

**15 -ാം കേരള നിയമസഭ**

**3 -ാം സമ്മേളനം**

**നക്ഷത്ര ചിഹ്നം ഇല്ലാത്ത ചോദ്യം നം. 2075**

**11-10-2021 - ൽ മറുപടിയ്ക്ക്**

**ആലപ്പുഴയിലെ സൂപ്പർ സ്പെഷ്യാലിറ്റി പഞ്ചകർമ്മ ഹോസ്പിറ്റൽ ആൻഡ് റിസർച്ച് സെന്റർ**

ചോദ്യം	ഉത്തരം
<p align="center"><b>ശ്രീ. എച്ച്. സലാം</b></p>	<p align="center"><b>Smt Veena George</b> <b>(ആരോഗ്യ വനിത-ശിശുവികസന വകുപ്പ് മന്ത്രി)</b></p>
<p>(എ) ആലപ്പുഴയിൽ 2012 ൽ നിർമ്മാണം ആരംഭിച്ച സർക്കാർ സൂപ്പർ സ്പെഷ്യാലിറ്റി പഞ്ചകർമ്മ ഹോസ്പിറ്റൽ ആന്റ് റിസർച്ച് സെന്ററിന്റെ നിർമ്മാണത്തിലെ അപാകത സംബന്ധിച്ച് പരിശോധന നടത്തിയ വിവിധ ഏജൻസികളുടെ കണ്ടെത്തലുകൾ എന്തെല്ലാമെന്ന് വ്യക്തമാക്കാമോ;</p>	<p>(എ) (i) ചീഫ് ടെക്നിക്കൽ എക്സിക്യൂട്ടീവ് ഓഫീസർ 03.08.2013-ന് സ്ഥലം സന്ദർശിച്ച് നൽകിയ റിപ്പോർട്ട് അനുബന്ധം 1 ആയി ചേർക്കുന്നു. (ii) CTE-യുടെ നിർദ്ദേശ പ്രകാരം 11.12.2013-ൽ BSNL നടത്തിയ പരിശോധനയുടെ റിപ്പോർട്ട് അനുബന്ധം 2 ആയി ചേർക്കുന്നു. (iii) CTE-യുടെ നിർദ്ദേശ പ്രകാരം പ്രൈവറ്റ് എഞ്ചിനീയറിംഗ് കൺസൾട്ടന്റ് എഞ്ചിനീയർമാർ അൻവർ ഇസൈൻ പരിശോധിച്ച റിപ്പോർട്ടും തിരുവനന്തപുരം എഞ്ചിനീയറിംഗ് കോളേജിന്റെ നിർദ്ദേശങ്ങളും (CET) അനുബന്ധം-3 ആയി ചേർക്കുന്നു. (iv) തിരുവനന്തപുരം കോളേജ് ഓഫ് എൻജിനീയറിംഗിലെ ഡിപ്പാർട്ടുമെന്റ് ഓഫ് സിവിൽ എൻജിനീയറിംഗ് വിഭാഗത്തിലെ സൂപ്പർവൈസർ എൻജിനീയറിംഗ് ഡിവിഷൻ വിഭാഗം 05.04.2019-ൽ സ്ഥലം സന്ദർശിക്കുകയും Retrofitting Strengthening Measures നിർദ്ദേശിക്കുകയുമുണ്ടായി. റിപ്പോർട്ട് അനുബന്ധം 4 ആയി ചേർക്കുന്നു</p>
<p>(ബി) ഈ നിർദ്ദേശങ്ങൾ പഠിച്ച് റിപ്പോർട്ട് നൽകാൻ ഭരണ സമിതി ആരെയാണ് ചുമതലപ്പെടുത്തിയിരുന്നതെന്നും ആരെക്കൊണ്ടാണ് ഇതിലെ അംഗങ്ങളെന്നും ഇവർ എത്ര തവണ യോഗം ചേരുകയും സ്ഥലം സന്ദർശിക്കുകയും റിപ്പോർട്ടിലെ വസ്തുതകൾ പരിശോധിക്കുകയും ചെയ്തതെന്നും വ്യക്തമാക്കാമോ ;</p>	<p>(ബി) (i) ഈ നിർദ്ദേശങ്ങൾ പഠിച്ച് റിപ്പോർട്ട് നൽകാൻ 06.03.2021-ലെ GO(Rt) No. 139/2021/AYUSH നമ്പർ ഉത്തരവ് പ്രകാരം ആറ് അംഗങ്ങൾ ഉള്ള ഹൈലൈവൽ കമ്മിറ്റിയെ ചുമതലപ്പെടുത്തി. ഹൈലൈവൽ കമ്മിറ്റി അംഗങ്ങളെ സംബന്ധിച്ച വിവരം ചുവടെ ചേർക്കുന്നു. 1. അഡീഷണൽ സെക്രട്ടറി, ആയുഷ് 2. ഡയറക്ടർ, ഭാരതീയ ചികിത്സാ വകുപ്പ്, തിരുവനന്തപുരം 3. ഡെപ്യൂട്ടി സെക്രട്ടറി, ആയുഷ് 4. മെമ്പർ സെക്രട്ടറി, ഗവ: ആയുർവേദ പഞ്ചകർമ്മ ആശുപത്രി സൊസൈറ്റി 5. ചീഫ് എൻജിനീയർ, നാഷണൽ ഹെൽത്ത് മിഷൻ 6. കൺസൾട്ടന്റ് എൻജിനീയർ, നാഷണൽ ആയുഷ് മിഷൻ. (ii) നാല് തവണ യോഗം ചേരുകയും 09.03.2021, 30.09.2021 എന്നീ തീയതികളിലായി രണ്ട് പ്രാവശ്യം സ്ഥലം സന്ദർശിക്കുകയും ചെയ്തു. (iii) റിപ്പോർട്ടിലെ</p>

