



by Ralph Mills-Tettey

HUDCO Housing

Neemuch, India



Architect
Shirgaokar and Associates

Client
*Neemuch Improvement Trust
Housing and Urban Development Corporation*

Design
1986

Completed
1989

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I. Introduction

The housing for the Neemuch Improvement Trust in Mandsaur District in the central Indian state of Madhya Pradesh was designed predominantly for the less well-off sectors of society, but also partly for the middle income group. Its 178 dwelling units were conceived and constructed with the aim of assuring a good standard of living and providing reasonable facilities, adequate and equitable distribution of infrastructure, and suitable open spaces. Row and cluster housing has been developed with common walls, and all houses are provided with front and back yards. Dwellings at first floor level are given access to an open terrace via an outside stairway. The houses were built of local stone and with local labour, thus achieving very high cost savings.

II. Contextual Information

a. Historical background

Neemuch is a *taluka* (an Indian term defining a small administrative unit of a district). Situated in the north-western corner of Madhya Pradesh state, very close to the Rajasthan border, the town shows the influence of Rajasthani culture. Neemuch is essentially an agricultural centre, known for its garlic and opium production. The old town of Neemuch was developed by the British, who selected it as a cantonment, and the town still has a distinctive colonial character. The present population is about 100,000. The Neemuch Improvement Trust, which has now been merged into the Neemuch Municipal Council, was a local area agency that acted as a facilitator of land and finance. The prime focus of its activities was to improve the available land by area development, and to ensure the provision of the infrastructure necessary for such development. It also made finance available for the development of housing through the state-level housing authority and the Housing and Urban Development Corporation (HUDCO).

HUDCO was set up in 1970 by the Indian government with the objective of financing housing and undertaking urban development programmes throughout the country, developing satellite towns and establishing building materials industries. HUDCO receives funding for its programmes through borrowing from the market and from insurance companies. HUDCO does not grant loans directly to individuals but rather finances housing and urban development projects that are sponsored by state governments, state housing boards, slum clearance boards, city development authorities and local bodies. The main trend in its activities is towards lower and lower-middle income families, but it does finance housing for middle and upper income groups in order to subsidize the loans to low income families.

In India, for the purpose of programming housing and other delivery systems the population is classified into four groups. These are the Economically Weaker Sector (EWS), Low Income Group (LIG), Middle Income Group (MIG) and Higher Income Group (HIG). In 1986, at the time of the conceptualization of the Neemuch HUDCO Housing scheme, the

relative income for the various groups was classified as follows: Economically Weaker, below 350 INR per month; Low Income, 351–600 INR per month; Middle Income, 601–1,500 INR per month; High Income, over 1,500 INR per month. The Indian Sixth National Development Plan (1980–85) concentrated predominantly on the ‘absolutely shelterless’ for its housing programme. Some 86 per cent of the new housing units financed through HUDCO during this period had been for families in the Economically Weaker Sectors and Low Income Groups. This was the setting and background that led to the Neemuch HUDCO Housing scheme.

b. Local architectural character

The influence of the British Raj is strong in Neemuch. Alongside landmark buildings such as the railway station and various churches, a large number of pyramidal-roofed residential buildings and others built in a graceful colonial style can be seen scattered around the town.

c. Climatic conditions

Summer temperatures at Neemuch do not exceed 33°C and winter temperatures are about 23°C. The rainfall is from moderate to low and the general climatic character is breezy and pleasant.

d. Site and topography

Neemuch town is situated on the Malwas plateau, at about 500 metres above sea level. The land within the town is undulating but at places fairly level, with a good layer of soil. The project site is fairly flat, and spot heights within the site have less than 2 metres variation.

III. Programme

During the early stages of conception, the primary focus of the programme was towards the segregation of the housing for the three income groups, the Economically Weaker, Low Income, and Middle Income, respectively referred to as types C, B and A. The initial emphasis was to develop a sense of community living and at the same time establish an equilibrium between functions and amenities. The overall scheme was envisaged to be a low-rise high-density solution.

The architect had to work within cost-per-dwelling limits set by HUDCO for each of the income groups. Upper limits were set as INR 12,000, INR 24,000 and INR 42,000 for dwelling units of the EWS, LIG and MIG respectively. In order to work within this budget the project architect conducted studies in the optimal use of land and local resources. These included the investigation of stone building techniques and options for raw material procurement, and the erection in stone of prototypes for actual building components so as to test their viability. In planning the layout a grid system was used, the dimensions of which responded to the stone roofing elements that would eventually be used on the housing units.

