APPENDIX - B

NORMS AND STANDARDS

B.1.00 THE BASIC FRAMEWORK

1. The basic objective of suggesting various norms and standards for urban development plans formulation is to provide a basis for taking decision. The suggested norms and standards are indicative and can be suitably modified depending upon the local conditions. Variations in the norms and standards, as applicable to small and medium towns and large cities as classified by UDPFI Guidelines, have been given. Variations in respect of urban centres located in hill areas have also been provided at appropriate level.

2. Table B.1 gives the classification of urban centres by population size and location in plains and hill areas.

3. Norms and standards have been provided for :

a. Distribution of land use,

b. Infrastructure, further classified as :

i) Physical infrastructure including :

Water supply
Sewerage
Drainage
Electricity, and
Solid waste

ii) Social Infrastructure covering :

Education
Health
Socio-cultural Facilities including :
- Religious Sites
- Community Room
- Community Hall and Library
- Recreation Club
- Music, Dance and Drama Centre
- Meditation and Spiritual Centre
- Socio-cultural Centre
- Museum and Art Gallery

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- Meditation and Spiritual Centre
- Socio-cultural Centre
- Museum and Art Gallery

- Cinema/Theatre

Distributive Services including :
- Petrol Pump
- Milk Booth, and
- LPG Godown

Miscellaneous Facilities including
- Dhobi Ghat
- Cremation Ground
- Taxi Ground, and
- Bus Stops

Other Facilities and Services including :

- Communication
- Postal Service
- Security Service, and
- Fire Protection Service

iii) Commercial Facilities covering :

CBD
Sub-city Business District
District Centre
Local Shopping Centre
Convenient Shopping Centre
Informal Shopping and Weekly Markets, and
Service Centres

iv) Recreational Facilities covering :

Parks and Open Spaces
Sports Centre and Play Grounds
Botanical and Zoological Parks
Water Bodies/Other Natural Features, and
Places of Tourist Interest

c. Traffic and Transportation

B.2.00 DISTRIBUTION OF LAND USE

The land use distribution norms are dependent upon the following basic norms for densities and work force :

B.2.10 DEVELOPED AREA AVERAGE DENSITIES

Settlement Type	Persons per hectare(pph) in	
	Plain Areas	Hill Areas
Small Towns	75 - 125	45 - 75
Medium Towns	100 - 150	60 - 90
Large Cities	100 - 150	60 - 90
Metro Cities	125 - 175	-

B.2.20 WORK FORCE

a. Work force participation 33% of total population

b. Industrial workers as percentage of total work force :

Small and medium town	20
Large cities	25

c. Industrial workers density 100 pph to 125 pph

B.2.30 PROPOSED LAND USE STRUCTURE OF URBAN CENTRES IN PLAIN AREAS

Landuse Category	Percentage of Developed Area			
	Small	Medium	Large Cities	Metro Cities
Residential	45-50	40-45	35-40	35-40
Commercial	2-3	3-4	4-5	4-5
Industrial	8-10	8-10	10-12	12-14
Pub.& Semi-Public	6-8	10-12	12-14	14-16
Recreational	12-14	18-20	18-20	20-25
Transport & Communication	10-12	12-14	12-14	15-18
Agriculture & Water Bodies	Balance	Balance	Balance	Balance
Total Developed Area	100	100	100	100

B.2.40 PROPOSED LAND USE STRUCTURE IN HILL TOWNS

Land Use	Percentage of Developed Area		
	Small Towns	Medium Towns	Large Cities
Residential	50 - 55	48 - 52	45 - 50
Commercial	2 - 3	2 - 3	4 - 5
Industrial	3 - 4	4 - 5	5 - 7
Public & Semi-Public	8 - 10	8 - 10	12 - 15
Recreational	15 - 18	15 - 18	16 - 20
Transport & Commn.	5 - 6	5 - 6	6 - 8
Ecological	8 - 10	8 - 10	8 - 10

B.3.00 INFRASTRUCTURE

1. Infrastructure is the basic requirement of urban life and its adequacy and accessibility are two important ingredients and key contributors in the upgradation and enrichment of quality of urban life which is the primary objective of any planned development effort. The extent and the nature of problems faced by different towns vary by size, geographical conditions, local natural resources, state/regional differentials in the resource availability and the policies, resource base of local authorities and several such factors directly or indirectly affecting the population of cities/towns.

2. Social amenities and infrastructure fall under the social welfare objectives of the urban development programme, as distinct from economic development objectives and especially in context of the rapidly developing liberalised and competitive economic scenario.

3. The city planners, urban managers and administrators are required to make special efforts to devise innovative strategies in order to ensure their wider coverage and equitable distribution for the society as a whole and the vulnerable sections of the urban society in specific. Thus, this is an effort to suggest the norms and standards for different components of infrastructure with respect to their hierarchy, locational and spatial attributes, affordability, socio-economic compatibility and manageability.

B.3.10 PHYSICAL INFRASTRUCTURE

The standards are applicable for hill as well as non-hill towns/cities.

B.3.11 Water Supply

S.No.	Aspect	Size of Town: Small (<50,000)	Medium (> 50,000)	Large and Metro (>10 lakh)
1.	Standards			
a)	Domestic			
	i) Absolute Min.	70 lpcd	70-100 Upper limit above 100,000	135 lpcd it can be reduced up to 70 lpcd
	ii) Desirable	100 lpcd	135-150 lpcd	150-200 lpcd Upper limits for metro cities income areas the standards to lpcd
b)	Non-Domestic			
i)	Institutional	Refer Table B.3.12.		
ii)	Industrial	Refer Table B.3.13		
iii)	Fire Fighting	1% of total demand		
iv)	Public Purpose	10-15 lpcd	20-25 lpcd	30-35 lpcd

Suggested Policy Interventions

- Involvement of NGO's for awareness programme on optimal utilisation and saving water.
- Involvement of community to develop their own systems of supply.
- Equitable distribution, every individual household shall get at least the minimum including those living in squatters.
- Cross-subsidisation for weaker sections.
- Efforts should be made to reduce the water losses in transmission and distribution. The contingency provision of 15-20% to be made to account for the losses.

B.3.12 Water Requirements for Institutional Buildings

Sl. No.	Institutions	Litres per head per day
1.	Hospital (including laundry) a. No.of beds exceeding 100 b. No.of beds not exceeding 100	 450 (per bed) 340 (per bed)
2.	Hotels	180 (per bed)
3.	Hostels	135
4.	Nurses' homes & medical quarters	135
5.	Boarding schools/colleges	135
6.	Restaurants	70 (per seat)
7.	Airports & seaports	70
8.	Junction stations & intermediate stations where mail or express stoppage (both railway and bus stations) is provided	70
9.	Terminal stations	45
10.	Intermediate stations (excluding mail and express stops)	45 (could be reduced to 25 where bathing facilities are not provided)
11.	Day schools/colleges	45
12.	Offices	45
13.	Factories	45 (could be reduced to 30 where no bathing rooms are required to be provided
14.	Cinema, concert halls and theatres	15

Source : Manual on Water Supply, CPHEEO, Government of India.