			വസ്തുതകൾ പഠിച്ച് സർക്കാരിന് ശുപാർശ നൽകുകയും ചെയ്തു.
(സി)	ഉന്നതതല സമിതി റിപ്പോർട്ട് സമർപ്പിച്ചിട്ടുണ്ടെങ്കിൽ പ്രസ്തുത വിശദാംശങ്ങൾ വെളിപ്പെടുത്താമോ; ഇല്ലെങ്കിൽ കാരണം വിശദമാക്കാമോ ;	(സി)	ഹൈലൈവൽ കമ്മറ്റി റിപ്പോർട്ടിലെ കുറിപ്പ് അനുബന്ധം 5 ആയി ചേർക്കുന്നു.
(ഡി)	കെട്ടിട നിർമ്മാണം പൂർത്തിയാക്കി ഇതിന്റെ പ്രയോജനം പൊതുജനങ്ങൾക്ക് നൽകുന്നതിന് എന്ത് നടപടി സ്വീകരിക്കാനാണ് ഉദ്ദേശിക്കുന്നതെന്ന് വ്യക്തമാക്കാമോ ?	(ഡി)	ഹൈലൈവൽ കമ്മറ്റിയുടെ ശുപാർശയുടെ അടിസ്ഥാനത്തിൽ സർക്കാരിൽ നിന്നും ഹിന്ദുസ്ഥാൻ പ്രീഫാബ് ലിമിറ്റഡിനോട് ഹൈലൈവൽ കമ്മറ്റി അംഗീകരിച്ച Rectification Measures ഹിന്ദുസ്ഥാൻ പ്രീഫാബ് ലിമിറ്റഡിന്റെ സ്വന്തം ചെലവിൽ മൂന്ന് മാസത്തിനകം സമയബന്ധിതമായി പൂർത്തീകരിക്കാനും, നിർമ്മാണ പ്രവർത്തനത്തിന്റെ അപകൃത പരിഹരിക്കുമ്പോൾ കെട്ടിടത്തിന്റെ ബലം ഒറിജിനൽ കോൺഫിഗറേഷൻ പ്രകാരം പൂർത്തീകരിക്കാൻ സാധിക്കത്തക്കവിധം ബലമുള്ളതാവണമെന്നും, ആയത് NIIT, IIT എന്നിങ്ങനെയുള്ള ഏജൻസികളെക്കൊണ്ട് പരിശോധിച്ച് സാക്ഷ്യപ്പെടുത്തണമെന്നും നിർദ്ദേശിച്ചിട്ടുണ്ട്. ഇത് ഹൈലൈവൽ കമ്മറ്റി സൂക്ഷ്മമായി നിരീക്ഷിക്കുകയും സർക്കാരിലേയ്ക്ക് റിപ്പോർട്ട് ചെയ്യണമെന്നും നിർദ്ദേശിച്ചിട്ടുണ്ട്. ഹിന്ദുസ്ഥാൻ പ്രീഫാബ് ലിമിറ്റഡ് ഹാജരാക്കിയ വർക്ക് ഷെഡ്യൂൾ അനുബന്ധം 6 ആയി ചേർക്കുന്നു.

സെക്ഷൻ ഓഫീസർ

Farman/MD-1

No.63397/FIW.C3/2013/Fin

Finance (Inspection - Technical - Wing) Dept.,  
Thiruvananthapuram,  
Dated: 22.01.2014

ENQUIRY REPORT

Sub:- Construction of Government Panchakarma Ayurveda Hospital building at Alappuzha by M/s Hindustan Prefab Ltd. - Enquiry Requested Reg.

Ref:- Letter No. S1.29307/2013 dated 24/6/2013 & 4/11/2013 and 01/01/2014 of the District Collector, Alappuzha.

1.0 Introduction:-

1.1 The District Collector, Alappuzha vide his letter dated 24/6/2013 requested this office to conduct a site inspection and to take further steps on the petition forwarded to him by Sri. G. Sudhakaran, M.A (Ambalappuzha), alleging irregularities in the subject work. The main allegation was in the quality of Concrete.

1.2 Accordingly, a site inspection was conducted by the officials from this Wing on 03/08/2013 in the presence of consultants from M/s. Hindustan Prefab Ltd. (A Government of India Undertaking). Subsequently, documents pertaining to the work were furnished to this office by the Member Secretary, Alappuzha Ayurveda Panchakarma Hospital Society and M/s. Hindustan Prefab Ltd.

2.0 Observations:-

2.1 On-site inspection and perusal of the documents furnished, it was observed that the work was entrusted to the Hindustan Prefab Ltd. on deposit work basis. M/s. Hindustan Prefab Ltd. has awarded the contract for execution of work to M/s Sri Rajeswari Engineering & Constructions vide Work Order No. HPL/CE/LOA/2012-13/141/1112 dated 16/1/2013 and agreement executed on 24/1/2013. As per the agreement, the official date of commencement and completion of work are 28/1/2013 and 27/3/2014 respectively. The estimated PAC of the work is Rs. 4,84,57,368/- and the agreed PAC comes to Rs. 4,65,84,288/-.

2.2 In order to ascertain the quality of concreting done, M/s. Hindustan Prefab Ltd. was requested to conduct a Non Destructive Test, in the presence of officials from this Wing, vide this office letter of even No. dated 4/9/2013 and subsequent reminder dated 4/11/2013, which was not complied till date.

2.3 In this circumstance, the District Collector, Alappuzha was requested to direct the consultants M/s. Hindustan Prefab Ltd. to arrange the required test early, vide this office letter of even No. dated 27/11/2013.

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2.4 The District Collector vide his letter dated 01/01/2014 reported that the Non Destructive Test was conducted by the BSNL Engineer on 11/12/2013 in the presence of Member Secretary and no test report was received so far.

