CENTRAL BUILDING RESEARCH INSTITUTE, ROORKEE-247667 (INDIA)

BUILDING RESEARCH NOTE

B. R. N. 40

ZONEWISE ECONOMIC SPECIFICATIONS FOR BUILDING CONSTRUCTION

Zone I	—	Jammu, Punjab, Haryana, Delhi, Chandigarh and Western Uttar Pradesh.
Zone II	—	Kashmir Valley, Himachal Pradesh, Hilly Areas of Uttar Pradesh and Sikkim.
Zone III	—	Rajasthan, Madhya Pradesh and Gujarat.
Zone IV	—	Assam, Manipur, Meghalaya, Nagaland, Tripura Arunachal Pradesh and Mizoram.
Zone V	—	Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala Andman & Nicobar Islands, Dadra and Nagar Haveli, Goa Daman & Diu, Lakshadweep and Pondicherry.
Zone VI	—	West Bengal, Bihar, Orissa and Eastern Uttar Pradesh.

There is a demand for short notes summarising available information on selected topics of building research for the use of engineers, architects, builders, building material manufacturers and others interested in building research. To meet this need the Institute was so far bringing out various serial publications, such as, Building Digests, Building Materials Notes, Data Sheets, Information Notes, Technical Notes etc. It was decided in January 1982 to combine all these serial publications into a new serial under the main heading "BUILDING RESEARCH NOTE" and the present one is the 40th in this series.

Readers are requested to send to the Institute their experience of adopting the suggestions given in this publication.

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Sl. No.	Element	Zone I	Zone II
1.	**FOUNDATIONS**	(i) Depth from lowest ground level in normal soil shall be 500 mm.	(i) Same as in Zone I.
		(ii) Base concrete shall be 100 to 150 mm thick consisting of :	(ii) Base concrete shall be 100 to 150 mm thick consisting of :
		(a) 1:8:16 cement concrete with stone or brick aggregate for buildings upto two storeys and 1 : 7 : 12 with stone or brick aggregate for more than two storeyed buildings. Or	(a) 1:8:16 cement conc. with stone aggregate for building upto two storeys and 1:7:12 with stone aggregate for more than two storeyed buildings. Or
		(b) Lime concrete 16 : 32 : 100 with lime : surkhi or cinder : brick or stone aggregate,	(b) Lime Concrete 16 : 32 : 100 with lime : surkhi or cinder : stone aggregate.
		(c) Lime base product : sand :40 mm down aggregate in 1:3:6	(iii) In place of random rubble masonry, precast stone masonry blocks 300 × 200 × 150mm nominal size comprising of 12-15 cm size sand stone and lean cement conc. 1:5:8 shall be adopted. The mortar shall be either 1:6 or 1:7 cement sand depending on number of storeys or 1 : 3 lime surkhi or 1:3 lime cinder or lime base product : sand in 1 : 1.5 depending upon the strength requirement and cost economics. The steps shall be concentrated at bottom.
		(iii) Brick Masonry shall be laid in 1:7 cement sand mortar for buildings upto two storeys and in 1 : 6 cement sand mortar for more than two and upto five storeyed buildings. Composite mortars such as 1:1:8 or 1:2:9 or hydrated lime:sand 1:3 or lime:surkhi 1:3 or lime base product : sand in 1:1.5 depending upon the strength requirement and cost economics shall also be used. The steps shall be concentrated at bottom and shall be 115 mm/75 mm or 100 mm for traditional and modular bricks respectively.	
2.	**DAMP-PROOF COURSE**	10 mm thick cement : sand 1 : 4 plaster shall be laid over brick-work and after its curing and drying, hot bitumen at 1.2 kg per sq.m. shall be applied.	10 mm thick cement : sand 1 : 4 plaster shall be laid over stone block masonry and after its curing and drying, hot bitumen at 1.2kg per sq. m. shall be applied.
3.	**SUPER-STRUCTURE**	Wall shall be designed like any other structural member as per National Building Code of India 1970/IS : 1905 : 1980. Single brick thick load bearing wall shall be adopted in all floors. The compressive strength of bricks	Precast stone masonry block wall shall also be designed as per N.B.C. of India 1970/IS:1905-1980. For single storey buildings the load bearing wall shall be 15 cm thick. The load bearing wall in