B.3.13 Water Requirements for Industrial Units

Industry	Unit of Production	Water Requirement in Kiloliters per unit
Automobile	Vehicle	40
Distillery	Kilolitre(proof alcohol)	122-170
Fertilisers	Tonne	80-200
Leather	100 Kg (tanned)	4
Paper	Tonne	200-400
Spl.quality paper	Tonne	400-1000
Straw Board	Tonne	75-100
Petroleum Refinery	Tonne (Crude)	1-2
Steel	Tonne	200 250
Sugar	Tonne (cane crushed)	1-2
Textile	100 kg (goods)	8-14

Source : Manual on Water Supply, CPHEEO, Government of India.

B.3.14 Sewerage

1. The treatment of sewerage is essential to check the decay in the environment as well as to provide hygienic conditions for the population. Besides the sewerage from households, the waste from industries also needs attention. The sewerage is estimated at the rate of 80% of the water supply in any area.

2. The small and medium towns may be encouraged for adopting low-cost sanitation technologies with the technical assistance by the local bodies and involvement of NGO's in actual implementation of such programmes. The newly developed areas shall be considered for the provision of community level septic tanks based on economic and environmental considerations with a flexibility in planning for the extension of regular sewerage facility in long term. The large and metro cities shall be provided with regular sewerage treatment facilities at zonal/city level. The squatter settlements may be provided with a facility of 1 toilet for 4 to 5 families based on the concept of low cost and low water consumption, the maintenance of such community toilets to be looked after by the community and the voluntary organisations together. For the existing developed areas without sewerage network, the individual households or a group of households may be encouraged for adoption of low-cost sanitation systems.

B.3.15 Drainage

The drainage system for any city/town is governed mainly by natural drainage course and topography. Besides on the impact of region level of development, its climate and hydrological consideration, the discharge is calculated that guides the requirement for provision of additional drain as well as upgradation of existing drains.

B.3.16 Electricity

Based on the estimated requirements of power supply as per the Master Plan for Delhi, the consumption works out to be about 2 KW per household at the city level and includes domestic, commercial, industrial and other requirements. The actual estimation of power requirements can be made based on the industrial development (type and extent), commercial development, domestic and other requirements. The provision of one electric sub-station of 11 KV for a population of 15,000 is recommended as a general standard for all categories of towns/cities.

B.3.17 Solid Waste Disposal

The production of solid waste in an urban centre is a function of the socio-economic profile of the population and activities in the area. The insufficient conservancy services in most of the urban centres tend to leave the garbage spread on the road sides or open spaces leading to unhygienic living conditions. The garbage is removed by the municipal bodies and dumped at the sanitary landfill or in some cases it is converted to compost especially in small towns. The generation of waste varies from about over a quarter of kilogram in small towns to about half a kilogram per capita in large and metro cities.

B.3.20 SOCIAL INFRASTRUCTURE

1. The provision of these amenities in any size town/city shall consider the regional bearings as small towns cater to the requirements of surrounding villages, medium size towns cater to small towns and villages and so on in the hierarchy of settlements in the region for the higher level facilities. Especially in case of large and metro cities, certain apex level facilities significantly cater to regional demand in addition to the city demand.

2. This affects the general level of satisfaction and further strains the facility infrastructure. In order to efficiently cater to the city and regional demands, alternatives which could be considered may be to provide :

   a. Amenities for 25% additional population overall as a cushion, or

   b. Exclude such apex level facilities from the total estimated needs provision.

3. It is common knowledge that the local level facilities once provided at considerable cost, tend to lose their efficiency owing to neglect, inefficient management, lack of funds for upkeep, encroachments and at times misuse. It is imperative to encourage local community participation in management of local level facility units, even if created fully or partly by public funds. The idea is that the user community should have a stake in proper functioning and maintenance of the facility.

4. It is also observed that a number of lower level social amenity units particularly in regard to education and health infrastructure are operating in private residential premises due to both non-availability as well as deficiency in number of designated sites. The potential of such practices shall be assessed to find out the actual needs, which shall be reliable input for arriving at realistic norms, as also for providing adequate number of sites for such facility units.

5. In residential areas where exclusive sites for social amenities units are not available, local level facilities only (viz. nursery and primary schools, dispensary, etc.) may be allowed to operate from residential use premises on condition that specific controls and guidelines are adhered to.

6. The possibilities for multiple use of social amenities may also be considered especially for the areas with deficiencies of certain facilities depending upon the compatibility of the activities and acceptance of the society.

7. In distribution of infrastructure, population plays the guiding role and, therefore, indication of population served by a facility or service has been given. In some cases depending upon the regional requirements, a higher-order facility becomes necessary in a lower order settlement. No attempt has been made to classify them by size of town, that is, small, medium town or large city.

B.3.21 Educational Facilities

A. Pre-primary to Secondary Education

a.	Pre-primary, nursery school 1 for 2500 population	
	Area for school	0.08 ha
	Pre primary/nursery school to be located near a park	
b.	Primary school (class I to V)	
	Strength of the school	500 students
	Area per school	0.4 ha
	School building area	0.20 ha
	Play field area with a minimum of 18m x 36 m to be ensured for effective play	0.20 ha
c.	Senior secondary school (VI to XII) 1 for 7,500 population	
	Strength of the school	1000 students
	Area per school	1.60 ha
	School building area	0.60 ha
	Play field area with a minimum of 68m x 126 m to be ensured for effective play	1.60 ha

d.	Integrated school without hostel facility (Class I-XII) 1 for 90,000-1 lakh population	
	Strength of the school	1500 students
	Area per school	3.50 ha
	School building area	0.70 ha
	Play field area	2.50 ha
	Parking area	0.30 ha
e)	Integrated school with hostel facility 1 for 90,000 - 100,000 population	
	Strength of the school	1000 students
	Area per school	3.90 ha
	School building area	0.70 ha
	Play field area	2.50 ha
	Parking area	0.30 ha
	Residential hostel area	0.40 ha
f)	School for handicapped 1 for 45,000 pop.	
	Strength of the school	400
	Area per school	0.50 ha
	School building area	0.20 ha
	Play field area	0.30 ha

B. Higher Education - General

g)	College 1 for 1.25 lakh population	
	Student strength of the college	1000-1500 students
	Area per college	4.00 ha
	College building area	1.80 ha
	Play field area	1.80 ha
	Residential including hostel area	0.40 ha
h)	University campus	
	Area of the university campus	10.00 ha
i)	New University	
	Area	60.00 ha

