	Type of Building	Occupancy	Water Requirement (LPCD)	Total Water Requirement (LPD)	Water Requirement For Domestic (LPD) @40%	Water Requirement For Flushing (LPD) @60%
PHASE-I						
A	COLLEGE BUILDING - 1					
1	Students	240	45	10,800	4,320	6,480
2	Teachers	25	45	1,125	450	675
3	Technical Staff	5	45	225	90	135
4	Support Staff	5	45	225	90	135
5	IV Class Staff	5	45	225	90	135
6	Laboratory Requirement	L.S		4,000	4,000	
	Total (Phase-1)	280		16,600	9,040	7,560

2.2 Source of Water

2.2.1 Since municipal water supply does not exist in the vicinity of project site it will be necessary to develop own infrastructure to fulfill the entire requirement. It is proposed to meet the total water requirement for the campus by other source / external supply such as bore wells etc. Two nos. bore wells (1 working+1standby) having a discharge of 18000 lph for operating 2-3 hours operated manually should be provided to fulfill the requirement.

2.2.2 However, it is also proposed to design a sewage treatment plant in such a way that effluent will be recycled for horticulture purpose only.

2.3 Storage

Since the water requirement is only 17KL, therefore underground tank has not been considered for phase I building.

Overhead tank capacity for 1 day storage has been considered.

2.4 Quality of Water Supply

Since, the water will be required for different purposes i.e. for drinking, cooking, in laboratories in the toilets etc., it has to be of a required standard quality. The exact treatment of water will be suggested after getting the bore well water test report for potability which will be provided by PTU.

3. MATERIALS FOR WATER SUPPLY

- All the external pipes to be used for water supply shall be Ductile Iron (DI) / Galvanized steel tubes confirming to I.S.1239 medium class of superior quality. Fittings shall be malleable iron/brass as applicable. For pipes above 80mm dia, Ductile Iron pipes will be used.
- For internal works, the pipes running on the terrace, shaft are proposed to be G.I pipe and in the wall chases to the various fixtures of CPVC pipes.
- Valves on branches, main line and pumps shall have ball valve / butterfly valve of good approved quality, as per requirement.

4. Soil, Waste, Vent & Rain Water Disposal Pipe System

- The system will be designed based on two pipes (stack) system as recommended in code of practice for soil and waste pipes above ground (I.S. 5329 - 1964).
- Minimum diameter of pipes shall be adopted as:

▪ All main soil pipes	- -	100mm
▪ All branch soil pipes	- -	100mm
▪ All main waste pipes	- -	100mm
▪ All branch waste pipes	- -	50mm
▪ All main soil and waste pipes stack	- -	150mm
▪ Wash basin/Sink waste connection to floor trap	- -	32/40/50mm

- Rain water pipes -- min 150mm
- All soil, waste, vent & rain water pipes running vertically, shall be exposed and approachable, in vertical shafts as per architectural design.
- Each connection from the fixtures shall be provided with access doors for cleaning (door junctions).
- All traps shall be with a minimum water seal of 50mm.

Materials

- (a) All soil, waste, vent and anti-syphonage pipes and fittings 50mm and above shall be CI centrifugally cast.
- No clean out plugs provided as/ the decision of PTU on previous PIT projects.

5. SEWERAGE SYSTEM

- Soil waste from water closets and urinals etc. will be collected by horizontal and vertical soil pipes and discharged directly to the manholes. Waste water from wash basins, sinks, and from other waste fixtures shall be collected separately by waste pipes and discharged through gully traps into the manhole of the external sewerage system.

The external sewerage system shall be running around the building periphery having manholes in front of each shaft. The main sewer line will carry the whole sewage by gravity up to the Sewage Treatment Plant.

Capacity of S.T.P:

Phase-1 - 15 KLD

1

5.1 Sewage Treatment Plant

It is proposed to treat the domestic sewage in a scientific manner through a properly planned sewage treatment plant. The objective is to stabilize the decomposable organic matters present in sewage so as to get an effluent and sludge having characteristics which are within safe limits, and which can be recycled and re-utilized for various purposes to help in maintaining the ecology of nature and save energy resources. The treatment process for sewage/effluent and the location of the final waste water disposal shall be based on the following considerations:

- Use of Treated Sewage.
- Aesthetics of the area and nearby inhabitation.
- Wind direction
- Availability of suitable land.
- Initial Cost of the system
- Recurring Cost of the system.

