NEPAL NATIONAL BUILDING CODE

NBC 106 : 1994

SNOW LOAD

Government of Nepal
Ministry of Physical Planning and Works
Department of Urban Development and Building Construction
Babar Mahal, Kathmandu, NEPAL
Reprinted : 2064

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तत्कालिन श्री ५ को सरकार (मन्त्रिपरिषद्) को मिति २०६०।४।१२ को निर्णयानुसार स्वीकृत

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Preface

This Nepal Standard was prepared during 1993 as part of a project to prepare a draft National Building Code for Nepal.

In 1988 the Ministry of Housing and Physical Planning (MHPP), conscious of the growing needs of Nepal's urban and shelter sectors, requested technical assistance from the United Nations Development Programme and their executing agency, United Nations Centre for Human Settlements (UNCHS).

A programme of Policy and Technical Support was set up within the Ministry (UNDP Project NEP/88/054) and a number of activities have been undertaken within this framework.

The 1988 earthquake in Nepal, and the resulting deaths and damage to both housing and schools, again drew attention to the need for changes and improvement in current building construction and design methods.

Until now, Nepal has not had any regulations or documents of its own setting out either requirements or good practice for achieving satisfactory strength in buildings.

In late 1991 the MHPP and UNCHS requested proposals for the development of such regulations and documents from international organisations in response to terms of reference prepared by a panel of experts.

This document has been prepared by the subcontractor's team working within the Department of Building, the team including members of the Department and the MHPP. As part of the proposed management and implementation strategy, it has been prepared so as to conform with the general presentation requirements of the Nepal Bureau of Standards and Metrology.

The subproject has been undertaken under the aegis of an Advisory Panel to the MHPP.

The Advisory Panel consisted of :

Mr. UB Malla, Joint Secretary, MHPP	**Chairman**
Director General, Department of Building (Mr. LR Upadhyay)	**Member**
Mr. AR Pant, Under Secretary, MHPP	**Member**
Director General, Department of Mines & Geology (Mr. PL Shrestha)	**Member**
Director General, Nepal Bureau of Standards & Metrology (Mr. PB Manandhar)	**Member**
Dean, Institute of Engineering, Tribhuvan University (Dr. SB Mathe)	**Member**
Project Chief, Earthquake Areas Rehabilitation & Reconstruction Project	**Member**
President, Nepal Engineers Association	**Member**
Law Officer, MHPP (Mr. RB Dange)	**Member**
Representative, Society of Consulting Architectural & Engineering Firms (SCAEF)	**Member**

Representative, Society of Nepalese Architects (SONA) **Member**
Deputy Director General, Department of Building,
(Mr. JP Pradhan) **Member-Secretary**

The Subcontractor was BECA WORLEY INTERNATIONAL CONSULTANTS LTD. of New Zealand in conjunction with subconsultants who included :

Golder Associates Ltd., Canada
SILT Consultants P. Ltd., Nepal
TAEC Consult (P.) Ltd., Nepal
Urban Regional Research, USA

Principal inputs to this Standard came from :

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0 Foreword

This Nepal Standard on "Snow Load" comprises the Indian Standard IS: 875 (Part 4) 1987 : CODE OF PRACTICE FOR DESIGN LOADS (OTHER THAN EARTHQUAKE) FOR BUILDINGS AND STRUCTURES (Second Revision) with amendments as set out herein.

These amendments have been necessary to ensure the requirements of Nepalese context.

1. Scope

NEPAL AMENDMENTS TO IS: 874 (Part 4) –1987

0 Foreword

Delete **0.1** to **0.3.2** inclusively and replace with:

Most of the mountainous districts of Nepal experience snowfall two to three times a year. The districts that experience snowfall are Darchula, Bajhang, Humla, Mugu, Jumla, Dolpa, Rukum, Mustang, Manang, Gorkha, Rasuwa, Sindhupalchok, Dolakha, Solukhumbu, Sankhuwasabha and Taplejung. The depth of snow that occurs in these places is variable.

The country can broadly be divided into five categories based on the physiographic regions. Of these five physiographic regions, the Terai, the Siwaliks and the Middle Mountains do not experience snowfall. The region falling in the high mountains, however, gets snow during two or three months of a year. The High Himalayas always have snow cover throughout the year. Figure 1.1 shows the regions of the country and the likelihood that each will experience snow.