C. Technical Education

j)	Technical education centre (A) 1 such centre provided for every 10 lakh population to include one industrial training institute and one polytechnic	500 students
	Strength of the polytechnic	400 students
	Area per centre	4.0 ha
	Area per ITI	1.60 ha
	Area for polytechnic	2.40 ha
k)	Technical centre (B) 1 provided for 10 lakh population to include 1 ITI 1 Technical centre and 1 coaching centre	
	Area per centre	4.00 ha
	Area per technical centre	2.10 ha
	Area for ITI	1.40 ha
	Area for coaching centre	0.30 ha

D. Professional Education

m)	New engineering college 2 numbers to be provided in urban extension	
	Strength of the college	1500-1700 students
	Area per college	60.00 ha
n)	New medical college 2 sites of 15 ha each in urban extension. This includes space for specialised general hospital	

B.3.22 Health Care Facilities

a)	General hospital Hospital for 2.5 lakh population capacity Initially the provision may be for 300 beds	500 beds
	Area for hospital	4.00 ha
	Area for residential accommodation	2.00 ha
	Total area	6.00 ha
b)	Intermediate hospital (Category-A) 1 hospital for 1 lakh population capacity initally the provision may be for 100 beds	200 beds
	Area for hospital	2.70 ha
	Area for residential accommodation	1.00 ha
	Total area	3.70 ha

c) Intermediate hospital (Category-B)
1 hospital for 1 lakh population capacity
80 beds initally the provision may be for 50 including 20 maternity beds

Area for hospital	0.60 ha
Area for residential accommodation	0.40 ha
Total area	1.00 ha

d) Poly-clinic with some observation beds
1 for 1.0 lakh population

Area	0.20 to 0.30 ha

e) Nursing home, child welfare and maternity centre 1 for 0.45 to 1 lakh population

Capacity	25 to 30 beds
Area	0.20 to 0.30 ha

f) Dispensary
1 for 0.15 lakh population

Area	0.08 to 0.12 ha

B.3.23 Socio-Cultural Facilities

a) Community room
One for 5,000 population

Area	660 sq.m.

b) Community hall and library
One for 15,000 population

Area	2,000 sq.m

c) Recreational club
One for 1 lakh population

Area	10,000 sq.m

d) Music, dance and drama centre
One for 1 lakh population

Area	1,000 sq.m

e) Meditation and spritual centre
One for 1 lakh population

Area	5,000 sq.m.

f) Socio-cultural centre

One for 10 lakh population
Area 15 ha.

B.3.24 Distribution Services

a) Petrol pump

- One petrol pump for 150 ha. of gross residential areas in residential use zone
- One petrol pump for 40 ha. of gross industrial area
- Two petrol pumps in each freight complex
- Two petrol pumps in each district centre
- One petrol pump in each community centre

b) Milk distribution

One milk booth for 5,000 population. The standard recommended as per the Delhi Master Plan is adequate.

c) LPG godowns

One gas godown for 40-50 thousand population is sufficient for any size of town. The major concern for its storage and distribution is the location which shall be away from the residential areas.

B.3.25 Police

Planning norms for police, civil defence and home guards and fire shall be as under:

Police

a) Police station

1 for 90,000 population
Area inclusive of essential residential accommodation 1.5 ha
0.05 ha additional to be provided for civil defence and home guards

b) Police post

1 for 0.4 tc 0.5 lakh population (not served by a police station)
Area inclusive of essential residential accommodation 0.16 ha

c) District office and battalion

1 for 10 lakh population	
Area for district office	0.80 ha
Area for battalion	4.00 ha
Total area	4.80 ha

d) Police line

1 for 20 lakh population	4.00 to 6.00 ha

e) District jail

1 for 10 lakh population	
Area	10.00 ha

f) Civil defence and home guards

1 for 10 lakh population	
Area	2.00 ha

B.3.26 Fire

1 fire station or sub-fire station within	
1 to 3 km to be provided for 2 lakh population	
Area for fire station with essential residential accommodation	1.00 ha
Area for sub-fire-station with essential residential accommodation	0.60 ha

B.4.00 COMMERCIAL ACTIVITY

B.4.10 HIERARCHY OF COMMERCIAL CENTRES

Hierarchy of commercial centres is a function of the hierarchy of planning units in an urban centre. Normally an urban centre has some or all of the following, depending upon its size :

Planning Unit	Class of Settlement S	M	L	Popn. served	Hierarchy of Commercial Centre
Housing cluster	*	*	*	1000 - 4000	Cluster Centre
Sector	*	*	*	5000 - 20000	Sector Centre
Community	*	*	*	25000 - 100000	Community Centre
District	-	*	*	125000 - 500000	District Centre
Sub-city	-	-	*	25 lakh - 50 lakh	Sub-city Centre
City	-	-	*	50 lakh +	City Centre

S : Small towns M : Medium towns L : Large cities

Indicates the availability of the planning unit and the hierarchy of the commercial centres.

Since every settlement has a town/city centre, for small and medium size towns one of the community centres or district centres, as the case may be, will serve the function of the town centre.

B.4.20 AREA OF COMMERCIAL CENTRES

	Area per 1000 persons sq.m.	No.of shops
Cluster centre	220	1 for 110 persons
Sector centre	300	1 for 200 persons
Community centre	500	1 for 200 persons
District centre	880	1 for 300 persons

B.4.30 DISTRIBUTION OF SHOPS BY TYPE

Type of Shops	District	Community	Sector	Cluster
Formal Shops(total)	1250	365	55	24
General Retail	1200	295	35	16
Fruit & Vegetables	Not specified included in general retail	40	6	3
Service & Repairs	50	30	13	5
Informal Shops	370	110	22	13
General Retail	355	88	14	8
Fruit & Vegetables	Not specified included general retail			
Service & Repairs	15	9	5	3
Total shops (formal and informal)	1620	475	77	37

B.4.40 Distribution of Activities

Activities	Hierarchy of Commercial Centre				
	City and sub-city centre	District centre	Community centre	Sector centre	Cluster centre
1	2	3	4	5	6
1. Shopping (retail service, repair)	*	*	*	*	*
2. Limited wholesale	*	*	-	-	-
3. Informal shopping	*	*	*	*	*
4. Commercial Offices	*	*	*	-	-
5. Cinema	*	*	*	-	-
6. Hotel	*	*	*	-	-
7. Guest House	*	*	*	-	-
8. Nursing Home	*	*	*	-	-
9. Service Industries	*	*	*	-	-
10. Auditorium	*	*	*	-	-
11. Museum	*	*	-	-	-
12. Library	*	*	*	-	-
13. Science Centres, Art/Craft/ Music/Dance School	*	*	-	-	-
14. Weekly Markets(on close days)	*	*	*	*	-
15. Local Govt. Offices	*	*	*	-	-
16. Bus Terminal	*	*	-	-	
17. Fire Station	*	*	-	-	-
18. Police	*	*	-	-	-
19. Telephone Exchange	*	*	-	-	-
20. Electric Sub-station	*	*	*	*	*
21. Post and Telegraph	*	*	*	-	-
22. Petrol Pump	*	*	*	-	-
23. Conveniences	*	*	*	*	*
24. Residential	*	*	-	-	-

* Activities to be provided in the commercial centre.

