



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/CC/036

Dated 10.01.2014

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

Sh. Amrit Sagar Mittal
CMD, Sonalika Tractors Ltd,
Hoshiarpur.

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

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

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

Sh. Inderjit Kumar (Special Invitee),
(PH Experts)
House No. 116, Phase 3B/I,
S.A.S. Nagar, Mohali.

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

Dr. H. S. Bains,
Registrar,
Punjab Technical University, Jalandhar.

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

Sh. S. K. Mishra (Special Invitee),
Finance Officer,
Punjab Technical University, Jalandhar.

Er. Jaswant Singh Pabla (Special Invitee),
(Electrical Expert)
House No. 2631, Sector-79, Mohali.

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

Sub : Construction of new campuses of Punjab Technical University – 40th meeting of the Standing Building Construction Committee.

Dear Sir/Madam,

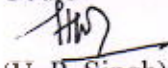
40th meeting of the Standing Building Construction Committee shall be held under the Chairmanship of Dr. R. S. Khandpur, Director General, PGSC at 1100 hours on 21.01.2014 at PTU's Mohali campus at C102B, Phase-7, Industrial Area, Mohali:

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, SCO 60-61, Sector 34-A, Chandigarh.

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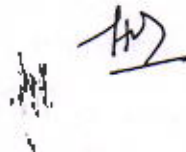
Kapurthala Campus : Jalandhar-Kapurthala Highway, Kapurthala-144601

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PUNJAB TECHNICAL UNIVERSITY, JALANDHAR

Sub : Agenda for the 40th meeting of the Standing Building Construction Committee.

- Item No. 40.1 : To confirm the Minutes of 39th meeting of Standing Building Construction Committee held on 23.12.2013.
- Item No. 40.2 : Action taken on various items discussed during previous meetings of Standing Building Construction Committee.
- Item No. 40.3 : To discuss the test results of non-destructive tests conducted on the existing structural members of the buildings taken over at Punjab Institute of Technology, main campus, Kapurthala and finalize the next course of action.
- Item No. 40.4 : To discuss and finalize Electric load for new buildings of Punjab Institute of Technology, main campus, Kapurthala.
- Item No. 40.5 : To discuss and finalize 'Griha Rating' for Electrical works of new buildings of Punjab Institute of Technology, main campus, Kapurthala.
- Item No. 40.6 : To discuss and finalize the seating capacity of proposed auditorium of the Convention centre at University's main campus, Kapurthala.
- Item No. 40.7 : To discuss and finalize the layout plans of proposed hostels at main campus, Kapurthala.
- Item No. 40.8 : Any other point with the permission of the Chair.



PUNJAB TECHNICAL UNIVERSITY, JALANDHAR

Agenda Note for the 40th meeting of the Standing Building Construction Committee.

Item No. 40.1 : To confirm the Minutes of 39th meeting of Standing Building Construction Committee held on 23.12.2013.

The minutes of 39th meeting of Standing Building Construction Committee held on 23.12.2013 were circulated on 26.12.2013. The minutes circulated are to be confirmed.

Item No. 40.2 : Action taken on various items discussed during previous meetings of Standing Building Construction Committee.

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

- The requirement of electric load for the new buildings being constructed for Punjab Institute of Technology, Kapurthala has been revised by the Architect and are to be discussed in the present meeting.
- The Architect will make presentation in the present meeting for the 'Griha Rating' in respect of Electrical works of new buildings of Punjab Institute of Technology, main campus, Kapurthala.
- The Architect has started detailed designing and estimation of External water supply, sewerage and rain water harvesting systems for Punjab Institute of Technology, Kapurthala and Nandgarh campuses as per the decisions taken in 39th meeting of Standing Building Construction Committee.
- The detailed estimate for Parking area to be developed at PTU's main campus, Kapurthala has been forwarded to Punjab PWD for vetting.
- The detailed estimate for Balance portion of boundary wall of Punjab Institute of Technology, main campus, Kapurthala has been forwarded to Punjab PWD for vetting.
- The requirements of the proposed convention centre at main campus, Kapurthala are being discussed in the present meeting.
- The detailed plans of the proposed hostels at main campus, Kapurthala are being discussed in the present meeting.
- Punjab State Council for Science and Technology was requested to submit their offer for conducting 'Energy Audit' for PTU's administrative building at main campus, Kapurthala. A visit to the site has already been made by their representative and their offer is awaited.