IV. Description

a. *Building data*

The scheme was developed as an amalgamation of clusters. The following is a summary of the house types within the clustering layout and the respective floor areas and quantities constructed:

Cluster type	Floor area	Accommodation	Remarks
1. A	47.33 square metres	Entrance veranda, living room, bedroom, kitchen/dining, store, bath, WC	Middle Income category 34 units built on ground floor and 28 units on first floor (62 dwelling units total)
2. B	25.00 square metres	Entrance veranda, one room, kitchen, bath, WC	Low Income category II 78 units built on ground floor and 38 units on first floor (116 dwelling units total)
3. C	16.25 square metres	Entrance veranda, one room, bath, WC	Low Income category I Intended as ground and first floor dwelling units
(Cluster type C was earmarked as Phase II of the project but was never built.)			

b. *Design concepts*

Each type of cluster was given its own open space. The overall environment results from the hierarchy established by these open spaces, which range from individual terraces and front/back yards to cluster open spaces. Their continuum throughout the scheme is established by pathways that link the various spaces.

c. *Structure, materials and technology*

From the start, the scheme was developed in conjunction with a study of indigenous, locally available resources in terms of both raw materials and grassroots-level technology. Rubble and limestone slabs were used extensively in the construction to achieve very high cost savings. The local stone was cut and rough-dressed to a thickness of 75–100 millimetres and dimensions of 600 by 3,000 millimetres. Rubble for the stone masonry was available in sizes between 150 and 175 millimetres and in even thickness due to the very nature of the limestone strata. Stone slabs 100 millimetres thick, 750 millimetres wide and 1,200 millimetres high were used as partitions, parapets, supporting walls for staircases, etc. In use

or installation they were usually placed on edge and dovetailed by iron U-pins at staggered intervals.

d. Origins of technology, materials, labour force, professionals

The main building materials – rubble and limestone slabs – are indigenous to the region and have been used for centuries. As a result the locals are well versed in their usage. The stones and slabs came from a quarry about 20 kilometres from the site and were used cut and dressed to various specified sizes depending on anticipated usage. The method of construction was very similar to that used for pre-cast concrete, but in a natural form, and did not require any sophisticated equipment. All work was done manually on the site.

V. Construction Schedule and Costs

a. Project history

As stated above, the scheme for the Neemuch Improvement Trust was specifically proposed for lower income groups but also partly for the middle income group. The scheme was proposed on a piece of land measuring about two hectares and surrounded by main roads on almost all sides. A density of 150 units per hectare was the goal. The aim was to provide a good standard of living, with reasonable facilities, adequate and equitable distribution of infrastructure, and suitable amounts of open space. The design was commissioned in 1986 and construction began in 1987. Although the project was conceived to be built in two phases, of 178 and 157 dwelling units respectively, only the first phase (comprising the Middle Income and Low Income house types) was constructed. This was completed in 1989.

b. Total costs and main sources of financing

The project site was purchased for INR 60,000 (USD 4,545 at 1986 prices) and the overall project cost was INR 6,256,000 (USD 393,459). The development cost of infrastructure, which included water supply, overhead water tanks, storm water drainage and street lights, was about 16 per cent of total project cost. HUDCO provided 80 per cent of the cost of the project, and the Neemuch Improvement Trust raised the remaining 20 per cent.

c. Comparative costs

The table below gives the comparative costs of the two house types built:

Cluster Type	Floor area	Cost per unit	Per square metre	Full cost of development
1. A	47.33 square metres	INR 55,991 (USD 3,521)	INR 1,183 (USD 74)	INR 60,000 (USD 3,776)
2. B	25.00 square metres	INR 29,575 (USD 1,860)	INR 1,183 (USD 74)	INR 30,000 (USD 1,888)

The first HUDCO-sponsored housing project in Neemuch had been built ten years earlier, in 1979. This comprised 352 dwelling units for the Economically Weaker, 125 Low Income dwelling units and 12 Middle Income dwelling units, giving a total of 489 homes. The Economical Weaker units had one room, a kitchen, a bathroom and a latrine on a 56-square-metre plot, built at a cost of INR 12,000. The Low Income units had two rooms, a kitchen, a bathroom and a latrine on a 140-square-metre plot, with a cost of INR 24,000. The Middle Income units, meanwhile, had three rooms, a kitchen, a bathroom and a latrine plus a staircase on a 223-square-metre plot, with a cost of INR 42,000.