B.4.50 NORMS FOR INFORMAL SECTOR ACTIVITIES

	No.of informal commercial units
i) Retail Trade	
Central Business District	3 to 4 units per 10 formal shops
Sub-central Business District	as specified in the norms separately
District Centre	
Community Centre	
Convenience Shopping Centre	
ii) Government and Commercial Offices	5 to 6 units per 1000 employees

iii) Wholesale Trade and Freight Complexes	3-4 units per 10 formal shops
iv) Hospital	3-4 units per 100 beds
v) Bus Terminal	1 unit per two bus bays
vi) Schools	
Primary	3-4 units
Secondary/Senior Secondary/Integrated	5-6 units
vii) Parks	
Regional/District Parks	8-10 units at each major entry
Neighbourhood Parks	2-3 units
viii) Residential	1 unit/1000 population
ix) Industrial	5-6 units per 1000 employees
x) Railway Terminus	To be based on surveys at the time of preparation of the project

B.4.60 VARIATIONS IN NORMS AND STANDARDS BY SIZE OF SETTLEMENT

B.4.61.Small Towns

i. For the general retail shopping requirements, the concept of street/roadside commercial activity shall be accepted as a policy with certain specific controls such as

- no commercial activity along the NH/SH or any major district road;
- the minimum width of the street to be 12 m. where vehicular movement is permitted to a limited extent (i.e. only up to 2 wheelers or rickshaw) and the streets with a minimum width of 4.5 m without vehicular movement may be permitted for road/street side commercial activities;

2. The open spaces within residential areas or certain streets with completely controlled traffic on specific day can be made available for weekly markets to shop-keepers. The weekly markets tend to generate more waste and thus effort should be made to ensure that the cleaning of the area is arranged by the cooperation of shopkeepers. It has been generally observed that the service and repair shops emerge along the major roads and the activities are extended upto the roads in most cases, thereby affecting the smooth flow of traffic and increasing probability of accidents.

3. Thus, it is suggested that the service centres shall be provided as a planned component and the sites near the petrol pumps shall be considered. The exact requirement of the area for service centre will be guided by the following factors :

- vehicular population;
- villages falling in the influence zone of the towns or, in other words, the service requirements of the villages in the surrounding areas.

4. The function based commercial requirements such as mandi (vegetables/grains/fruits), cattle markets or any other such specialised markets are to be planned as per the case specific requirements based on the study of the area.

5. The other important aspect that requires a serious thought is the quantum of commercial activities to be proposed but in light of the suggested policy, it is envisaged that the control shall be restricted to locational attributes and the local need based emergence in its natural growth be permitted.

6. For the newly planned schemes in small towns also, the policy of mixed land use shall be considered as accepted practice to suit the behavioural pattern of the society.

7. As already dealt in the previous section on landuse, the area requirements for commercial activities in small sized towns works out to be about 0.2 - 0.25 ha/1000 persons on an average, based on the proposed landuse which is governed by the functional character of the town.

B.4.62 Medium Size Towns

1. The growth of towns from small to medium sized town through transition phases (50,000-100,000) changes the requirements of commercial activities gradually and for a town exceeding a population of 1 lakh, the extensions starts developing in pockets of well-defined economic strata of the people and thus it is suggested that the areas predominantly planned for upper income groups shall be provided with the planned commercial centres (with adequate inbuilt provision for informal commercial activities with the commercial centres) at the rate of 4-5 formal shops and 2-3 informal shops per 1000 persons. The requirements for wholesale trade will be governed by the following factors :

- location of the town with respect to large/metro cities,
- small towns and villages falling in the direct influence zone of the town for which it has to act as a distribution centre.

2. As already dealt in the previous section on land use, the area requirements for commercial activities in medium sized towns works out to be about 0.24-0.32 ha/1000 persons on an average, based on the proposed land use which, in fact, is governed by the functional character of the town and the regional imperatives mentioned above.

B.4.63 Large and Metro Cities

The average land requirements for commercial activities (based on a sample of 14 large cities) work out to be 0.4 ha per 1000 persons in a range of 0.2 to 0.6 ha/1000 persons depending on the location of these large cities with respect to metro cities. Similar requirements have also been observed in case of metro cities which are located in the influence zone of mega cities, the average land requirement for commercial activities under this category works out to be about 0.3 ha/1000 persons.

B.4.70 VARIATIONS FOR HILL TOWNS

1. The hill areas can be broadly classified into two categories, i.e. tourist centres and non-tourist centres. The requirements of commercial activities in hilly areas are mainly limited to retail activities and that too are mainly catered by small shops in the residence in non-tourist centres. The provision of commercial facilities in tourist centres is to be reviewed for two major aspects. First, the boarding and lodging requirements of the tourists and second the informal activities near tourist spots.

2. The requirements of hotels and restaurants can be worked out only on the basis of the data on tourists and their growth trends. The informal activities at the tourist spots are mainly informal eating places and other general shops selling local specialities, but it shall be ensured that these activities do not spoil the environment around the tourist spots.

B.5.00 RECREATIONAL FACILITIES

The norms for parks, play fields and other open space such as specified park, amusement park, maidan, a multi-purpose open space, botanical garden and zoological parks, traffic parks etc. are as under :

Planning Unit	Area in sq.m. per person
Housing Cluster	3-4 local parks and playgrounds
Sector	3-4 local park and playgrounds
Community	2-3 community level park and open space
District	1 district level park and sports centre, maidan
Sub-city centre	1 city level park, sports complex, botanical/zoological garden, maidan
Overall town/city level	10 sq.m. - 12.00 sq.m. per person

B.5.10 VARIATIONS BY SIZE OF SETTLEMENT

B.5.11 Small Towns

1. In light of the standards recommended by various bodies, it is suggested to provide 1.0 to 1.2 ha per 1000 persons for town level recreational facilities (excluding the open spaces in residential pockets) which can be distributed for different residential pockets uniformly for a population of 8,000 - 10,000.

2. As already mentioned, the open spaces are to be developed with the other socio-cultural and commercial facilities so that they can serve multiple purpose.

B.5.12 Medium Towns

The recreational open spaces shall be provided at the rate of 1.4 - 1.6 ha/1000 persons as per the hierarchy recommended in the Master Plan for Delhi. The lower income areas shall be provided with more open spaces and the area under facilities like community halls etc. can be merged with the open spaces to suit their social requirements.