### 3.0 Findings:-


3.1 On preliminary enquiry, no visual defects are noticed in the concrete structures casted.

3.2 Since the complaint is regarding the strength of concrete casted, that can be assessed only by conducting a Non Destructive Test.

3.3 The cooperation extended from the part of M/s. Hindustan Prefab Ltd. is not satisfactory to complete the enquiry as requested by the District Collector.

### 4.0 Recommendations:-

4.1 Since the consultant M/s. Hindustan Prefab Ltd., a Govt. of India Undertaking, is primarily responsible for ensuring quality, the case may be referred to Central agencies, like Chief Technical Examiner under CVC.

  
S.J. VIJAYADAS,  
Chief Technical Examiner(i/c)



പരമാനം 20-2



BHARAT SANCHAR NIGAM LIMITED  
(A. Govt. of India Enterprise)  
Kerala Civil Zone, Thiruvananthapuram

No. 26(28)/CE(C)/BSNL/TVM/2014/ 442

Dated 26/03/2014

To  
The General Manager (SZ),  
M/s Hindustan Prefab Ltd.  
TC 24/656(FF), Thycaud P.O  
Thiruvananthapuram-695 014

Sub: Construction of Super speciality Panchakarma hospital and Research centre at  
Alappuzha-Conducting non-destructive test-reg.

Ref: 1. Your Letter No. HPL/K/GM/2013-14/230/449 Dated 20.09.2013  
2. This office Letter No.26(28)/CE(C)/BSNL/TVM/2013/368 Dated 23.09.2013  
3. Your Letter No. HPL/K/GM/2013-14/230/237/456 Dated 25.09.2013

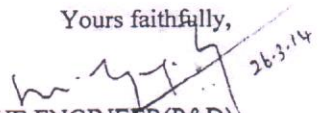
Dear Sir,

With reference to the above, kindly find enclosed herewith a copy of Report regarding  
the assessment of quality of concrete of the above work for favour of information.

It is recommended that the **Strength of concrete** arrived at may be compared with the  
standard strength of concrete for different mixes and necessary action may be taken as  
per CPWD Specifications 2009 (Vol-I).

Enl: as above (9 sheets + 1drg)

Yours faithfully,

  
EXECUTIVE ENGINEER(P&D)

O/o Chief Engineer(C), 1<sup>st</sup> Floor, Admn. Bldg., T.E. Comp., Manacaud, Thiruvananthapuram-695 009  
Tele: Office: 2458044 Fax: 2458590 & 2458550 E-Mail : [cectvm@yahoo.co.in](mailto:cectvm@yahoo.co.in)





## GOVERNMENT OF KERALA

No.Insp-Tech-1/383/2017-FIN

Finance(Inspection Wing - Technical) Dept.,  
Thiruvananthapuram,  
Dated: 09/12/2019.NOTE

Sub:- AYUSH-Construction of Government Panchakarma Hospital building at Alappuzha through M/s HPL - Substandard works - Retrofitting suggested - Reg.

Ref: - Letter dated 12/11/2019 of State Mission Director (NHM).

Kindly refer to the above. The State Mission Director has informed that the Technical Committee for the Project under the Chairmanship of Secretary (AYUSH) in its meeting dated 11/11/2019 has decided to seek the advise of CTE on the report suggesting retrofitting works proposed for strengthening the RCC structural components of building constructed for Govt. Panchakarma Ayurveda Hospital at Alappuzha.

Accordingly, the site was on 22/11/2019 in presence of HPL & Hospital authorities.

On perusal of the report of the SHM comprising of the suggestions of the Consultant Sri. S. Anwar Hussain and recommendations of the College of Engineering, Thiruvananthapuram, following observations are noted:-

- 1) As per contract specifications, the concrete mix to be adopted is M20. However, as per the report of Consultant Er. Anwar Hussain, out of 125 columns, 50 Nos. were found to be having strength less than M15, 32 Nos. were in between M15 and M20.
- 2) The Consultant has submitted two options for retrofitting the building. As per the first proposal, the existing beams are to be given RCC jacketing by providing extra steel bars in addition to the existing ones. For slab region, leak proofing technology was adopted. For columns having strength between M15 & M20, CFRP wrapping has been suggested and for columns less than M15, RCC jacketing along with CFRP has been suggested.



- 2) 3) As per the second proposal of the Consultant, the existing RCC beams are to be given RCC jacketing by providing extra steel bars in addition to the existing ones. For slab region, leak proofing technology was adopted. For columns between M15 & M20, CRFP wrapping has been suggested and for columns less than M15, RCC jacketing along with self compacting concrete, SBR polymer reinforced concrete, micro concrete or high performance concrete has been suggested.

During site inspection the following observations are noted:-

- 1) As per the detailed study since conducted through the Consultant engaged by HPL and verified by the College of Engineering, Thiruvananthapuram (CET), it is proved that majority of the RCC columns (82 out of 125) having compression strength less than the required strength of 20 N/mm<sup>2</sup>.
- 2) Cracks were seen at many locations in the masonry walls indicating the settlement.
- 3) Adequacy of foundation adopted is not seen neither checked by the Consultant nor verified by CET.
- 4) Quality and quantity of steel used was not seen checked and confirmed and steel of different brands are seen used.
- 5) The quality of concreting work in joints between RCC columns and beams are not adequate.
- 6) The plinth beam level is seen lower than the existing road level which can lead to stagnation of rain water inside building.
- 7) It is reported that payments to the contractor of HPL was released even after the sub standard work was came to the notice of HPL through the NDT done by BSNL Civil Wing. Further, the contract was terminated by HPL without risk and cost of contractor who executed inferior quality work. The above actions of HPL are highly irregular warranting departmental penal action.
- 8) 8) It is informed that Rs.200 lakhs has been released to HPL by the Panchakarma Society from the Central Fund till date. Govt. of India has informed that the amount with penal interest has to be remitted if the funds released were not properly utilized. M/s HPL is solely responsible for this situation and shall be held responsible.