Zone III	Zone IV	Zone V	Zone VI
i) Same as in Zone I.	(i) Same as in Zone I	(i) Same as in Zone I.	(i) Same as in Zone I.
ii) Same as in Zane I, adopt	(ii) Same as in Zone III.	(ii) Same as in Zone III.	(ii) Same as in Zone III
(a) when lime is not available.	(iii) Same as in Zone I/II, depending upon the availability of bricks/ stone.	(iii) Same as in Zone I/II, depending upon the availability of bricks/ stone. Granite stone shall be used for stone masonry blocks and after proper weathering Laterite shall also be used as agg. instead of using it after dressing sand-lime bricks where available shall also be used.	Same as in Zone I/II depending upon the availability of bricks stone.
iii) Same as in Zone I/II depending upon availability of bricks/stones. The quality of bricks shall be improved by grog coal ash addition			(iv) Same as in Zone III.
iv) In areas af expansive soil, under - reamed piles with grade beams shall be adopted. And also in areas of poor, loose and filled up soils. For EWS low rise buildings, in expansive soil, pedestal piles shall be used.		(iv) Same as in Zone III.	
D.P.C. same as in Zone I/II. Not to be done where water table is very low below G.L.	D.P.C. same as in Zone I/II.	D.P.C. same as in Zone I/II.	D. P. C. same as in Zone I/II.
Same as in Zone I/II, depending upon the availability of brick/ stones. The quality of bricks shall	Same as in Zone I/II depending upon the availability of bricks/ stones. Or alternatively timber	Same as in Zone I/II/IV depending upon the availability of bricks/ stones/timber or bamboo. The	Same as in Zone I/II depending upon the availability of

Sl. No.	Element	Zone I	Zone II
		required for load bearing walls for four storeys is 100 kg/cm², for three storeys 75 kg/cm², for two storey 50 kg/cm², and for single storey 35 kg/cm². Same mortars as given in foundation shall be adopted as per strength requirements. For single storey buildings mud mortar may also be adopted. To increase productivity and quality brick masonry, improved method of brick laying using end frames and string holders etc. shall be used.	more than single storey buildings shall be 20 cm thick and the concrete mix shall be such that the required strength of masonry blocks is achieved namely 60 kg/cm² for double storey, 90 kg/cm² for triple and 115 kg/cm² for four storeyed buildings. Same mortar as given in foundations shall be used as per strength requirements. The improved method using end frames and string holder shall also be adopted. Or Alternatively timber post frame cross braced and panelled with planks shall be adopted. Also bamboo matting duly plastered with composite mortar 1 : 2 : 9 cement lime sand shall be used where bamboo is available.
4.	**LINTELS**	(i) Flat or segmental brick arch 115 mm thick laid in 1 : 6 cement sand mortar or composite mortar or lime base product mortar shall be used for spans upto 1.2 m. Or (ii) Precast R. C. thin lintels designed on composite action shall be used. The concrete shall be M-150 and 2 bars of 10 mm dia. and 3 bars of 10mm dia. placed centrally for spans upto 1.2 m and 1.8 m respectively shall be used. These precast lintels shall be placed after curing for 28 days and propped till the brick masonry laid over (minmum height 30cm for 1.2 m and 45 cm for 1.8 m spans) attains strength. The sun-shades with precast thin lintels shall be precast alongwith the lintels or reinforcement shall be kept projecting out and the sunshades cast in-situ.	(i) Precast R. C. lintels same as in Zone I (ii) OR Stone Patties if available shall also be used as lintel, Or in areas where timber is available timber lintels shall be used after applying protective treatment of Creosote or ASCU.
5.	**DOORS AND WINDOWS**	**(i) Frames & Shutters** These shall consist of secondary species ef	Same as in Zone I

Zone III	Zone IV	Zone V	Zone VI
be improved as given in foundations.	Post frame and cladding with bamboo matting duly plastered with 1 : 2 : 9 cement lime sand plaster shall be adopted.	quality of bricks shall be improved by grog/coal ash and other methods.	bricks / stone. The quality of bricks shall be improved by grog and other methods in Bihar and Orissa.
Stone patti lintels shall be adopted where available. Or Same as in Zone I (i) and (ii).	Same as in Zone I/II depending up on the availability of bricks/ stone patti/timber	Same as in Zone IV.	Same as in Zone I (i) and (ii)
Same as in Zone I	Same as in Zone I	Same as in Zone I	Same as in Zone I