B.5.13 Large and Metro Cities

1. Large and metro cities shall at least be provided with the recreational facilities as per the standards given in the Master Plan of Delhi. The suggested standards for open spaces in large and metro cities are 1.2 - 1.4 ha/1000 persons, depending on the land availability.

2. Secondly, the older parts of large cities have normally been found highly deficient with respect to the availability of recreational spaces, thus additional provisions in the new developments to take care for the existing deficiencies also to be made. For the large and metro cities, provisions shall also be made for city level special parks such as botanical and zoological parks, picnic huts, children parks and amusement parks, etc.

B.6.00 SOCIO-CULTURAL FACILITIES

1. Merely the prescription of norms for the provision of socio-cultural facilities is not enough as there are certain vital issues involved with their provision which are as follows :

a. It has generally been observed that the religious buildings come up on encroached sites and especially those meant for open spaces. In fact, just the provision of 400 sq.m. area for a population of 5,000 is not enough. It is not to say that the area is inadequate but effort should be made by the development agencies, with the assistance of NGO's in the area, to ensure that the places of worship come up as planned with the participation and preferences of the

community itself.

b. The provision of housing cluster and sector level socio-cultural facilities such as community room, community hall and library shall be given following considerations :

- Socio-economic profile and behavioural pattern of the beneficiaries as for the areas with lower income group population, the maintenance and management of formal community buildings is not an easy task and even it does not match with their behavioural pattern. Thus, for lower income areas the use of such facilities shall be planned and designed for multipurpose activities which can ensure optimal utilisation. The activities such as adult education, training programmes for economic generation activities, child and family welfare programmes, etc. can be organised in such spaces besides the facility of reading room.

c. The community halls for middle and higher income areas are utilised more often for various functions, etc. compared to lower income areas where open spaces/streets are preferred for such functions.

d. In the congested areas, the schools are used for various social functions in non-teaching hours which in fact is a practice in small or even in medium sized towns, can be considered as an option.

2. As a general basis, separate religious sites (2 for 15,000 population) may be provided so that places of worship do not get established on encroached sites as is invariably happening. Further, the norms for socio-cultural facilities may be considered as under :

a. Community hall(multi-purpose): House Cluster Level

The small parks/open spaces should also be developed with the community hall to suit the cultural and behavioural needs of the society.

b.	Local Community Center (Hall, Library, Space for extra-mural activities)	: Sector Level
c.	Recreation Club	: One for 15,000 population, 2,000 sq.m. One for 50,000 population 0.5 ha One for 100,000 population, 1.0 ha
d.	Music,Dance, Drama Center	: One for 50,000 population

e. Meditation and Spiritual Center : One for 50,000 population

f. Socio-cultural Center : One for 5 lakh population

3. Increased provision of space for socio-cultural facilities is essential in view of the increasing demand of such sites for diverse needs, creating more avenues for socio-cultural interactions and enriching the quality of built environment at neighbourhood and community levels.

B.7.00 MISCELLANEOUS FACILITIES

B.7.10 CREMATION/BURIAL-GROUND

The sites for cremation grounds shall be identified in locations which are not proximous to residential areas. It may be advisable to provide one electric crematorium for large size towns besides the provision of at least 2 sites for 5 lakh population.

B.7.20 DHOBI GHAT

It is suggested to provide one site for 1 lakh population with appropriate arrangements for water and drainage facilities and it shall be ensured that the water bodies are not polluted as a result of such activities.

B.7.30 TAXI STANDS/BUS STOPS/RICKSHAW STANDS

The taxi stands/bus stops shall be provided with the following considerations:

- these should not be located near the road intersections;
- the maximum distance of such facilities should not exceed 0.5 km from the farthest point in any residential area.

B.7.40 OTHER FACILITIES AND SERVICES

B.7.41 Telecommunication

The norms for other facilities and services listed under communication, security, fire, postal are derived from the departmental norms which are governed by the national/state level policies. The communication sector is getting lot of priorities due to its increasing importance in the economic development and thus immaterial of the size of town. It is hoped that the standards as well as level of service will be improved in time to come. The existing standards for these services are as under :

a. Communication - 10 lines per 100 population.
b. Fire - one fire station for 2 lakh population within 1 to 3 km distance.

c. Postal services - One post office for 10-15 thousand population.

B.7.42 Fire Protection

The fire services for small and lower category of medium size towns shall be provided taking into consideration the demands of surrounding villages also.

B.8.00 NORMS OF SOCIAL INFRASTRUCTURE PROVISION IN EXISTING BUILT-UP AREAS

1. The norms and standards of facilities outlined in the preceding paragraphs have been proposed primarily with respect to minimum requirements of social amenities to be provided in new development areas at various levels. While the level of facilities and infrastructure to be provided should not make any distinction in their qualitative aspects between existing built-up areas vis-a-vis new development areas, in view of ground realities and other constraints, it is often observed that problems arise in implementing these norms in existing built-up areas, particularly the core areas of any town, calling for their rationalisation for effective adaptation.

2. In order to resolve these problems following guidelines are proposed for existing built-up areas.

a. It is proposed that while Unit Norms (facility per unit size of population) of local level facilities should be kept uniform, the space norms may be considered at a reduced scale, which may range between 50-60% of those proposed for urban extension areas.

b. In order to compensate for the shortfall in various types and levels of facilities which cannot be provided within the existing built-up area, such facilities may be provided in contiguous/proximus sectors of new development as additional provision, e.g. due to space constraints in existing built-up area the school facility may not have ample space for playgrounds/open spaces in the proximus new sector to compensate for its non-availability in the built-up area. Such provision shall be over and above that which may be required for the sector's own assigned population.

c. As proposed earlier also, multiple use of one facility unit should be encouraged so that optimum use of a facility could be possible. Such a step would also compensate for non-availability of individual facility units in a built-up area.

B.9.00 SPECIAL PROVISION FOR FRINGE AREAS/TRANSITIONAL AREAS

1. It has been observed that the fringe areas, particularly the fringe rural settlements, are subject to considerable stress during the process of a city's growth. Such fringe

settlements are normally not included in the programme of social infrastructure development as they lie outside the urban limits, despite the fact that they are both functionally and physically integral part of the urban area. In order to mitigate the existing deficiencies and stress conditions, and to prepare such transitional settlements and development pockets for proper integration with the planned urban areas, it is proposed that such fringe villages and pockets be identified and skeletal provision of basic infrastructure and facilities may be made. An incremental approach for upgradation of these facility units should be in-built in provision of such facilities in fringe/transitional areas.

2. While no specific norms and standards can be suggested as these will depend on the broad characteristics of development and nature of demand, the above measures, if incorporated in the total programme of social infrastructure planning, would be able to help in their integration with the urban area as well as improve the quality of life in these fringe settlements which otherwise would grow into slums, which would result in serious implications in the quality of built environment.