5.1.1 Salient Features of STP

(A) Characteristics of Influent

- | | | |
|-----------------------------------|----|-----------|
| • B.O.D (5 days at 20°C) (mg/lit) | -- | 250 – 300 |
| • Suspended solids (mg/lit) | -- | 400 – 600 |
| • PH | -- | 6.5 – 8.5 |

(B) Characteristic of Effluent (after treatment)

- B.O.D (5 days 20°C) (mg/lit) less than 20mg/lit.
- Suspended solids mg/lit less than 30mg/li

The technology suggested to be used for Sewage treatment will be M.S fabricated FAB type. The equalization tank, treated water tank will be underground constructed in R.C.C and the other parts of the equipments will be fabricated in M.S.

5.1.2 PROCESS DESCRIPTION: FAB Process

Sewage generated from the building will reach the last manhole of trunk sewer line from where it shall be passed through a bar screen of suitable size before entering the equalization cum collection tank. There shall be suitable arrangement for cleaning and lifting the coarse material from the platform near the screen chamber.

From equalization tank the sewage shall be lifted through submersible automatic control pumps into FAB aeration tanks. The equalization tank shall also have provision of the aeration system to keep the sewage in the homogeneous condition.

In the FAB aeration tank of required capacity wastewater will be mixed with microorganisms in presence of dissolved oxygen. Microorganisms will assimilate organic impurities. The FAB aeration tank will be supplied through two positive displacements (roots type) air blowers (1 working + 1 standby) located outside

the tank. Submerged air diffusers will provide mixing and oxygen for the needs of microorganisms. The blowers will be sized to maintain dissolved oxygen level in the aeration tank of approximately 2 mg/lit.

From the FAB aeration tank mixed liquor will flow by gravity into adjoining Tube/Plate Settler of required capacity. The solids will settle in the tube/plate settler tank. A sludge return pump will be provided for pumping the settled sludge from the tube/plate settler tank back to the aeration tank. Tube/Plate settler tank will also be provided with skimmer system to pump floating scum back to the aeration tank to keep the plate settler surface clean.

An overflow weir with scum baffle will be provided in plate settler to take treated wastewater out of the plate/tube settler.

From the plate/tube settler, treated wastewater will flow by gravity into chlorine contact tank where chlorine will be added to the water for disinfection. From this tank the water will be lifted with a submersible pump and passed through a pressure sand filter and an activated carbon filter and stored in the flushing water tank. The water will also be softened and stored in the soft water tank. Water from these tanks will be further used for Flushing and Horticulture purpose. In case of extra effluent the arrangement shall be made to dispose off into municipal sewer.

Excess sludge from the tube/plate settler tank will be taken periodically into sludge holding tank. In this tank sludge will be aerated for self-stabilization. Air will be shut off periodically and supernatant water will be transferred to the aeration tank creating stabilized sludge. This stabilized sludge shall be dried in filter presses and carted off for disposal or for further use for horticulture purposes. The stabilized sludge shall be lifted from tank into the tanker for outside transportation

6. DESIGN PARAMETERS

The following parameters shall be considered for design of sewerage system:

- | | | |
|-------|--|----------------------|
| (i) | Flow of sewage | 0.8 of water Supply) |
| (ii) | Peak Flow | 3 x average flow |
| (iii) | Min. velocity of flow in pipes flowing half full | 0.75 m/sec |

- (iv) Max Velocity of flow 2.0 m/sec.
- (v) Min. depth for sewers 0.9m
- (vi) Infiltration Factor Add 8.33% of average discharge

(For surface run off, subsoil water conditions etc.)

- (vii) Formula for calculation for design of sewer lines shall be by Manning's formula:

$$V = S^{1/3} R^{2/3} \frac{1}{n}$$

Where,

- V = Velocity in m/sec.
 R = Hydraulic radius in m
 S = Slope or hydraulic gradient in m/m
 n = Manning's co-efficient

- (viii) Manning's co-efficient $n = 0.015$

6.3 Appurtenances & Materials' Specifications

6.3.1 Pipes

(a) S.W. Pipes

For dia 150mm to 250mm Grade 'A' as per IS: 651 depending on site conditions with laying and jointing and bedding as per IS: 4127-1983

(b) R.C.C. Pipes Class NP2

For dia 250mm and above as per IS: 458, for normal slopes and general site conditions.

(c) R.C.C. Pipes Class NP3

For road crossings, for heavy loading conditions as per IS:458.

All R.C.C. pipes shall be laid as per IS: 873 - 1985 and as per "Manual on Sewerage and Sewage Treatment" by Ministry of Urban Development, New Delhi.