Item No. 40.3: To discuss the test results of non-destructive tests conducted on the existing structural members of the buildings taken over at Punjab Institute of Technology, main campus, Kapurthala and finalize the next course of action.

Some works were already executed in the buildings (namely college building, boys hostel and girls hostel) taken over by PTU from CAPARO society at PTU's main campus, Kapurthala. Detailed estimates for the balance works of these buildings were approved by PTU and PWD have awarded the works to the contractor accordingly. The detailed design for the balance works was done by PTU's Architect by assuming M25 grade of the concrete of existing structures (as indicated in the available drawings of these buildings). It was indicated in the drawings issued by PTU's Architect that non-destructive tests shall be conducted by the contractor before start of works to ascertain the concrete strength of the existing structures and provisions in the approved estimates was also made for these tests. However, there are huge variations in the results of non-destructive tests conducted on the existing structural members and concrete quality is not meeting the requirements of M25 grade. (Detailed report of the Architect is placed below). By considering the various options, Architect has recommended to demolish the structure above the plinth and reconstruct it after strengthening the structure below plinth (foundations, columns below plinth and plinth beams). The additional expenditure for these works will be Rs. 148.36 lacs. Thus, the total cost for these buildings, including earlier approved estimate of Rs. 1684.44 lacs, will be Rs. 1832.80 lacs.

The matter is placed before the Committee for discussions and to finalize the next course of action.

Item No. 40.4 : To discuss and finalize Electric load for new buildings of Punjab Institute of Technology, main campus, Kapurthala.

In previous meeting of Standing Building Construction Committee, requirement of Electric load of new buildings of Punjab Institute of Technology, main campus, Kapurthala was discussed and committee was of the view that electric load calculated by the Architect is on the higher side and should be reviewed. The same has been recalculated by the Architect and will be presented in the meeting.

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

Item No. 40.5 : To discuss and finalize 'Griha Rating' for Electrical works of new buildings of Punjab Institute of Technology, main campus, Kapurthala.

In previous meeting of Standing Building Construction Committee, the Architect was advised to submit the details indicating 'Griha Rating' achieved with the provisions already made in new buildings of Punjab Institute of Technology, main campus, Kapurthala and actions which may be taken to improve this rating. The details worked out by the Architect in this regard will be presented in the meeting.

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



Item No. 40.6 : **To discuss and finalize the seating capacity of proposed auditorium of the Convention centre at University's main campus, Kapurthala.**

In previous meeting of Standing Building Construction Committee, it was decided that Dean (P&D) and Registrar PTU shall finalize the seating capacity of proposed auditorium at University's main campus, Kapurthala and the same will be discussed in the next meeting.

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

Item No. 40.7 : **To discuss and finalize the layout plans of proposed hostels at main campus, Kapurthala.**

In previous meeting of Standing Building Construction Committee, approval for provision of hostels with a capacity of 400 students was accorded. The detailed scheme, plans etc. for these hostels shall be presented by the Architect in the meeting.

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

Item No. 40.8 : **Any other point with the permission of the Chair.**

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Report on results of the non destructive tests conducted at APIT Jalandhar

This report is based on results of the non destructive tests conducted at APIT Jalandhar, a site visit and our analysis. This analysis (attached to this report as annexure I) was discussed with Dr. Ashok Gupta of IIT Delhi (the proof-checking agency for this project) who has verbally conveyed his consent to our strategy during the meeting and his email over the same is awaited.

The main finding from the tests is that the concrete quality does not meet the requirements of M25 grade as mentioned in the working structural drawings. Generally a strength of only M15 grade can be attributed to the existing concrete in accordance with guidelines of IS: 456 (Table 11) for boys' hostel and CB3 and it is even worse for the girls' hostel where the lowest of test value is as low as 3.5 MPa implying an M8 grade concrete. The field of non destructive test results for various locations in girls' hostel is a bit too wide as for an 'uncontrolled concrete' (reference: Table 4.1, 'Design of Concrete Mixes' by N. Krishna Raju, CBS Publishers & Distributors). In addition, there are structural cracks in some beams and slabs in the girls' hostel.

In light of the above the possible options are:

- I. Adjust the future construction according to the existing strength of the concrete. This means that one floor will have to be omitted in all the buildings and the construction would have to be limited to G+1 floor instead of current proposal of G+2 floors. This option does not apply to CB3 as this college building has to be three storeyed.
- II. Demolish the structure above the plinth and reconstruct it after strengthening the structure below plinth (foundations, columns below plinth and plinth beams).