B.10.00 NORMS AND STANDARDS FOR TRANSPORTATION

B.10.10 CLASSIFICATION OF URBAN ROADS

Besides expressways and freeways, the urban roads can be classified as :

a. Arterial Road : Roads for intra-urban through traffic, with no frontage access, no standing vehicle and very little cross traffic and minimum roadway intersection spacing 500 m.

b. Sub-Arterial Road: Roads for intra-urban through traffic with frontage access but no standing vehicles having high cross traffic, high capacity intersections and minimum roadway inter-section spacing 300 m.

c. Collector Street : Streets for collecting and distributing traffic from and to local streets and also for providing access to arterial and sub-arterial roads, having free frontage access but no parked vehicles and having heavy cross traffic and minimum roadway inter-section spacing 150 m.

d. Local Street: Street for access to residence, business or other abutting property, having necessary parking and pedestrian movement. Free Access.

B.10.20 DESIGN CONSIDERATIONS OF URBAN ROADS

B.10.21 Design Speed

The recommended design speeds for different categories of roads are :

Arterial	-	80 kph
Sub-Arterial	-	60 kph
Collector Street	-	50 kph
Local Street	-	30 kph

B.10.22 Space Standards

The space standards (land width) recommended for different categories of roads are :-

Arterial	-	50 - 60 m
Sub-Arterial	-	30 - 40 m
Collector Street	-	20 - 30 m
Local Street	-	10 - 20 m

The land width is often referred as 'Right-of-way'.

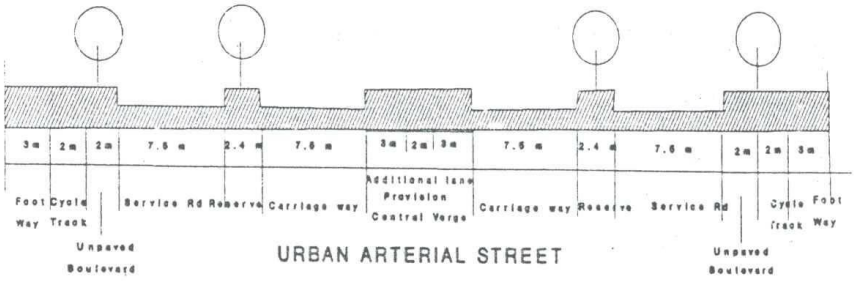
B.10.23 Cross-Sectional Elements

The width and layout of urban road cross-sections depend on many factors, the chief amongst them being the classification of roads, design speed and volume of traffic expected. Some of the salient cross-sectional elements are described below :

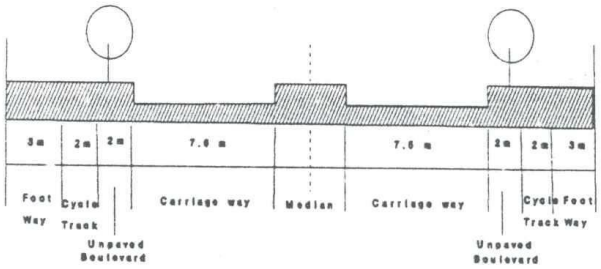
a) Carriageway Widths

The recommended carriageway widths are shown below :

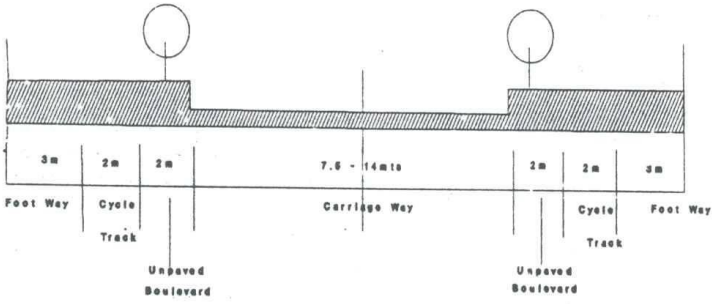
	Description	Width (m)
i)	Single lane without kerbs	3.5 m
ii)	2-lane without kerbs	7.0 m
iii)	2-lane with kerbs	7.5 m
iv)	3-lane with/without kerbs	10.5/11.0 m
v)	4-lane with/without kerbs	14 m
vi)	6-lane with/without kerbs	21.0 m



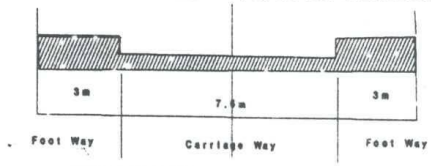
URBAN ARTERIAL STREET



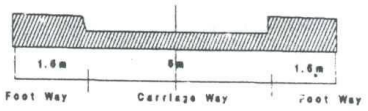
URBAN SUB-ARTERIAL STREET THROUGH OPEN AREA



URBAN COLLECTOR STREET THROUGH RESIDENTIAL AREA



URBAN RESIDENTIAL STREET



URBAN CUL-DE-SAC

Fig. 1 : TYPICAL CROSS-SECTIONS OF URBAN ROADS

b) Footpath (sidewalk)

The minimum width of footpaths should be 1.5 m. The width should be increased by 1 m in business/shopping areas to allow for dead width. Footpaths adjoining shopping frontage should be at least 3.5 m and a minimum of 4.5 m is desirable adjoining longer shopping frontages. The capacity guidelines for design of footpaths are as below :

Capacity (Persons)		Required width of Footpath(m)
All in one direction	In both directions	
1220	800	1.5
2400	1600	2.0
3600	2400	2.5
4800	3200	3.0
6000	4000	4.0

B.10.24 Cycle Tracks

The minimum width of cycle tracks should be 2 m. Each additional lane, where required, should be one m. Separate cycle tracks should be provided when the peak cycle traffic is 400 or more on routes where motor vehicle traffic is 100-200 vehicles/hr. When number of motor vehicles using routes is more than 200 per hour, separate cycle tracks are justified even if cycle traffic is only 100 cycles per hour. The capacity of cycle tracks recommended is as below :

Width of Cycle Track	(m)	Capacity (Cycles/hr)	
		One way	Two way
Two lanes	3	250 - 600	50 - 250
Three lanes	4	7600	250 - 600
Four lanes	5		>600

B.10.30 PASSENGER CAR UNITS (PCU)

1. Urban roads are characterised by mixed traffic conditions, resulting in complex interaction between various kinds of vehicles. Capacity of urban roads is normally expressed in terms of a common unit, namely Passenger Car Unit (PCU). Each vehicle type is converted into equivalent PCU based on their relative interference values.

2. The relative PCU of a particular vehicle type is affected to a certain extent by increase in its proportion in the total traffic. Following table shows the recommended PCU factors for various types of vehicles on urban roads.