(d) C.I. Pipes Class LA

For steep slopes and exposed pipe as per IS: 1536.

6.3.2 Manholes

- (a) The manholes shall be constructed of brick masonry as per standard specifications of National Building Code.
- (b) Minimum Depths of Manhole - 0.9m
- (c) Spacing
 - (i) Manholes shall be provided at all junctions, change of directions, and change in diameters, as per connection requirement.
 - (ii) A distance of 30 metres on the main trunk sewer lines, depending on dia. of pipe and local conditions.
- (d) Manhole Covers
 - (i) Medium/heavy duty for manholes.

7. RAIN WATER DISPOSAL

7.1 Roof Drainage:

Vertical rain water pipes provided as per requirement and will collect the rainwater pipe through khurrahs and this will discharge into masonry storm water drains with SFRC Covers or Piping cum manhole storm water drainage system.

Drainage system shall be designed on the parameters setup by the metrology department and various statutory codes. Rooftop rainwater is generally clean does not require any pretreatment before discharging into Rain water Harvesting wells. Rain water from roof shall first be discharged into the harvesting wells and excess water from the wells shall overflow into the surface drain.

8.2 Surface Drainage:

Arniwala

Surface drainage consisting of surface drains and underground storm water disposal pipes will be provided so that there is no accumulation of rain water.

Before discharging into rain water harvesting wells bar screens and silt traps will be incorporated to remove the silt, heavier particles and other objectionable material which can cause choking of the percolation well. Surface rain water separately collected in the external masonry storm water drains with SFRC Covers or Piping cum manhole storm water drainage system and discharge into the rain water harvesting chamber.

The final disposal of the rain water collected from the overflow of the rain water harvesting system will be in the proposed retention basin. In case of over flooding of storm water in the basin, one of the following systems can be adopted:

1. Bio swale (as elaborated in 8.2.1)
2. Pumping the water to the reservoir at water works site
3. Pumping the water to the drain along the main road

Sikhwala

The level of site is 1.5m down from the main road level of that area. Also, as per soil test report, sub-soil water was at a depth of 1.2 m below natural ground level so rain water harvesting system cannot be provided.



8.2.1 Bio swale-

Storm water drainage through Bioswale is proposed.

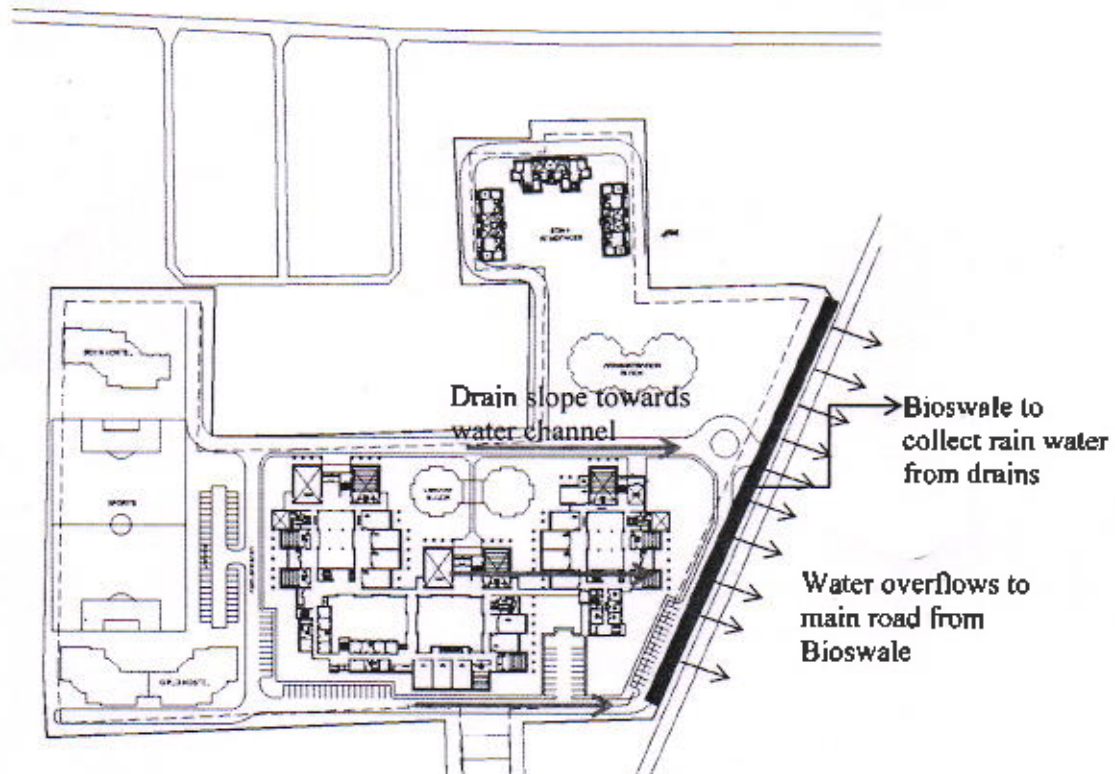
Bioswale are landscape elements designed to remove silt & surface runoff water. They consist of a swaled drainage course with gently sloped sides and filled with vegetation.