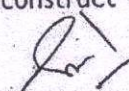
- 9) It may be noted that usually retrofitting works are proposed for addressing the problems of deterioration of strength due to aging and not due to poor quality of works. The normal guarantee offered in case of retrofitting with carbon fibre wrapping is around 10 years only.

**Hence, arranging retrofitting works with CFRP as per the present proposal may not be advisable.**

From the above, it can be seen that M/s HPL is solely responsible for the poor quality of works executed. The detailed study conducted by Consultant & verified by CET as well as the observations of this Wing point out the pathetic condition of the building structure constructed by HPL. Without verifying the adequacy of foundation adopted and quality and quantity of steel reinforcement used, retrofitting for increasing the strength of super structure is no use. CET shall be directed to conduct detailed study of all structural members including footings, plinth beams, all columns, beams and roof slab as per site condition to confirm their admissibility.

Therefore M/S HPL shall execute all rectification works to ensure that the design strength of all structural elements are met with and the same shall be got tested and certified by College of Engineering Thiruvananthapuram. CE NRHM shall ensure adequate monitoring and supervision of above works. However HPL shall be solely responsible for the rectification works in a time bound manner. AD shall enquire how the amount was disbursed for an inferior quality work and appropriate action shall be initiated.

M/s HPL shall complete all rectification works duly certified by CET and approved by CE NRHM within four months otherwise steps to reconstruct the building at the risk and cost of M/s HPL shall be initiated.

  
Krishnakumar S,  
Chief Technical Examiner In Charge.

The Secretary (AYUSH)

Copy submitted to the Additional Chief Secretary (Finance) for favour of information.

Copy to the State Mission Director (NHM), General Hospital Junction, Thiruvananthapuram - 695 035.



Farmonmcs-A



COLLEGE OF ENGINEERING TRIVANDRUM  
DEPARTMENT OF CIVIL ENGINEERING  
Structural Engineering Division

ITC&SR/CET No.1681/19-20

15-02-2021

Sub: Rectification of existing structure and strengthening of building - Construction of Panchakarma Ayurveda Hospital at Alappuzha- reg:

Ref:

1. Letter no. HPL/DGM/CET/2020-21/354 dated 24/01/2021 from the Dy. General manager (Civil), HPL, Trivandrum
2. Letter no. 03/Secy/2021/AYUSH dated 19/01/2021 from the Secretary, AYUSH Department, Govt of Kerala
3. Previous Reports from CET (ITC&SR/CET No.118/19-20) (Report-5 dt 23/08/2019, Report-4 dt 08/06/2019, Report-3 dt 03/06/2019, Report-2 dt 27/04/2019 & Report-1 dt 25/04/2019)

Vide ref.1 cited above the Dy. General Manager (Civil), HPL, Trivandrum have requested CET to give advice to M/s. Hindustan Prefab Limited (HPL) for further course of action for strengthening the existing building of Panchakarma Ayurveda Hospital at Allappuzha.

Vide ref.2 the Secretary, AYUSH Department, Govt of Kerala have specified the details of various technical reports and technical meetings. It is stated that, based on meeting held on 11/11/2019 under Chairmanship of Secretary AYUSH, decided to seek the advice of Chief Technical Examiner (CTE), Finance Department, Govt of Kerala on strengthening solutions recommended by CET. Based on this CTE, visited the building site on 22/11/2019 and submitted a detailed report on 09/12/2019 with observations stated in ref.2.

Vide ref.3, the structural stability of the construction was inspected by the team from CET on 05/04/2019 based on the request of NHM Chief Engineer and reports have been submitted to clients. The report was concluded with statements like many of the structural elements are in distressed state, columns are of insufficient strength, beams out of plumb, honey combing, and leakages noticed in slab. The structure is unsafe for G+5 storeys. The existing structural elements are safe for only G+2 storeys. The existing structure in distressed state can be made useable /safe by properly retrofitting all beams, columns, and slabs on ground floor by suitable



means and only after performing the retrofitting for ground floor structural elements, further expansion could be permitted.

Since M/s. HPL have requested CET to give advice for further course of action for strengthening the existing building of Panchakarma Ayurveda Hospital at Allappuzha, CET is proposing the following course of action as described in **three stages**.

#### Stage-1

The construction work of the building has been stopped in 2015 and since then all the structural elements are exposed to environment without any protective coatings or measures. So distressing conditions in structural elements might have worsened.

Also vide ref.2, CTE has suggested a detailed study of all structural items including footing, plinth beams, all columns, beams, roof slab as per site condition.

So, all the structural elements (Columns, beams and slab) in ground floor have to be tested for its compressive strength using rebound hammer and quality of concrete adopted by Ultrasonic pulse velocity (NDT). CET will also look into the existing NDT results performed by BSNL and Er. Anwar Hussain, and core test results performed by CET vide previous reports. Based on this, CET will give proper instructions to HPL, to which structural elements needs retrofitting.

Footing of the structure has to be exposed at many locations (External and internal footings) to check the level and quality of construction adopted for the work. The dimensions of the footings will be randomly verified as per the structural drawings. Minimum 10-12 footings have to be exposed and verified.

Plinth beams has to be exposed at various positions and has to be checked for concrete strength.

Check / Inspect whether the reinforcements provided in columns, beams and slabs are same as that shown in structural drawings on random locations, by exposing the clear cover of structural elements at some portions.

For performing NDT tests, HPL is requested to clear the plaster provided if any, over the RCC structural elements and plane and clean the surface, free of dust and debris.