3. Recommended PCU factors for various types of vehicles on urban roads :

	Equivalent PCU Factors	
	Percentage composition of vehicle type in stream of traffic	
	10%	10%
Fast Vehicles		
1. Two wheeler motor cycle or scooter etc.	0.5	0.75
2. Passenger car, pick up van	1.0	1.0
3. Auto rickshaw	1.2	2.0
4. Light commercial vehicle	1.4	2.0
5. Truck or bus	2.2	3.7
6. Agricultural Tractor Trailor	4.0	5.0
Slow Vehicles		
7. Cycle	0.4	0.5
8. Cycle rickshaw	1.5	2.0
9. Tonga (horse-drawn vehicle)	1.5	2.0
10. Hand-cart	2.0	3.0

Source : IRC Code : 106-1990.

B.10.40 DESIGN SERVICE VOLUME

1. It is recommended that normally 'C' LOS be adopted for design of urban roads. At this level, volume of traffic will be around 0.70 times the maximum capacity and this is taken as 'design service volume' for the purpose of adopting design values.

2. The design service volumes for different categories of urban roads are shown in the Table given below.

Recommended Design Service Volumes (PCU's per hour)

Sl.No. Type of Carriageway	Total Design Service Volume for different road categories		
	Arterial	Sub-Arterial	Collector
1. 2-lane (one way)	2400	1900	1400
2. 2-lane (two way)	1500	1200	900
3. 3-lane (one way)	3600	2900	2200
4. 4-lane undivided (two way)	3000	2400	1800
5. 4-lane divided (two way)	3600	2900	--
6. 6-lane undivided (two way)	4800	3800	--
7. 6-lane divided (two way)	5400	4300	--
8. 8-lane divided (two way)	7200	--	--

B.10.50 PARKING

B.10.51 Equivalent Car Space (ECS) for Different Vehicles

Car/Taxi	-	1.00
Two wheeler	-	0.25
Auto rickshaw	-	0.50
Bicycle	-	0.10

B.10.52 Parking Space Requirements

a. The minimum parking space requirements for each car and truck is as follows:

Car : 3 m x 6 m - When individual parking space is required.

2.5 m x 5 m - When community parking space is required.

Truck : 3.75 m x 7.5 m

b. Residential

i. Detached, semi-detached and row houses

Plot area upto 100 sq m. - No private or community parking space
Plot area : 101-200 sq.m.- Only community parking space
Plot area : 201-300 sq.m.- Only community parking space
Plot area : 301-500 sq.m.- Minimum 1/3 of open area for parking
Plot area: 501-1000sq.m.- Minimum 1/4th of open area for parking
Plot area : 001 sq.m + - Min. 1/6th of space area for parking

c. Flats

- One space for every two flats of 50-90 sq.m. or more of floor area.
- One space for every flat of 100 sq.m. or more of floor area.

i) For all kinds of developments excepting residential, warehouses and godowns

One berth for initial 500-1500 sq.m. of floor area. Additional berths at the rate of one for every subsequent 1000 sq.m. or part thereof.

ii) For warehouses and godowns

Two berths for initial 500-1500 m of floor area. Additional berths at the rate of one for every subsequent 500 m or part thereof.

d. Parking Norms for Work Centres

The parking norms for work centres as suggested by different organisation is shown below :

(ECS/100 sq.m. floor area)

	Work Centre Type	
	Commercial	Offices
Delhi Master Plan 1981	1.14	0.63
Delhi Master Plan 2001	1.67	1. 67
New Delhi Redevelopment Advisory Committee, 1972	2.28	1.14
Indian Road Congress, 1973	1.25	1.42
Central Public Works Department		1.23

Floor space per employee and employee to visitor norms

The space norm for floor space per employee adopted is :

a) Government - 9 sq.m.
b) Public Sector - 8 sq.m.

The employee to visitor ratio in office complexes is as 1 : 0.4.

B.10.60 BUS TERMINALS

B.10.61 Functions

The function of bus terminal primarily includes processing of vehicles, passengers etc. with provision of necessary facilities for their smooth flow. The terminal serves as a point and unit where ncessary information to user is made available for processing. A passenger bus terminal broadly needs to perform the functions to meet requirements of the following :

a. Passengers and vehicles
b. Passengers only
c. Vehicles only
d. Crew
e. Management

The functions related to both passengers and vehicles include:

- concentration
- loading

- dispersal
- unloading

Passenger only oriented functions of the terminal include provision of

- passenger platforms to board and alight
- waiting lounges
- rest houses/rooms
- baggage storage facilities
- basic shopping and commercial facilities
- utilities, services and amenities
- information system
- ticketing facilities
- shelter from weather
- communication and postal facilities
- eating places

B.10.62 Components

The components related to vehicles (bus) only include provision of :

- bays for loading and unloading
- idle bus parking spaces
- facilities related to maintenance
- information system for movement within terminal

The terminal components to meet the needs of crew are :

- rest rooms
- information system
- communication facilities
- eating places

The terminal facilities for the mangement in terms of :

- demand management on account of concentration
- incurring minimum expenditure
- development of centralised information
- ensuring better control

B.10.63 Design Criteria

The design criteria of terminal includes determining the size of terminal and factors to be taken into consideration in planning the facilities and activities. The size of the

terminal is primarily governed by the following factors :

- traffic demand
- traffic characteristics
- function of terminal
- type and sophistication of facilities

The other factors to be considered in terminal design by appreciating activity and facility inter-relationship are :

a. segregation of terminal and non-terminal traffic;

b. segregation of vehicular and pedestrians traffic and movement;

c. segregation of traffic by type, function and direction;

d. coordination of different activities in terms of functional and spatial inter-relationship;

e. provision of good user and vehicular information;

f. provision of necessary and identified facilities to meet requirement of all user groups;

g. achieving minimum passenger and vehicular processing time;

h. achieving overall functional and spatial efficiency;

i. achieving smooth flow of all types of traffic to and from terminal.

B.10.64 Planning Norms and Space Standards

Norms

a. Capacity of an intracity bus terminal	: 1.5 lakh passengers/day
b. One bus bay for 5000 passengers per day	: (Loading)
c. One bus bay for 10,000 passengers per day	: (Unloading)
d. Peak hour load	: 10% of daily passenger load
e. Occupancy/Bus	: 50 ideal
f. Time taken for loading	: 6 min; 12 min
for unloading	: 3 min; 6 min

Space Standards for Parking Facilities

a. Bus bays

Type of Parking	Area/Vehicle
Idle Parking	145 sq.m.
Angular	76 sq.m.
Parallel	104 sq.m.

b. Parking of other Modes

Car	25 sq.m.
Two wheeler	4 sq.m.
Taxi	16 sq.m.
Auto rickshaw	5 sq.m.
Cycle	1.2 sq.m.