Bioswales have four functions for storm water management: collection, conveyance, filtration and infiltration. These four traits reduce and delay peak run off volumes as well as treat storm water quality.

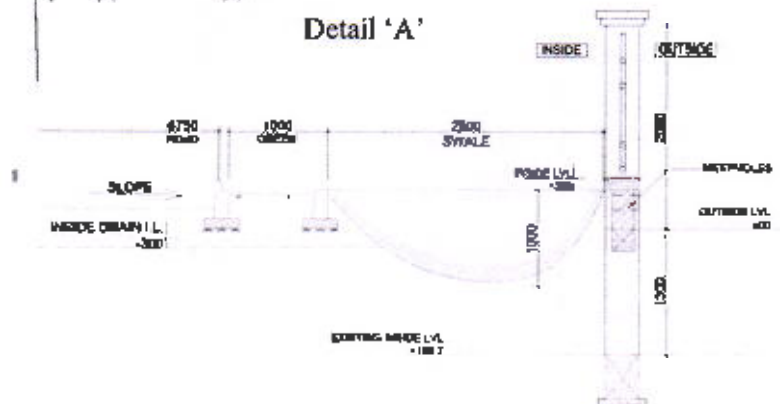
Rain water from buildings, roads & open areas will be channelized by a drainage system sloping towards the bioswales along the main road inside the

site. The overflow from the swale will be spilled onto the main road. (Refer plan & section below).

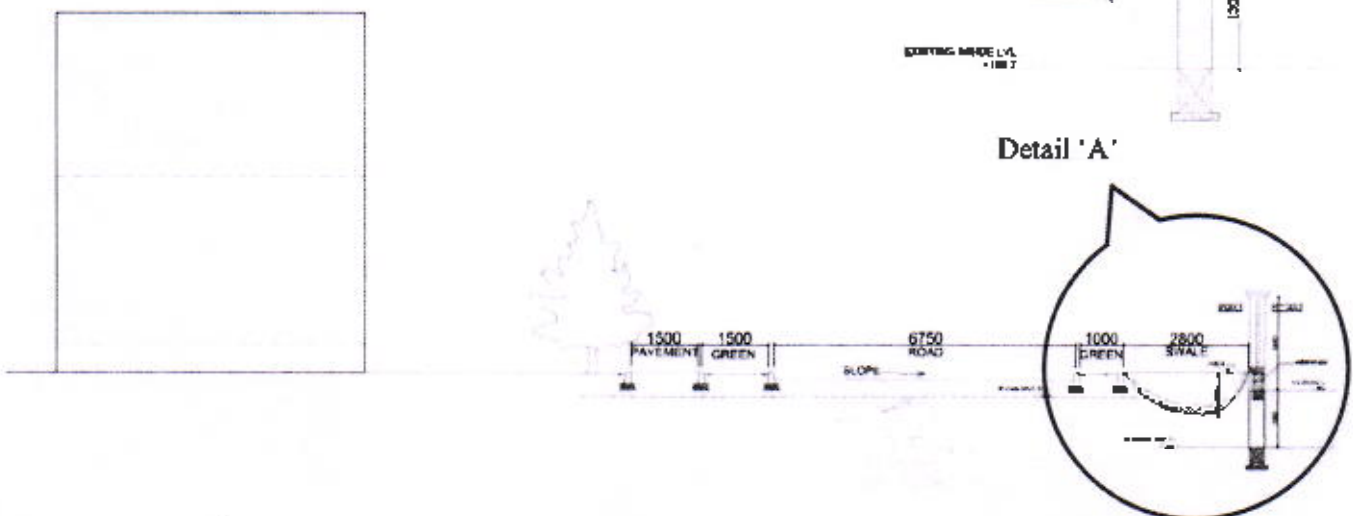
The size of swale has been derived considering maximum rainfall of 30mm/hr.