During a study to produce an inventory of current building practices (as part of the National Building Code Development Project), the teams gathered information pertaining to historic experiences of snowfall in the locality of surveyed buildings. Based on owner's responses, a ground snow load of about 1.2 m. was estimated for Jomsom. Jomsom is located at an elevation of about 2800 m. above mean sea level in the High Himalayas region.

At high altitudes and adjoining areas, flat roofs are built with mud placed over timber planks or split pieces of wood. A slope is not provided because the wind speed is high and the rainfall is sparse. According to the local people, on roofs with only a mild slope the mud even gets eroded by rainfall of only moderate intensity. Only a nominal slope that is just enough to drain the melted snow and rain water is provided. Snow accumulates on the roof and the narrow space between the adjacent buildings is also filled. Snow accumulated on the roof is removed manually.

Historical snow data in Nepal does not exist and is only recently being recorded. The Snow and Glacier Hydrology Project has started to collect data in the higher regions. Depth, density and water equivalent are monitored. Readings are becoming available from the Langtang and some other regions of the country with glaciers. Stations close to human settlements do not exist.

The project dispatches teams to the stations in February. The team spends one week collecting the identified parameters. Typical information obtained from the project is given in Table 1. The snow depth obtained from the project, however, is far less than that obtained from verbal inquiry. For this reason, the concerned personnel and the institutions are being requested to collect information from in-depth studies and inquiries of the knowledgeable people of the locality and to make this information available for snow load derivation.

In many parts of the snow-prone region, buildings using foreign materials (e.g., glass and cement pointing of the front walls) are being built. However, no roofs are constructed of corrugated iron sheet. Rice and wheat straw are not available and hence thatched roofs are totally absent. No other alternative materials for roofing can be obtained in these regions because the land in this area consists mainly of sand mounds where vegetation growth is virtually nil. Human settlement in these regions is concentrated mainly on the river banks which are shifting downwards because the stream bed consists of a sand bed which is sharply cut by the water currents.

0.4 1st line, *delete* "part" and *substitute* with "Code".

1. 1st line, *delete* "part 4".

4th line, *delete* "in part 2 Imposed load".

Note, *delete* inclusively.

3. Note, delete all except the last sentence.

4.

4.21 *Replace* $0^{\circ} < \beta < = 30^{\circ}$ with $0^{\circ} < \beta < 15^{\circ}$, and
Replace $0^{\circ} < \beta < = 30^{\circ}$ with $15^{\circ} < \beta < 30^{\circ}$

6. *Add* new clause :

6.1 Minimum Slope for Roof

6.1.1 For efficient removal of the snow, the minimum slope for a roof should be in the ratio of 2:1 (V: H). Higher sloped roofs become better for snow. However, the case is the reverse for wind. The most favorable slope for both wind and snow is therefore about 2:1.

6.1.2 It is ironic that the areas which experience snowfall have flat roofs and the other areas, which do not experience snow have sloped ones. The probable reasons for providing a flat roof are the unavailability of suitable indigenous materials for a sloped one and the possibility of the wind blowing away the roof. Imported corrugated iron sheet is possibly the only realistic alternative. However, the intensity of wind and the economy of construction should be though of before a change to sloped roofs is suggested for traditional buildings.

6.1.3 The snow and Glacial Hydrology Project dispatches teams to the stations each February.The team spends one week collecting the identified parameters. The information obtained from the project is given in Table 1.

TABLE 1 : SUMMARY OF SNOW DEPTH/DENSITY IN LANGTANG AREA

Date	Location	Elevation (m)	Slope	Mean Depth of Snow (cm)	StandardDeviation of Snow	Number of Observeations	Density (gm/cm3)	Water Equivalent (mm)	Remarks
24/25-II-91	Tsergoti to Yala Peak	5000 to 4920	Varies	33.0	46.2	145	0.320	107.0	Density quite variable
26-II-91	Kyanging base camp	3900	SW	16.6	1.3	14	0.069	11.5	Just able to snow fall
27-II-91	Plateau # 1 near gauging	3700	W	16.9	2.5	15	0.11	19.0	Just after snow fall
27-II-91	Plateau # 2 near gauging	3760	W	15.4	0.8	10	0.134	21.0	One hour after snow strong sunshine
27-II-91	Plateau # 3 near gauging	3820		15.7	1.5	10	0.126	20	Two hours after snow
27-II-91	Bottom of trail to Nayang Khola	3880	N	34.3	3.5	15	0.123	42	Forest area, rough, shape, old snow, depth hoar frost present
27-II-91	Kyanging base house	3900	SW	19.2	3.0	57	0.11	20	Estimated from plateau # 1 just after snow fall
27-II-91	Kyanging base house	3900	SW	16.7	3.3	12	0.11	18.5	Sub set of above snow depth