The pros and cons of the two options are as follows:

Option 1 – pros:

1. The important advantage of this option is the saving in structural cost. The saving is mainly in girls' hostel where the first floor level structure is already cast. In other buildings, only columns exist upto a little above plinth and at some places upto lintel/beam soffit level above plinth.
2. The accommodation lost in the boys' and girls' hostels can be made up in the new hostel buildings which are currently being planned by the architect.

Option 1 – cons:

1. The existing first floor structure in the girls' hostel exhibits a number of defects in form of cracks in beams as well as slabs. The horizontal cracks near bottom side face of a number of beams appear to be caused by rusting of reinforcing bars. Initiation of deterioration of reinforcement is obvious in a few beams, and the condition of other bars cannot be ascertained without exposure and tests. The defective members are mainly horizontal members (beams and slabs) strengthening which will need surgical precision, would be tedious and would also involve substantial cost and time. This repair work may cost almost as much as if not more, a new structure.
2. Even after strengthening the beams and slabs in the girls' hostel and reducing the number of floors, the concrete in the buildings would not meet the codal requirements for

durability. The defects that are visible today may be repaired, or defective members may be demolished and re-cast. The effect of deterioration of reinforcing steel at various places is perhaps yet to surface. Such defects are likely to occur later.

3. This option is not suitable for the CB3 where the reduction of one floor, thus the accommodation, may not be a feasible option.

Option 2 – pros:

1. The original proposed accommodation could be constructed since the structure below the plinth would be strengthened and above the plinth would be re-constructed.
2. The required codal requirements would be met for the superstructure. The pedestals shall be jacketed and so would meet the codal requirements. Please also see point 3 below.

Option 2 – Cons:

1. There would be a cost component of demolition of existing portions of the buildings.
2. The strengthening of the foundations and columns would be done as per guidelines in Chapter 6 – Rehabilitation and Retrofitting Methods - *CPWD Handbook on Repair and Rehabilitation of RCC Buildings*, first published in 2002. The design would be based on the sound engineering practice. The proof checking engineer (IIT – Delhi) has consented with this approach.
3. The chemical properties of the soil around the footings would have to be tested to ensure that the strategy mentioned in 2 above can be adopted. Also tests for concrete in footings for cement content should be conducted. These tests are summarized in Annexure II

Our recommendation is to adopt Option 2. Following are the cost implications for adopting this option:

1. Cost of demolition and reconstruction of demolished portion	= Rs. 1,26,75,600.00
2. <u>Cost of strengthening the under plinth structure</u>	= Rs. 21,60,000.00
3. Total	Rs. 1,48,35,600.00

If this option is approved further line of action would be to carry out tests summarized in Annexure II and then if the results are satisfactory demolish the structure above plinth level as noted in Annexure III.

There was a suggestion from APIT to study whether it would be possible to add one more storey to the hostel buildings (i.e. make the hostels G+3) if option 2 is adopted. We have studied this option and we find that with the given column sizes this would not be possible.

2

ANNEXURE I

Non destructive tests (Cut and Pull Out) were carried out to make sure the quality of concrete in the existing structure of APIT Jalandhar is satisfactory. The test results are attached herewith. The gist and our observations are listed hereunder:

Parameter	Boy's Hostel	Girl's Hostel	College Building 3
Number of tests	10	10	10
Maximum strength (MPa)	36.1	37.6	35.5
Minimum strength (MPa)	15.6	3.5 / 13.9*	9.3
Average Strength (MPa)	21.6	21.38	21.99
Standard Deviation	6.35	9.73	8.5
Characteristic Strength**	11.2 / 16.44 / 18.68	5.33 / 13.36 / 18.38	7.96 / 14.98 / 18.99

*The minimum strength actually recorded for girls' hostel is 3.5 MPa. This may be ignored towards a general adjudgement of quality terming it as an exceptionally defective case. The next lowest strength is 13.9 MPa. •

**The three values are based on clause 9.2.2 (for mix design) and table 11 of IS:456.

IS: 456 clause 17.4 specifies guidelines for adjudgement of core tests. The actual test carried out is cut and pull out, which may be treated as equivalent to core test. The code suggests that the concrete quality may be termed acceptable if the average of test results is above 85% of the grade of concrete and none of the test results is below 75% of grade of concrete. Going by this guideline the grade of concrete is M15 for the hostels (if we ignore the lowest test value for girls' hostel) and M12.5 for CB3.