Detail 'A'



Detail 'A'



8.3 Design/Technical Parameters

8.3 Design/Technical Parameters

8.3.1 Min. velocity of flow in pipes = 0.6 m/sec or as per site

Max Velocity of flow = 2.0 m/sec.
Min. Free board

- a. For drains upto 300 mm width = 75 mm
- b. For drains upto 900 mm width = 150 mm

8.3.2 The run off for designing of drainage = As per Metrological Data

8.3.3 The design of drains is based on Manning's formula, for flow due to gravity

$$V = \frac{1}{n} R^{2/3} S^{1/2}$$

Where V = Velocity in m/sec.
R = Hydraulic mean radius in m
S = Hydraulic gradient in m/metre n =
Manning's co-efficient

8.3.4 Manning's Co-efficient

(a) For R.C.C. pipes n = 0.015

(b) For brick masonry channel with neat coat of cement plaster n = 0.013

IMPORTANT INDIAN STANDARDS PLUMBING & SANITARY WORK TITLE

IS 651-1965	Specification for salt Glazed stoneware pipes and fittings (First revision).
IS 782-1978	Specification for caulking lead.
IS 1172-1971	Code of basic requirements for water supply, drainage and sanitation (revised).
IS 1239-1 968 (Part-I)	Specifications for mild steel tube, tubular and other steel pipe fittings.
IS 1239-1 968 (Part-II)	Specifications for mild steel tube, tubular and other steel pipe fittings.
IS 1537-1 976	Specification for vertically cast iron pressure pipes for water, gas and sewage.
IS 1536-1 976	Specification for centrifugally Cast (Spun) Iron pressure pipes for water, gas and sewage.
IS 1538 (Part 1 to 23)	Specification for Cast Iron fittings for pressure pipes for water, gas and sewage.
IS 1626-1960	AC building pipes, gutters and fittings (Spigot and socket type).
IS 1726-1960	Code for cast iron manhole frame and cover.
IS 1729-1979	Specification for Sand cast iron Spigot and Ventilating pipes, fittings and accessories.
IS 1742-1960	Code of practice for building drainage
IS 2064-1962	Code of practice for selection, installation and maintenance of sanitary appliances.
IS 2065-1963	Code of practice for water supply to buildings.
IS 3114-1965	Code of practice for laying of C.I. Pipes.
IS 3589-1981	Specification for electrically welded steel pipes for water, gas and sewage

IS 3989-1970	Centrifugally cast spun iron and socket soil and ventilating pipe, fittings and accessories.
IS 4111-1967	Code of practice for Ancillary structure in sewerage system.
IS 4127-1 967	Code of Practice for laying glazed stone ware pipe.
IS 4515	Specification for unplasticised PVC pipe fittings.
IS 4985-1 981	Specification for unplasticised PVC pipes for portable water supplies.
IS 1703-1 984	Ball Valves
IS 2548-1 970	Toilet Seat Cover

National building code for water supply, drainage and sanitation Part IX Plumbing services section 1 & 2.

The installation shall also be in conformity with the bye-laws and a requirement of the local authority is so far as these become applicable to the installation. Wherever this specification calls for a higher standard of materials and/or workmanship then those required by any of the above regulations and standards, hence these specifications shall take precedence over the said regulations and standards. Wherever drawings and specifications require something that may violate the regulations, the regulation shall govern.

DESIGN BASIS REPORT FOR PHASE-I FIRE FIGHTING SERVICES FOR PIT, ARNIWALA & SIKHWALA

1.0 INTRODUCTION

Most accidental fires have a small, insignificant beginning, but a terrible ending. They advance rapidly from the incipient stage to a devastating stage and soon go out of control. And fire is no sojourner and travels rapidly to engulf large areas with least delay. The end result is always horrible and needs no further description.

The present objective is to put forth a Fire Protection and Safety Scheme for the campus in conformity with existing standards and practices.

2.0 Details of the building

2.1 The fire fighting will be designed as per the recommendations of the National Building Code of India-Part IV, 2005. The Occupancy wise classification will be as under:

i) Building-Colleges & Workshop

Group-B: Educational Buildings (Less than 15 m in height, 15 m and above but not exceeding 30 m in height)

2.2 Considering that the purpose of the buildings, as well as the height of the structure, it will be necessary to provide a proper and adequate fire fighting system based on the requirements of the National Building Code 2005.