#### Stage-2

It is recommended to do the retrofitting of the building, wherever distress was observed on the exiting columns, slabs and beams, as early as possible following the guidelines of the CPWD manual Handbook on Repair and Rehabilitation of RCC Buildings. **Only after performing retrofitting measures in Ground floor, the subsequent floors shall be constructed.**



Retrofitting works shall be done only by well experienced contractor who has already done similar work of similar nature under the strict supervision of engineer. All the design and construction steps stipulated in the CPWD Hand book on Repair and Rehabilitation of RCC buildings manual should be strictly adhered to. The client can seek the help of approved construction repairing agents in market like CERA -Chem pvt ltd, FOSROC Solutions, SIKA Ag chemical Company or equivalent for the execution of the work.

For columns and beams whose strength is found to be very less (Concrete strength less than 10 N/mm<sup>2</sup>), dismantle / demolish that structural element portion and reconstruct the column and beam using self-compacting concrete of grade M60 and additional steel bars if required. Proper props/ formwork support has to be provided during this operation. But utmost care has to be taken not to give any undue vibrations to other parts of structure. Rather than using jack hammer or manual demolishing, flush cutting/ slicing is recommended.

Since CTE has denied the usage of CFRP wrapping for structural elements, CET is proposing the RCC jacketing technology by providing extra steel bars in addition to the existing ones (for Concrete strength 10-19 N/mm<sup>2</sup>). All the columns & beams in the ground floor (except those dismantled due to low compressive strength) shall be strengthened by adopting this technology.

Detailed procedure for RCC retrofitting is written in Annex -1 for columns and for beam retrofitting in Annex-2. For retrofitting slabs, the detailed procedure is written in Annex-3. For beam column joints and also at joints of concreting and also for honeycombed portion, retrofitting technique adopted in Annex-4 has to be followed.

Suitable measures have to be taken at site such as proper quality control checking and ensure the strength of self-compacting concrete and the reinforcements used. Proper supervision also has to be ensured at site. Proper formwork protection has to be done while performing retrofitting.

Anti-carbonation coating (painting) has to be provided for all superstructural elements to prevent carbonation in future.

The final list of structural members to be retrofitted / reconstructed will be submitted after completing NDT tests on the structural elements after stage -1. General procedure to be adopted for retrofitting are given in Annex -1 to 4. Variations in any of the methods will be intimated to client after performing stage-1 and depending on prevailing conditions of concrete and reinforcements.

### Stage-3

After performing all retrofitting / reconstructing RCC structural elements in Ground floor as suggested by CET, NDT testing at random locations only (Rebound hammer test and Ultra sonic Pulse velocity test) will be again performed to check whether the strength after retrofitting / reconstruction is adequate or not. Load testing also will be executed on the



building at random locations of the building and to check whether the ground floor structural elements are safe or not, after retrofitting.

Based on this stability report, the feasibility of further construction will be proposed. The proposal for further expansion will be especially for G+2 floors with top most floor constructed using light roof truss with sheeting, so as to reduce the loads acting over footing and columns. The option of reduction in brick wall load by using AAC blocks or to use LGSF sections will be suggested after performing the detailed study (stage 1 and 2).

Regarding the Plinth level condition (lower than the existing road level), HPL is requested to furnish the technique / methods adopted. CET will look into this and will give suggestions.

**Dr. Mitra DC**

Associate Professor

Dept of Civil Engineering

Government Engineering College Kannur

**Biju V**

Assistant Professor

Civil Department

College of Engineering Trivandrum



### **General Procedure for retrofitting**

- The retrofitting work of structural elements of Ground floor of the building has to be executed in stages; one at a time.
- Proper precautionary measures have to be taken in the building to reduce the loads by restricting the usage on slabs during the time of repairing.
- Retrofitting works shall be done only by well experienced contractor who has already done similar work of similar nature under the strict supervision of engineer. All the design and construction steps stipulated in the CPWD Hand book on Repair and Rehabilitation of RCC buildings manual should be strictly adhered to.
- The client can seek the help of approved construction repairing agents in market like CERA –Chem pvt ltd, FOSROC Solutions, SIKA Ag chemical Company or equivalent for the execution of the work.
- Examine thoroughly the cracks / distress seen on columns, beams and slabs. Apply slight tapping on to surface of the concrete, by using hammer and allow the distressed plaster concrete to spall from the surface.

### **Annex -1: Retrofitting of columns**

For columns having strength in the region 10 -19 N/mm<sup>2</sup>, provide retrofitting by RCC jacketing with additional bars (longitudinal and ties) and Shear keys for columns.

1. Prop and support the structure in order to relieve the RCC column of stresses due to load coming over it. Steel props, bracings and runners shall be used. Steel tubular sections of required size or rolled steel sections may be used as props and should be placed over steel base plates of adequate size. Base plate shall be placed over a suitable foundation of wooden planks / steel or equivalent which is laid over well compacted soil.
2. Remove plaster and finishes all around the distressed RCC columns. Thereafter remove the loose, cracked and spalled concrete to expose the rusted reinforcement.
3. Examine thoroughly the existing columns. Tamp the surface using hammer. During tamping, the concrete surface using hammer or exposing the reinforcements in concrete structural elements during retrofitting for a gap of 25mm, if the quality of concrete used in any of the structural element is found doubtful, it is highly recommended to demolish the entire concrete provided on that particular structural element and cast the surface using self-compacting concrete and existing steel. Finally apply rich layer of plaster.
4. Chip of unsound / weak concrete material from columns, with manual chisel / by standard power-driven percussion type or pneumatic chisel of approved make including



tapering of all edges, making square shoulders of cavities, cleaning the exposed concrete surface and reinforcements with wire brushes. Remove the concrete all around the reinforcement in order to get average 25mm air gap behind the reinforcement and clean the reinforcement of concrete and rust by appropriate methods such as manual methods like hammering the bars, using wire brushes etc or by sand blasting. Clean the reinforcement from rust to give it a rust-free surface by using alkaline chemical rust remover / rust converter of approved make with paint brush and removing loose particles after 24 hours of its application with wire brush.