Considering the ten-year lapse between the projects the cost savings achieved in the 1989 scheme are commendable. The 1989 project had a full development cost of INR 60,000 and INR 30,000 for the Middle Income and Low Income clusters respectively. When inflation is taken into account, the latter scheme compares favourably with its predecessor, which had a development cost of INR 42,000 and INR 24,000 for the Middle Income and Low Income groups respectively.

d. *Qualitative analysis of costs*

The use of reinforced cement concrete (RCC) was avoided; this reduced construction costs by cutting down the costs of steel reinforcement. In addition, cement was used as little as possible during construction, which contributed to the cost-effectiveness of the scheme. This was possible because of the optimal use of indigenous material – stone – and local technology.

e. *Maintenance and utility costs*

The houses are individually metered, and electricity is supplied to the residents by the Electricity Board. There is no charge for the water supply from the public taps in front of every dwelling unit. This supply, however, is irregular, with the mains supply being opened for about half an hour every other day. (For further information on water supply see VI.c. below.) Household cooking gas is supplied to homes by wheeled carts. A 14.1 kilo cylinder costs about INR 248, and can last for one or two months.

f. *Ongoing costs*

Residents of the estate are exempted from property tax, and there are no specific charges levied on occupants for the maintenance of the estate. There is, however, an Integrated Tax of INR 150 which is charged to every property owner in Neemuch for the maintenance of street lights, fire-fighting services and sewerage disposal services and maintenance. The flagstone pathways on the estate are taken care of as routine street paving repair within the annual budget. The cost is charged to the consolidated fund of the municipal council, whose main sources of income besides property tax are compensation, annual road repair and other government grants. Dedicated staff from the municipal council visit the estate to attend to complaints. These staff comprise workmen for civil works maintenance, electricians for

street light repair, plumbers for water supply pipeline repair, and cleaners for pathways and other open-area cleaning, as well as for removing blockage of choked sewers.

VI Technical Assessment

a. Functional assessment

Just over one-third of the homes constructed (62 out of 178) were intended for the Middle Income Group, with the rest being intended for the Low Income Group. The second phase, which was to comprise the dwelling units for the Economically Weaker Sector, was never built. In effect, the original guidelines for allocation of the different units were widely disregarded. A different category of people, very high up the socio-economic strata, now lives in the units, thus occupying an environment that was meant for a totally different way of living. This change from the intended living pattern and lifestyle has created some problems for the residents. Many units have been altered both externally and internally by plastering and the application of coloured paint, which is now a common feature. In a way the residents could be said to be ‘personalizing’ the houses into ‘homes’ of their own taste.

b. Climatic performance and systems developed

Because of the pre-existing sizes of the cut stones used as lintels, the windows are generally very small. Most residents complained about heat, especially at night when they have to shut doors for privacy. Almost all households use fans. However, once the doors are kept open a fairly good breeze flows through the rooms.

c. Responses to treatment of water and rainfall

Flat roofs were adopted, using limestone slab units similar to those used for floor spans between load-bearing walls. Herringbone brick courses were then laid over the roofs and finished with a thin lime plaster membrane. Water is disposed of through spouts coming out of the parapet walls.

Because of the intermittent water supply, almost all households have adopted at least two different water storage systems: one for drinking and cooking, and another for general use in washing, etc. Some households have containers both within and outside the dwellings, while others have created underground tanks that collect the mains water while it is running. Electrical pumps are used to lift water from these underground tanks to fill other containers. For the toilets, valve flush systems have been adapted to control how much water is used.

d. Response to environment

An important element of the overall design is the way that everything – from the pathways to each component of the units – is built from stone, giving a feeling of homogeneity to the whole project. The use of rubble stone walls gives a low-maintenance external finish. Interestingly, though, the internal walls in a very high percentage of homes have been plastered with sand-cement and painted to the occupants’ personal taste. In a few houses

even parts of the external stone finish have been plastered and painted. The homogenous character of the scheme has been disturbed due to a lack of control in the treatment of external surfaces and the immediate surroundings of some houses.