Minimum Requirement for Fire Fighting System as per NBC – 2005 (Table No.-23)

Building-College

Group-B: Educational Buildings (Less than 15 m in height)

S. No.	Description	As Per (NBC)	
1	Fire Extinguisher	Required	Provided
2	Hose Reel	Required	Provided
3	Dry Riser	Not Required	Not Provided

4	Wet Riser	Not Required	Not Provided
5	Down Comer	Not Required	Provided
6	Yard Hydrant	Not Required	Not Provided
7	Automatic Sprinkler System	Not Required	Not Provided
8	Manually Operated Electric Fire Alarm System	Not Required	Not Provided
9	Automatic Detection Alarm System	Not Required	Not Provided
10	Underground Static Water Storage Tank	Not Required	Not Provided
11	Terrace Tank	Required-5 KL	Provided-5KL
12	Pump Near UG Tank	Not Required	Not Provided
13	Pump at Terrace	Required-450 LPM	Provided 450 LPM

2.3 Vertical down comer of 100mm dia M.S. pipes will be taken to provide pressurized water to the single outlet hydrant landing valve on each floor as per requirement and then connected commonly to an overhead tank and pump. Along with down comer system, portable fire extinguishers are to be provided at all accessible positions.

2.4 Also it has been proposed to provide following portable type fire extinguishers.

- 9 lit. Water expelling type.
- 4.5 lt. CO2 Type.
- 6 kg ABC type.
- Dry chemical powder type of 10kg/5kg capacity.

IMPORTANT INDIAN STANDARDS FOR FIRE FIGHTING WORK TITLE

IS 1239-1 968 (Part-I)	Specifications for mild steel tube, tubular and other steel pipe fittings.
IS 1239-1 968 (Part-II)	Specifications for mild steel tube, tubular and other steel pipe fittings.
IS 1536-1 976	Specification for centrifugally Cast (Spun) Iron pressure pipes with flanges for water, gas and sewage.
IS 1538 (Part 1 to 23)	Specification for Cast Iron fittings for pressure pipes for water, gas and sewage.
IS 1726-1960	Code for cast iron manhole frame and cover.
IS 3589-1981	Specification for electrically welded steel pipes for water, gas and sewage.
IS 4736-1986	Galvanizing G.I. Pipes
IS 636-1988	Non percolating flexible fire fighting delivery hose (third revision)
IS 694-1990	PVC insulated cables for working voltages upto and including 1.100 volts (third revision)
IS 778-1984	Copper alloy gate, globe and check valves for water works purposes (fourth revision) (Amendment 2)
IS 780-1984	Sluice valves for water works purposes (50 to 300 mm) size (sixth revision) (amendment 3)
IS 884-1985	Specification for first-aid hose-reel for fire fighting (for fixed installations) (first revision) (with amendment No.1)
IS 900-1992	Code of practice for installation and maintenance of induction motors (second revision)
IS 901-1988	Specification for couplings, double male and double female, instantaneous pattern for fire fighting (third revision)
IS 902-1992	Suction hose coupling for fire fighting of purposes (third revision)
IS 903-1984	Specification of fire hose delivery couplings branch pipe, nozzles and nozzle spanner (third revision) (Amendment 5)

IS 937-1981	Specification for washers for water fittings for fire fighting purposes (revised) (with amendment No. 1)
IS 1520-1 980	Horizontal centrifugal pumps for clear cold, fresh water (second revision)
IS 1536-1 976	Horizontally cast iron pressure pipes for water, gas & sewage (first revision) (with Amendments No. 1 to 4)
IS 1554-1988 Part I	PVC insulated (heavy duty) electric cables (working voltage upto and including 1100 volts (third revision)
IS 1554-1988 Part II	PVC insulated (heavy duty) electric cables (working voltage from 3.3 KV upto and including 11 KV (second revision)
IS 1648-1 961	Code of practice for fire safety of buildings (General) Fire fighting equipment and its maintenance (with amendment No.1)
IS 3624-1 987	Pressure and vacuum gauges (Second revision)
IS 4736-1 968	Hot-dip zinc coatings on steel tubes (with Amendment No.1)
IS 5290-1983	Specification for landing valves (second revision) (with Amendments No.6)
IS 5312- 1984 Part I	Swing check type reflux (non return) valves Part I-single door pattern (with amendments nos. 1 & 2)
IS 5312- 1986 Part II	Swing check type reflux (non return) valves Part II-Multi door pattern (with amendments nos. 1 & 2)
IS 7285	Seamless cylinders for storage of gas at high pressure.
IS 2189-1962	Code of practice for Automatic Fire alarm system
IS 2195-1962	Specification for heat sensitive fire detectors
IS 732-1973	Code of practice for electrical wiring installation
	UL 168 Underwriters Laboratory specification for smoke detector.