5. Put additional new reinforcements if found necessary with adequate centering and shuttering. Holes shall be power drilled with appropriate diameters to a minimum depth of 3 to 5 cm, and reinforcement shall be fixed in position using epoxy. The holes are filled with polyester resin anchor grouts, and the new reinforcement bars shall be inserted in the holes and tied with the old reinforcement. Fix shear keys of appropriate diameter and length at specified spacings over the surface to be covered with repair materials. Minimum depth of 6 to 10 times the diameter of shear key bar shall be used for the drilling holes by using chemicals. The drilled holes shall be cleaned of any loose dust by air blowing. The epoxy should be inserted from the cartridge using plastic nozzles and the shear key bar shall be placed in position and allowed to stay undisturbed for 24 hours.
6. Apply appropriate passivating and bond coat over the old and new reinforcements and prepared RCC surface. Apply two coats of epoxy zinc rich primer, as an anticorrosive treatment on the reinforcement surface. Epoxy bonding agent shall be applied on the surface to receive the new concrete. Provide and apply bonding coat of adhesive on chipped portion of RCC. Epoxy bonding adhesive having coverage of 2.2 sqm/kg shall be applied. Adequate extra steel bars have to be provided- Longitudinal and stirrups.
7. Drilling suitable holes in RCC with power driven drill machine to a minimum depth of 100 mm to 200 mm in RCC beams / columns/slabs to introduce steel bars (Longitudinal, shear connectors, and lateral ties) and using epoxy resin anchor grout of approved make for proper fixing of reinforcement.
8. Within the tacky period of bond coat, shuttering and concreting shall be done with specified grade of concrete. The thickness of RCC jacket shall be as specified (Normally 5 to 7.5 cm). Apply RCC for columns using self-compacting concrete (SCC) of grade M60.
9. 6mm thick finishing coat with cement sand plaster 1:3 (1cement: 3 fine sand) (of least possible thickness) if felt necessary, shall be applied within 48 hours of application of micro-concrete. The concrete surface shall be cured by applying Acrylic resin based curing compound.



For columns which require retrofitting, provide additional reinforcement bars of #16 mm diameter and sufficient number has to be provided on all the four sides of the column if carbonation level is more than 30%. Stirrups #8mm dia @ 100 mm c/c at beam column junctions and 150 mm towards center in addition to the existing one shall be provided. Provide steel bars of 8mm as shear key connector anchored by 50-100 mm, spacing as 300 mm c/c staggered (maximum), for connecting existing column with the newly laid SCC concrete. Steel of grade Fe 500 D has to be used. Clear cover 40 mm is to be provided for the retrofitted columns. Final dimensions of column will enhance by 5 - 10 cm.

For column portions where concrete strength is less than  $10 \text{ N/mm}^2$ , dismantle the existing concrete with suitable measures without tampering adjacent structural elements and then opt for re-concreting the element by using self- compacting concrete of grade M60 or above and steel of grade Fe500.

Columns of diameter 300x1000 mm, 300x800mm, 300x600mm, 300x300 mm, 400 dia, 300 dia columns are found as per structural drawings For all these columns, additional reinforcements provided is as follows:

Column Size	Extra Longitudinal reinforcement	Extra lateral ties
300 x 1000 mm	12 nos #16 mm dia	#8@100 mm c/c at corners for a height of H/4 and #8@150 mm c/c at remaining portions
300 x 800 mm	10 nos #16 mm dia	
300 x 600 mm	8 nos #16 mm dia	
300 x 300 mm	6 nos #16 mm dia	
400 mm dia	6 nos #16 mm dia	
300 mm dia	6 nos #12 mm dia	

If any additional bars are required other than mentioned above, based on strength and existing reinforcement condition, it will be intimated at time of construction.



## Annex -2 - Retrofitting of Beams

For beam portions where concrete strength is less than  $10 \text{ N/mm}^2$ , dismantle the existing concrete with suitable measures without tampering adjacent structural elements and then opt for re-concreting the element by using self- compacting concrete of grade M60 or above and steel of grade Fe500.

At portions where beam strength is almost confirming to  $10 -19 \text{ N/mm}^2$ , perform retrofitting by RCC jacketing with additional bars, shear keys and stirrups.

1. Prop and support the structure in order to relieve the RCC elements of stresses due to load coming over it.
2. Remove plaster and finishes all around the distressed RCC elements; remove the distressed / honeycombed / cracked and spalled concrete to expose the rusted reinforcement. Remove concrete all around the reinforcement in order to get a 25 mm air gap-all round and clean the reinforcement and concrete. Chip of unsound / weak concrete material from beams, with manual chisel / by standard power-driven percussion type or of approved make including tapering of all edges, making square shoulders of cavities, cleaning the exposed concrete surface and reinforcements with wire brushes.
3. Clean the reinforcement from rust to give it a rust-free surface by using alkaline chemical rust remover / rust converter of approved make with paint brush and removing loose particles after 24 hours of its application with wire brush.
4. Apply appropriate passivating and bond coat over the old and new reinforcements and prepared RCC surface.
5. Provide necessary shuttering. Drilling suitable holes in RCC with power driven drill machine to a minimum depth of 100 mm to 200 mm in RCC beams / columns/slabs to introduce steel bars (Longitudinal, shear connectors, and stirrups) and using epoxy resin anchor grout of approved make for proper fixing of reinforcement.
6. Provide core cuts on the top of beam at a spacing of 1m c/c on alternate sides of the beam for pouring micro concrete
7. Apply RCC for beams using micro-concrete of grade M60 and above and 25- 30% of 10mm metal with adequate centering and shuttering including strutting, propping etc.
8. Adequate extra steel bars have to be provided- Longitudinal and stirrups.
9. Apply 6mm thick finishing coat with sand plaster 1:3, if felt necessary.
10. The micro-concrete surface shall be cured by applying Acrylic resin based curing compound.