The very high values of standard deviation in case of girls' hostel and CB3 is a concern as this would be termed as 'uncontrolled concrete' had the test results been those of cube strengths. Reliability is truly poor.

One of the boys' hostel footings has been tested. This has displayed strength of 21.5 MPa.

Of the superstructure only the girls' hostel has first floor level cast. The other two have only columns and certain lintels fully or partially cast. The girls' hostel exhibits a few cracks in slabs and beams. Demolition and recasting of these would be necessary in any case. In our opinion strengthening of the existing superstructure is not worthwhile. We feel we should demolish and re-build the superstructure completely. Of the sub-structure the pedestals and plinth beams may be strengthened by jacketing. In case of the footings also the strengthening may be done with a layer of concrete on top, epoxy bonded to existing concrete. The top of the footings is under flexural compression and the thickness of the new concrete layer can be so adjusted that full flexural strength is derived out of it. Shears may be checked for M15 concrete for the new depth. Column jacketing shall be designed such that the new dimension of column with M15 (the new concrete jacket shall be in M25) grade is capable of supporting full design load. The plinth beams shall be designed with jacket supporting full design flexural load and full section supporting shear as M15 concrete.

The PWD had posed a question that the durability criterion of IS:456 requires the footings and pedestals to be in M25 grade. This is not being achieved. That is true for footings as the bottom portion in contact with PCC is not being upgraded. We feel this should be permissible because we are not constructing a new structure, and most of two to three storey structures designed and built prior to 2000 were in M15 grade concrete. Further tests may be conducted for sulphate

content of soil, and the composition of footing concrete may be analyzed to make sure that the cement content conforms to requirements of Table 4 of IS:456.

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ANNEXURE - II

This annexure summarizes the further tests to be carried out.

1. Chemical test on soil samples to determine the contents of sulphates and chlorides. The soil samples should be extracted from a zone adjacent to footing, between the founding level and 600 mm above. Five samples from in and around hostels and five samples around CB3 may be taken.
2. Determination of cement content of foundation concrete (Kg/m^3), water cement ratio and density. Concrete samples may be cut out of footings. Four such samples may be taken, one from each hostel and two from CB3 choosing footings randomly.

Study of soil sulphate content shall give an idea of aggressiveness of soil. Table 4 of IS: 456 gives the recommended cement content and water cement ratio against soil sulphate content. If the cement content requirement against the sulphate content of soil is satisfied we shall consider the footings safe.

2

ANNEXURE III

This annexure summarizes the precautions and sequence for demolition work.

1.0 GENERAL

The demolition shall always be well planned before hand and shall generally be done in reverse order of the one in which the structure was constructed. The operations and sequence shall be got approved from the Engineer-in-Charge before starting the work.

Due care shall be taken to maintain the safety measures prescribed in IS 4130.

Necessary propping, shoring and/or under pinning shall be provided to ensure the safety of the adjoining work or property before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damage is caused to the adjoining work or property.

Temporary enclosures or partitions and necessary scaffolding with suitable double scaffolding and proper cloth covering shall also be provided, as directed by the Engineer-in-Charge.

Necessary precautions shall be taken to keep noise and dust nuisance to the minimum. All work needs to be done under the direction of Engineer-in-Charge. Helmets, goggles, safety belts etc.

should be used whenever required and as directed by the Engineer-in-Charge.

The demolition work shall proceed in such a way that it causes the least of damage and nuisance to public.

Dismantling shall be done in a systematic manner. All materials which are likely to be damaged by dropping from a height or by demolishing roofs, masonry etc. shall be carefully removed first. Chisels and cutters may be used carefully as directed. The dismantled articles shall be removed manually or otherwise, lowered to the ground (and not thrown) and then properly stacked as directed by the Engineer-in-Charge.

Any serviceable material, obtained during dismantling or demolition, shall be separated out and stacked properly as directed by the Engineer-in-Charge within a lead of 50 metres. All unserviceable

materials, rubbish etc. shall be disposed off as directed by the Engineer-in-Charge.

Preferably no demolition work should be carried out at night especially when the building or structure to be demolished is in an inhabited area.

Screens shall be placed where necessary to prevent injuries due to falling pieces.

Water may be used to reduce dust while tearing down plaster from brick work.

Safety belts shall be used by labourers while working at higher level to prevent falling from the structure.

First-aid equipment shall be made available at all demolition works.

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