Source : Snow and Glacier Hydrology Project

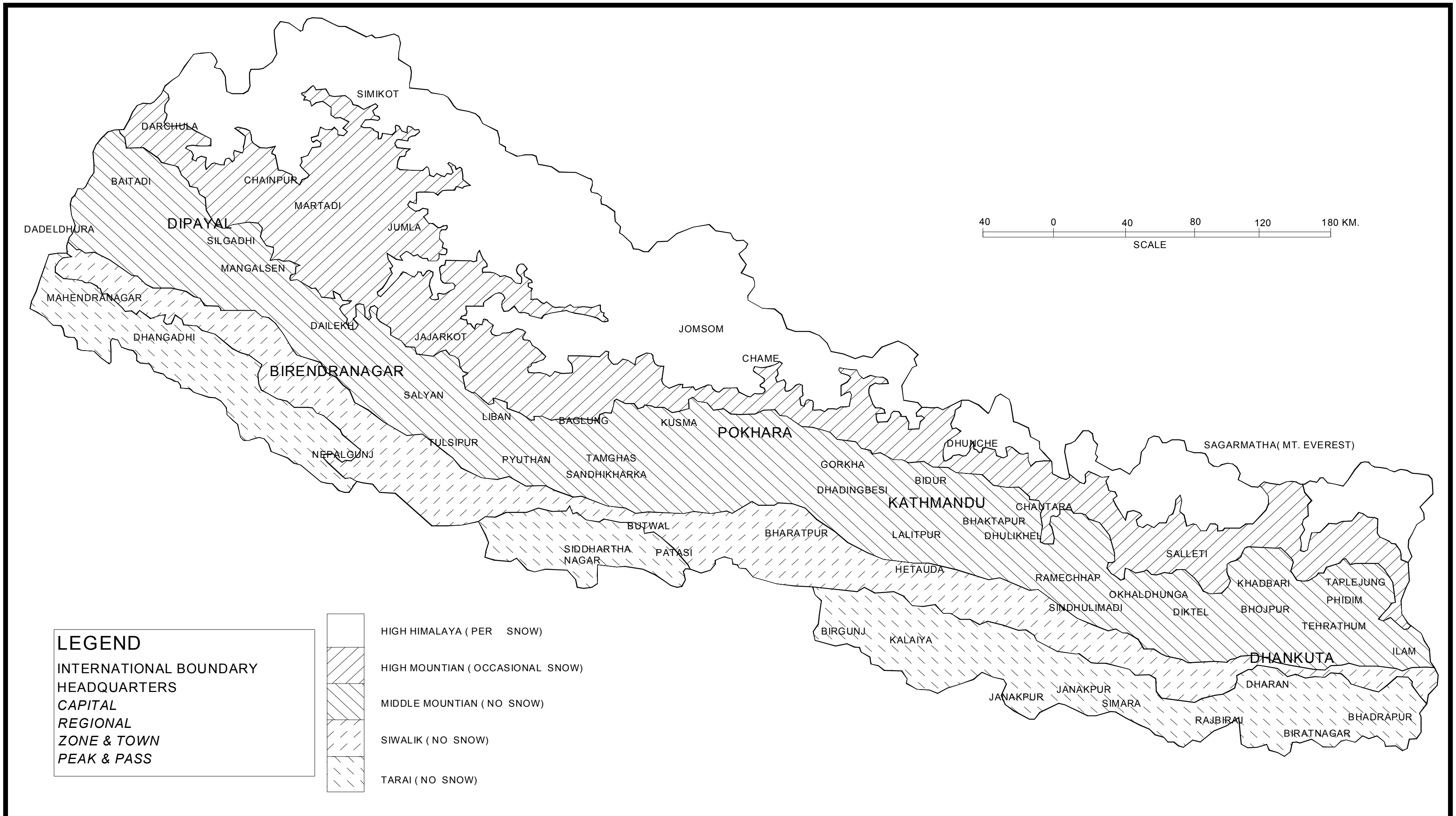

Figure 1.1 PHYSIOGRAPHIC REGION SHOWING SNOWFALL AREA