For beams having strength in the region  $10 -19 \text{ N/mm}^2$ , provide retrofitting by RCC jacketing with additional bars also provided. Shear keys have to be provided. Additional reinforcement bars have to be provided of #16 mm diameter and sufficient number has to be provided on the tension side if carbonation level is more than 30%. Stirrups #8mm dia @ 100 mm c/c at beam column junctions and 150 mm towards center in addition to the existing one. Provide steel bars of 8mm as shear key connector anchored by 50-100 mm,



spacing as 300 mm c/c staggered (maximum), for connecting existing concrete with the newly laid micro-concrete. Steel of grade Fe 500 D has to be used. Clear cover 25 mm is to be provided for the retrofitted beams. Final dimensions of beam will enhance by 5 - 10 cm.

Majority of beams as per structural drawings are of size 200mm x 350 mm, 200x400 mm, 200 x 500 mm, 200 x 500 mm, 200 x 650 mm. The extra reinforcements to be provided is 3#16 mm bars at bottom and 2L#8mm @100 mm c/c at support locations for a distance of L/3 and for middle portions 2L#8mm@150 mm c/c. If any additional bars are required other than mentioned above, based on strength and existing reinforcement condition, it will be intimated at time of construction.



### Annex-3

Normally on construction of additional floor, leakage will be stopped.

#### Crack sealing of slab

1. All surfaces must be clean, dry, sound and free from laitance, dust oil and any other contamination also free from water repellents.
2. Removing the existing sealants.
3. Cutting V-grooves in construction Joints, Cold Joints and visible cracks etc.
4. Priming - Apply one brush coat of primer.
5. Filling the crack with single part polyurethane sealant

If the slab strength is found to be very less, then retrofitting as described below has to be performed

1. Chip to remove all the spallen /delaminated concrete and clean the area using wire brush.
2. If the reinforcement bars are exposed while removal of the concrete, and are found to be in corroded condition, the diameter of the bars has to be checked.
3. If the diameter of the bars is reduced by more than 20%, then additional reinforcement bars have to be provided. If the reinforcement is corroded more than 20%, then replace the portion with new reinforcement bars by tag welding.
4. The exposed rebars shall be cleaned with wire brush and apply high performance solvent based rust remover, to remove corrosion scales.
5. Holes shall be drilled to a depth of 50mm on the sound existing concrete member.
6. The holes are filled with polyester resin anchor grouts, and the new reinforcement bars shall be inserted in the holes and tied with the old reinforcement.
7. Apply two coats of epoxy zinc rich primer, as an anticorrosive treatment on the reinforcement surface.
8. Epoxy bonding agent, shall be applied on the surface to receive the new concrete.
9. Finish the surface by providing fiber reinforced repair mortar, to rebuild the damaged portions. The surface shall be cured by applying Acrylic resin-based curing compound

For slabs having strength in the region 10 -19 N/mm<sup>2</sup>, provide retrofitting by RCC jacketing with additional bars also provided. Shear keys have to be provided. Additional reinforcement bars have to be provided of #8mm diameter@150 mm c/c both ways at bottom if carbonation level is more than 30%. Provide steel bars of 8mm as shear key connector anchored by 50-100 mm, spacing as 300 mm c/c staggered (maximum), for connecting existing concrete with the newly laid SCC concrete. Steel of grade Fe 500 D has to be used. Clear cover 15 mm is to be provided for the retrofitted slabs.



#### **Annex-4**

##### **Honey comb areas**

All visible honeycomb areas in RCC shall be chipped and cleaned to remove loose concrete and dust.

Apply a coat of epoxy bonding agent and provide fibre enriched repair mortar

If honeycombs are detected during UPV test and not visible, such areas shall be marked and appropriate non-returnable patches shall be fixed. Epoxy resin with appropriate strength characteristics shall be grateful with an electrical pump of pressure to a maximum of 400 psi.

##### **At portions where leakage were observed**

Adopt Pressure grouting technique using Epoxy resin injection chip off the plastered surface and apply micro concrete and apply rich mix of plaster.

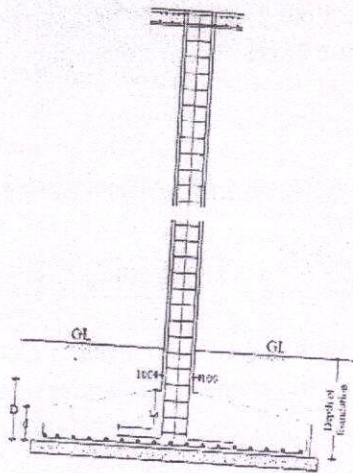
##### **Eccentricity of Columns**

Since eccentricity are noticed in some columns at plinth and GF slab levels, RCC jacketing from the pedestal of footings till plinth beams and jacketing at GF portions have to be performed.