Introduction

Punjab Technical University is a growth oriented University established by the Government of Punjab as an affiliating and teaching University to facilitate and promote studies, research and extension work with a focus on professional education in emerging areas of higher education in the fields of Engineering, Technology, Management, Medicine, Pharmacy, Nursing, Education and Law etc. In a brief span of existence, the University has made a significant progress and has multiplied its activities, manifold. In its endeavor to impart education from high school level upto engineering degree level it has been decided to construct campuses in different parts of Punjab under PTU. The campuses at Arniwala & Sikhwala are among such campuses.

The campus at Arniwala & Sikhwala are to become cohesive and an integrated unit, construction of the required infra-structural facilities like academic functions, students and staff accommodation, playing fields etc. on plots measuring about 12.27 acres at Arniwala and 13.3 acres at Sikhwala.

Phase I for PIT Arniwala & Sikhwala

Phase I of the project consists of a college building of G+1 floors with an approximate area of 3,700 sq. mts.. These proposed college buildings will house classrooms, labs, tutorial, and seminar hall & faculty rooms.

Since the area constructed in current phase is only 8% of the total F.A.R available, hence designing of services on modular basis is not a feasible & viable solution which is evident from the reports attached.

Finishing works:

The salient features of various provisions are as under:

Flooring:-

Main entrance	Kota stone flooring with marble pattern
Circulation	Kota stone
Rooms	Kota Stone
Toilets	Vitrified Tiles
Staircases	Kota stones

Doors and windows: - Door frames shall be in Pressed Steel sections with flush door shutters. Windows shall be of Aluminum frames and shutters as per architectural drawings. Structural glazing has been provided at places in the elevation. Fittings shall be of aluminum as per architectural drawings/specifications.

Staircase Railing: Mild Steel railing finished with approved synthetic enamel has been proposed.

Toilets: Matt finish ceramic tiles dado up to door level height, vitreous china WC, wash basin and urinals as/ requirement.

Roofing: - Terrace shall have brick coba treatment with polyurethane insulation.

False ceiling: - Proposed in the Seminar Hall and partially in classrooms for acouslcal treatment.

Internal Finishing: Cement plaster, oil bound distempers, Plastic emulsion and acrylic emulsion paint with POP, doors shall be enamel painted. Corridors will have 4 ft. high ceramic tile cladding.

External Finishing:

Arniwala- Exposed concrete finish in architectural features, Weather proof paint, grooves in plaster. Red sandstone cill in windows.

Sikhwala- Texture paint in architectural features, Weather proof paint, grooves in plaster. Red sandstone cill in windows.

This report is submitted for accord of Administrative approval of the design basis for Electrical, plumbing, Firefighting & HVAC services in the building.

DESIGN BASIS REPORT FOR PHASE-I HVAC WORKS FOR PIT, ARNIWALA & SIKHWALA

GENERAL

It is proposed to provide comfort cooling conditions with the help of economical and efficient air conditioning system for only seminar hall & faculty offices.

1. Design Philosophy

The air-conditioning system has been designed keeping in view the following:

- (i) Continuity and reliability.
- (ii) Flexibility of operation.
- (iii) Safety of personnel and equipments.
- (iv) Ease of maintenance.

2. Applicable Codes and Guides

- (i) National Building Code of India 2005
- (ii) Indian Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ISHRAE).

3. DESIGN CRITERIA

3.1 Outside Design Condition

Design outside air conditions are extracted from the NBC Part-8 design weather database for Hissar.

Outdoor Design Conditions :	
Summer	
Dry Bulb Temp.	43.3 deg. C (110 deg F)
Wet Bulb Temp.	25.8 deg. C (78.4 deg F)
Monsoon	
Dry Bulb Temp.	38.9 deg. C (102 deg F)
Wet Bulb Temp.	30.0 deg. C (86 deg F)
Winter	
Dry Bulb Temp.	6.1 deg. C (43.0 deg F)
Wet Bulb Temp.	5.2 deg. C (41.4 deg F)

Inside Design Conditions :		
Summer & Monsoon		
Dry Bulb Temp.	Seminar Hall	26 \pm 1 deg C (79 \pm 2 deg F)
	Faculty Offices	24 \pm 1 deg C (79 \pm 2 deg F)
Relative Humidity (RH)	Seminar Hall	55% (Design Value – No Control)
	Faculty Offices	