Common open spaces have been paved to allow for activities such as children's play and social gatherings. Neglect in the overall planting of trees and other soft landscaping has led to a problem with glare.

e. Choice of materials and level of technology

The project has successfully used rubble and stone slabs, which are indigenous materials. The locals have used these materials for centuries and hence are well versed in their usage and technology.

d. Response to and planning for emergency situations

An important part of the plan was to free the clusters and community areas from vehicular traffic. All heavy vehicles terminate at the periphery of the scheme, and only pedestrian movement is allowed within it. At the same time it was necessary to ensure that in case of emergency, basic rescue and assistance vehicles would be able to travel on the 3-metre-wide pathways. These pathways are paved with stone and run diagonally, which also makes them useful as short cuts to common open spaces.

g. Ageing and maintenance problems

The main building structures and fabric are still in very good condition, but some of the cut stone balustrades have fallen off, especially those at the sides of the first flight of stairs. This means that parents living on the first floor need to take great care to supervise young children and toddlers. There is a serious maintenance problem with the internal toilets and shower rooms. Due to the irregular water supply the toilets tend to smell, and because of their juxtaposition with the bedroom and living spaces this is a constant source of discomfort. Also, in a few instances leakage has occurred through upper floor bathrooms to ground floor residents; this has sometimes led to great friction as some upper floor residents show no interest in carrying out repairs since they are not the inconvenienced party.

While the local council is supposed to look after the infrastructure and maintain the open spaces, it has failed to do so effectively. However, a few individual residents have landscaped and developed some of the small gardens and terraces in order to improve the immediate environment.

h. Design features

The planning and design of the dwelling units were very carefully conceived. The hierarchy of open spaces, especially in terms of continuity, has been highly successful. However, because the second phase of the project was not carried out, the whole essence of the scheme – a form of community living that would bind the residents together – was not fully achieved.

i. *Impact of project on site*

The site was fairly flat and centrally located. Because of its fairly modest size, less than 2 hectares, it did not drastically affect traffic and circulation patterns nor did it bring a high demand on utility services. The site is surrounded by roads, which provide access from almost all sides. Open spaces, building design and infrastructure were planned simultaneously, hence each part relates to the whole and thus to the site.

j. *Durability and long-term viability*

The structure and fabric of the housing are composed of very durable materials. More home extensions and housing transformations are bound to take place as residents seek to create additional accommodation for living and for commerce. The issue of maintenance, especially in sanitary facilities, needs to be addressed; if not, the quality of the housing and the interest of residents towards continued residency in the estate will greatly diminish.

VII. Users

a. *Description of those who benefit from the project*

As initially conceived, only around 25 per cent of the scheme's units were to be targeted at the Middle Income Group; these were to be sold at the market price, and thus subsidize the remaining 75 per cent of dwellings, for the Economically Weaker Sections and Lower Income Group. As mentioned earlier, this initial guideline was widely disregarded, and in addition the second phase of the project (comprising bedsitter-style dwellings for the Economically Weaker) was abandoned. Several of the residents are tenants with absentee landlords, and only about 60 per cent of those who were initially allocated dwellings still live in the estate. Most of the present occupants are traders, teachers and civil servants.

b. *Response to project*

Reports on site indicated that initially people were sceptical about living together in double-storey apartment-type dwellings. When it was realized that the houses were available in affordable instalments, however, the offer was keenly taken up. Most of the residents do like the housing but naturally they have some complaints. The most recurring complaint is the non-rectangular (five-corner) layout of the rooms, which often makes the orderly placement of furniture such as beds or large appliances and refrigerators rather awkward. Another recurring complaint is with regard to the internal toilets, which because of the water situation tend to smell. Most residents said that they would have preferred the toilets to have been outside the main dwelling or even off a veranda for ease of maintenance.

VIII. Persons involved

The project architect was Anand M Shirgaokar of Shirgaokar and Associates based in Baroda in the state of Gujarat. Most of the other professional services, such as structural design

consultancy, plumbing, etc., were designed and detailed within the project architects' office. The architects appointed D Biswas of Tecom, Marketing & Projects, also based in Baroda, as electrical consultant, and Dongre Associates, also based in Baroda, as the cost analysis and project management consultants.

Five contracting agencies were involved, two of them for the buildings and three for the development of the infrastructure. One of the two main civil contractors was not performing well and was removed. The remaining company, J J Constructions, based at Indore, performed the role as the main civil contractor, including plumbing works.

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