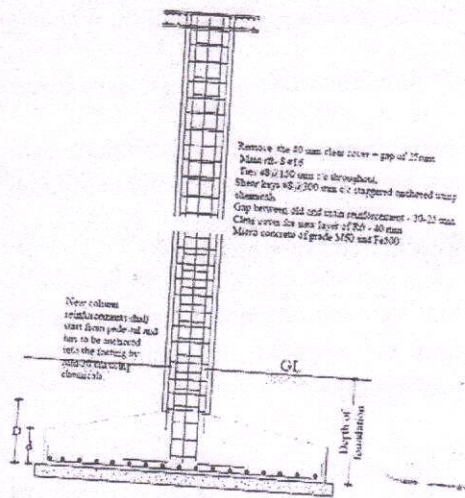


Annex -5

Typical Retrofitting Figures



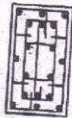
TYP. DETAILS OF EXISTING COLUMN & FOOTING



TYP. DETAILS OF RETROFITTED COLUMN



Existing Column rft  
Column size - 30x60  
cm



Addl Column rft and  
lateral ties with shear keys

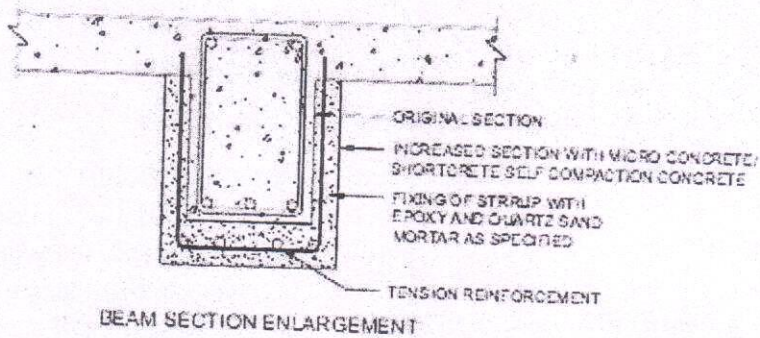
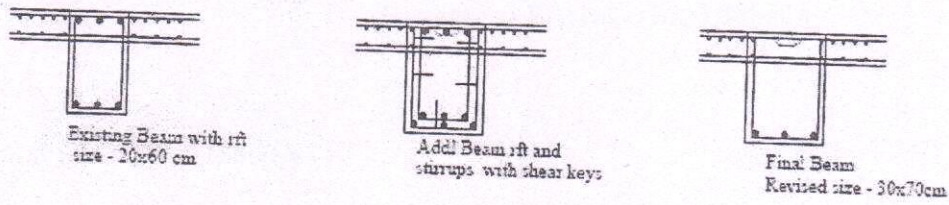


Final column  
Revised size - 40x70cm

Remove the 40 mm clear cover + gap of 25mm  
Main rft. #16  
Ties #8 @ 150 mm c/c throughout.  
Shear keys #8 @ 300 mm c/c staggered anchored using chemicals  
Gap between old and main reinforcement - 20-25 mm  
Clear cover for new layer of Rft - 40 mm  
Micro concrete of grade M60 and Fe500

Column Retrofitting Sketches - Typical





Beam retrofitting – typical sketches



Note

Sub: Construction of Super Speciality Panchakarma Hospital and Research Centre, Alappuzha - reg:

The project related to construction of Govt. Panchakarma Ayurveda and Research Centre, Alappuzha was entrusted with M/s. HPL as SPV. M/s. HPL has arranged the work through a Contractor and partially constructed the building. It is seen that the already constructed portions have some structural defects. This is to be rectified by proper rectification works by the SPV. Also, the structural details to be checked for various structural parameters after retrofitting works by any competent agency and is to be certified by them like NIT, IIT, etc. for further vertical extension as per the original proposal (G+5).

Vide letter no. HPL/K/DGM/2021-22/29/59 dated 15-06-2021, M/s. HPL has submitted a detailed estimate for carrying out rectification works. M/s. HPL was called for a discussion. In response to the above, vide letter No. HPL/K/DGM/2021-22/61/141 dated 31-07-2021 the SPV has submitted a proposal for rectification works through a practising Engineer, Mr. Anwar Hussain.

The committee feels that the procedure suggested is with a new concept at this stage which is not generally practised and hence the process cannot be approved by the committee. The option left behind is to carry out the rectification works, conduct sufficient test and prove that the building is structurally strong enough for the original configuration of G+2 floors in front portion and G+5 in the rear portion duly achieving the required strength for various components. Only after getting the retrofitted works duly certified by the SPV, through the agencies such as NIT, IIT, etc. they may be allowed to build up on it. The cost of the retrofitting works should be borne by the SPV.

In this connection, CTE have suggested certain observations which also is to be fully complied during the retrofitting works.

Government may take a suitable decision in the matter.

1. Additional Secretary, AYUSH
2. Director, Indian System of Medicine
3. Chief Engineer, National Health Mission
4. Member Secretary, Govt. Panchakarma Hospital Society
5. Consultant Engineer, National AYUSH Mission

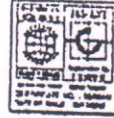




## HINDUSTAN PREFAB LIMITED

(A Govt. of India Enterprise)

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Fax. No: 0471-4066028

e-mail : hplsouthnew@gmail.com

No. HPI/K/DGM/2021.22/111/224

Date: 29.09.2021

To,

The Member Secretary,  
Govt. Ayurveda Panchakarma Hospital,  
Alappuzha

**Sub:- Construction of Panchakarma Ayurveda Hospital Alappuzha**

Ref:(i). Letter No.C203/2018, dated-29.09.2021

(ii)E1/22/2016-AYUSH, dated-08.09.2021

Dear Sir,


As per the above ref.(ii) we received the approval from the department for the rectification works on 10.09.2021. Accordingly we are processing the tender and it will be floated immediately. The road map of the project mentioned as below will be followed for further action.

### Road Map

<u>Activity</u>	<u>Target</u>
Proposal for rectification work submitted to Govt.	15.06.2021
Approval received from Govt. (through mail)	10.09.2021
Tendering under process and expecting the date of tendering	05.10.2021
Finalizing the tender	20.10.2021
Starting of work	30.10.2021
Completion period ( 3 months)	30.01.2022
Rebound test( 2 months) and obtaining stability certificate from CET/NIT	30.03.2022

Thanking You,

Yours faithfully

  
Dy. General Manager (C)  
Regional Incharge (SZ)