3.2 Outdoor Air Requirements

Outdoor Air Requirements	As per NBC 2005
Seminar hall	17 cfm/person
Offices	21 cfm/person

3.3 Lighting & Equipment

Area Description	Lighting (Watt/Sqft)	Equipment Load
Seminar hall	1.0	5.0 (Watt / Sqft)
Office	1.5	1.0 (Watt / Sqft)

3.4 Factor Considered (Building Envelope)

- Glass
SHGF = 0.56 & 'U' Value = 1.13 BTU / Hr - Sft - °F
- Walls
'U' Value = 0.36 BTU / Hr.-Sft - °F.
- Walls(Seminar Hall)
'U' Value = 0.21 BTU / Hr.-Sft - °F.
- Roof (Insulated)
'U' Value = 0.12 BTU / Hr. - Sft - °F.

4. LOAD ESTIMATION

The Air Conditioning loads are as follows:

Heat Load Summary Of PIT Arniwala																	
Outdoor Condition		DBT (°F)	WBT (°F)	Grains/ lb	Latitude (°N)	Revision											
Summer		110.0	78.4	76.0	30.2	0											
Monsoon		102.0	86.0	164.0	0.0												
BASIS OF DESIGN																	
CONDITIONED SPACE	ACTUAL AIR CONDITIONED AREA	HEIGHT	INSIDE DESIGN CONDITION							OCCUPANCY	LIGHT LOAD	EQPT LOAD	SUMMER LOAD	MONSOON LOAD	SUMMER DEHUMIDIFIED CFM	MONSOON DEHUMIDIFIED CFM	REQUIRED OUTDOOR AIR QTY(Normal)
			(A)	(B)	(C)	(D)	(E)	(F)	(G)								
	S.FT	FT.	CFM/ Person	CFM/ Sq. Ft	TEMP (°C)	RH % (Design Value-No Control)	NOS.	W/SFT	W/SFT				TR	TR	CFM	CFM	CFM
DX Split system																	
Ground Floor	1904.5	17.0	17.0	-	26+1	55	150	1.0	5.0	5.0	21.4	28.2	5,194	5,635	414	416	2,550
Seminar Hall	258	11.6	5.0	0.06	24+1	55	6	1.5	2.0	1.56	1.79	1.79	512	416	168	168	
Pro. Room	258	11.6	5.0	0.06	24+1	55	8	1.5	2.0	1.72	2.13	2.13	489	325	84	105	
Board Room	226	11.6	5.0	0.06	24+1	55	4	1.5	2.0	1.10	1.28	1.62	373	417			
HOD Room	258	11.6	5.0	0.06	24+1	55	5	1.5	2.0	1.45			508				
P.A Room																	
First Floor	1044	11.6	5.0	0.06	24+1	55	15	1.5	2.0	5.34	5.57	5.57	2,069	1,640	193	188	315
Asst. Prof.	102	11.6	5.0	0.06	24+1	55	2	1.5	2.0	0.60	0.70	0.70	215	188	16	16	42
ASSO. PROF-1	124	11.6	5.0	0.06	24+1	55	2	1.5	2.0	0.60	0.69	0.69	216	188	16	16	
ASSO. PROF-2	124	11.6	5.0	0.06	24+1	55	2	1.5	2.0	0.60	0.69	0.69	216	183	16	16	
ASSO. PROF-3	124	11.6	5.0	0.06	24+1	55	2	1.5	2.0	0.49	0.50	0.50	209	9597	10001	3438	
ASSO. PROF-4	4422									34.8	43.2						
Total Of DX Split system																	

Based on the above design calculations, air Cooled non-ductable Dx Split units are proposed for air conditioning the building. The system is proposed due to following reasons.

- Only specified areas needs to be air conditioned.

Some of the advantages of using Dx split system Machine for this project are:

- The Dx split system comes with completely Air-cooled System with two basic parts- Outdoor & indoor
- DX system comes with single point responsibility.
- DX system comes with inbuilt starter panel & also has a less noise level.
- No Trained Manpower is required for operation.

5. AIR CONDITIONING SCHEME

Hi-wall type DX split system shall be provided for seminar hall & faculty offices & there individual outdoor units shall be located in the specified area. The drain for each office units shall be terminated to the nearest drain point & for the seminar hall the drain shall be combined & will be terminated to the nearest drain point.

6. MECHANICAL VENTILATION

Toilet exhaust will also be planned for 50 cfm per WC/Urinal or 15 Air Changes per Hour whichever is more. A dedicated propeller fans are on each level.