Sl. No.	Element	Zone I
		recognised locally available seasoned and treated timber. The size of the frame shall be 65 × 90 mm or the frame shall be made out of M.S. flats or Angle iron of 40 × 25 × 5 mm and 45 × 30 × 5 mm for shutters of 30 and 38 mm thickness respectively. The window frames shall comprise of angle iron of 30 × 30 × 5 mm. Alternatively pressed steel frames as per availability and cost economics shall be used. No frame shall be used for EWS houses and for WC and bath for LIG houses, but the shutters shall be ledged, braced, battened and hung on pivots at top and bottom or on side from jamb. (ii) Fittings M.S. black Japanned fittings shall be be used in place of costly fittings.
5.	STRUCTURAL FLOOR/ ROOF	(i) Precast units such as channel or cored units or R.C. planks/R.B. panels supported over precast R.C. joists shall be used. For buildings upto two storeys, the erection of prefab components will be done manually and for upper storeys, CBRI design scaffold hoist or any other mechanical means shall be adopted. or R.B./R.B.C. or R.C.C. slab or thin R.C, ribbed slab designed on limit state method shall be laid in-situ. For laying in-situ slabs and beams, improvised form-work using M.S. wall brackets shall be adopted to increased productivity. or Brick tiles over R.C. or timber joists placed at 300 mm c/c shall be used. or Jack arches with precast R.C. joists shall be used (ii) For sloping roof, precast R.C. 'L' pan shall be used with overlap of 10 cm. between the pans and laid to 1 in 4 slope.

Sl. No.	Element	Zone I
7.	**FLOORING**	**(i) Base for Ground Floor** Over rammed earth, 10 cm thick sand layer shall be laid. The base concrete shall comprise of : (a) 75 mm thick 1 : 8 : 16 cement concrete; or (b) 18:32:100 lime concrete as specified in foundations. (c) Lime base product : sand : 40 mm & down aggregate in 1 : 3 : 6 mix as per specification for foundation. **(ii) Wearing Coat for G.F. and Intermediate Floors** 25 mm thick 1 : 2 : 4 cement concrete with 12 mm and down stone aggregate and finished smooth or Burnt clay/tile flooring laid with 1:4 cement sand mortar or clay flooring tiles 2.5 cm thick laid in ALPM : sand : 2 mortar.
8.	**FINISHES**	Composite mortar 1 : 1/2:8 (cement : lime : sand) or lime:sand in 1 : 3 or lime base product : sand in 1 : 2 shall be used for plastering. The thickness shall be 10 mm on even face and 15 mm on rough face. The external pointing shall be done with composite mortar in 1 : 1/2:5. The improved method of plastering using triangular shape trowel and L shaped gadgets shall be adopted for increasing productivity. The walls and ceiling shall be white/ colour washed.
9.	**WATERPROOFING**	After cleaning the surface with wire brush, hot bitumen @ 1.7 kg/m² shall be applied. Single layer of brick tiles shall be laid on mud phuska laid to a slope of 1 in 60. The brick tile joints shall be grouted with 1 : 3 cement sand mortar mixed with 5% crude oil by weight of cement. or Alternatively lime concrete terracing shall be used and compaction of the same shall be done by lime concrete tamping machine. 100 mm dia. A.C. pipe for 40 m² area shall be provided for draining the rain water.
10.	**WATER SUPPLY**	High density PVC pipes shall be used for underground and internal work. However, for all horizontal overhanging part in internal work, additional pipe of mild steel shall be provided, duly embedded in masonry to support the PVC pipes for unforeseen misuse The overhead tank shall be of AC/RCC/ PVC or ferrocement and to conserve water, dual flushing tank shall be adopted.
11.	**BUILDING DRAINAGE**	Single Stack System of Plumbing as per National Building Code of India-1970/IS-5329-1969 Code of Practice for Sanitary, Pipe work above ground for buildings shall be adopted.

Zone II	Zone III	Zone IV	Zone V	Zone VI
i) Same as in Zone I depending upon availability of lime.	(i) Same as in Zone I (i) (b) or (c)	(i) Same as in Zone I (i) (a) or (b)	(i) Same as in Zone I (i) (a) or (b)	(i) Same as in Zone I
ii) Same as in Zone I or timber flooring shall be used.	(ii) Same as in Zone I (ii) or Cut stone pieces flooring pointed with lime sand mortar in 1 : 3 or lime base product : sand in 1 : 2.	(ii) Same as in Zone I.	(ii) Same as in Zone I.	(ii) Same as in Zone I/II/III depending upon availability and cost economics.
Composite mortar :1/2:8 (cement:lime: sand) shall be used or plastering. The hickness shall be 10 mm on both faces of nternal wall. The external pointing and white/colour washing hall be done as given n Zone I	Same as in Zone I/II.	Same as in Zone I/II.	Same as in Zone I/II	Same as in Zone I/II
Lime concrete erracing shall be sed and compating of the same hall be done by me concrete amping machine. or After cleaning the urface with wire rush, hot bitumen @1.7 kg/m² hall be applied nd peagravel prinkled over it or sloping roofs ther than those f AC/CGI sheets.	Same as in Zone I	Same as in Zone I/II.	Same as in Zone I/II.	Same as in Zone I/II.
ame as in Zone I	Same as in Zone I	Same as in Zone I	Same as in Zone I	Same as in Zone I
ame as in Zone I	Same as in Zone I	Same as in Zone I	Same as in Zone I	Same as in Zone I