B.10.70 TRUCK TERMINAL

A truck terminal is a highly specialised facility, designed for a specific function and operating plan in terms of the service standards it must meet, the area it serves and the volumes to be handled. It provides interface between intercity and local transportation facilities and which handle the distribution and collection of goods within the city.

The major objectives of a truck terminal are :

a. To reorganise office and godown space of transport companies.
b. To provide for expansion of companies.
c. To reduce parking, loading/unloading instances in CBD.
d. To locate the facilities for vehicle repairs, servicing, rest places, shops, etc.
e. To cater to intercity movements destined to operator's godown and provide for idle parking for trucks waiting for return load.
f. To function as a rest and halting place for through traffic.

B.10.71 Facilities in Transport Nagar

The main facilities for which area allocation needs to be made in transport nagar are:

a. Transport Agencies
b. Circulation
c. Parking
d. Open Space
e. Petrol Pump
f. Service Centre
g. Toilets
h. Police Station
i. Restaurant

j. Shops
k. Godowns
l. Weigh Bridge
m. Stalls/Dhabas
n. Administrative Office
o. Fire Station, Post Office, Dispensary
p. Bank, Bus Station, Electric Sub-station
q. Cold Storage
r. Spare Parts Shops
s Body Building Shops
t. Cinema

B.10.72 Locational Factors

The following factors are generally considered while locating a truck terminal/transport nagar :

a. They should be located on main corridor of goods movement.

b. They are generally located on fringe of developed lands.

c. They should have proper linkage with other freight generating activities as well as developed areas.

d. Consideration for intra-city goods movement pattern in terms of desire of movement, modes used and distances over which movement is made should also be kept in view.

B.10.73 Broad Land Use Break-up

The broad land use break-up in a truck terminal (transport nagar) is as below :

Use		Percentage Area
1.	Transport Operators - Office, godown, loading/unloading	30.0
2.	Service Industry - Petrol pump, service area, weigh bridge, etc.	6.0
3.	Public/Semi-public - Police post, post office, telephone, first aid etc.	3.0
4.	Commercial	3.0
5.	Parking - idle, transit, other vehicles	18.0
6.	Open spaces	10.0
7.	Circulation	28.0
8.	Others	2.0
	Total	100.0

B.10.80 INTEGRATED FREIGHT COMPLEX

B.10.81 Functions

The basic functions of an integrated freight complex are :

a. To provide facilities for regional and intra-urban freight movement.

b. To provide facilities for freight in transit as well as interchange of mode.

c. To provide warehousing and storage facilities and inter-link these sites with specialised markets.

d. To provide servicing, loading and boarding, idle parking, restaurants and other related functions in the complex.

B.10.82 Objectives

The functional objectives of wholesale complex-cum-truck terminal should be :

a. To provide adequate facilities for wholesale trade activities, these include:

i) auction areas
ii) wholesale shops and subsidiary storage capacity
iii) packaging facilities
iv) wholesale godowns, cold storage, etc. togather with handling facilities and equipment, etc.

b. To provide adequate parking space and facilities for trucks expected to utilise the terminal. These facilities include :

i) service/repair facilities
ii) rest/recreation for drivers
iii) weighing of trucks etc.

c. To provide adequate facilities for office/storage activities of trucks operating at terminal. These include :

i) godown space
ii) office space
iii) loading/unloading facilities
iv) weighing of goods vehicle etc.

Apart from the above-mentioned objectives, the complex must provide for a number of associated/ancillary facilities and services, some of which are :

a. Provision for goods movement within the complex in terms of truck movement and loading/unloading/ stacking of goods.

b. Building and amenities for administration and security measures necessary for complex.

i) Facilities like banking, postal facilities, etc. required for business transactions
ii) Amenities for wholesalers, truckers and their employees
iii) Areas for shops, eating houses and other service establishment
iv) Provision of lighting, water supply and garbage, sewarage disposal.

B.10.83 Space Norms

The space norms in kg/sq.mt. for selected commodities as per Central Warehousing Corporation (CWC) is given below :

Commodity	Wt./Area (Kg./sq.m.)
Foodgrains	1054
Fruits and Vegetables	721
Hardware and Building Material	1054
Iron and Steel	904
Timber	968
Machinery	968
Auto parts	968
Textile	968
Chemicals and Fertilisers	968

B.10.84 Broad Land Use Break-up

The broad land use break-up of an integrated freight complex could be as follows :

	Use Type	Percentage of Area
1.	Wholesale Market	35.0
2.	Warehousing	8.0
3.	Booking Agencies	2.0
4.	Commercial & Public/Semi-public	5.0
5.	Utilities and Services	3.0
6.	Service Industry	4.0
7.	Parking	12.0
8.	Circulation	25.0
9.	Others	6.0
	Total	100.0

B.10.85 Area Requirements

As a general guideline, the area required for a truck terminal (transport nagar) should be reserved at the rate of one hect.per 300 tonnes of daily goods inflow into the complex. In case of integrated freight complex, the area necessary would be one hectare per 400 tonnes of daily goods inflow into the complex.

B.10.90 MODAL SPLIT BY PUBLIC TRANSPORT MODES

Recommended derived modal split levels i.e. share of public transport modes based on city size are :

City Size	Recommended Modal Split
Below 1 million	30 %
Around 1 million	35 %
1.5 million	40 % plus
3.0 million	50 % plus
6.0 million	70 % plus
9.0 million	75% plus (85% with a Mass Transit System)

In the absence of suitable modal split method, the above-mentioned modal split levels could be adopted for working out transportation system requirements of urban settlements.

B.10.00 MATHEMATICAL TECHNIQUES FOR FORMULATION OF SPATIAL STANDARDS

The Central Building Research Institute, Roorkee has evolved the following mathematical relationships for formulation of spatial standards.

B.10.10 IMPACT OF PHYSICAL PARAMETERS UPON SPACE STANDARDS

The impact of the value of land use percentage allocations and space requirements per 1000 persons upon gross and net densities can be determined by the following equations :

$$G = \frac{D \times (100 - z + y)}{100}$$

where

G = Gross density in persons per hectare
D = Net density in persons per hectare
z = Land use percentage allocation for amenities
y = Land use percentage allocation for ciruculation

B.10.20 IMPACT OF ECONOMIC PARAMETERS UPON SPACE STANDARDS

The economic success of an amenity among a complex of amenities depends upon the overall cost of development and the paying capacity of the inhabitants. The space standard in relation to land costs, cost of development and permissible rate of interest can be calculated from the following equation :

$$D = \frac{8.3 \times C \times R}{E}$$

where

D = Space standards in hectares per 1000 persons
C = Cost of land or cost of development per sq.m.
R = Rate of interest per annum
E = Maintenance cost in rupees per month

B.10.30 LOCATION ASPECTS OF AMENITIES

(Amenities, Catchment Area and Population to be served)

The population to be served by an amenity should be based upon the maximum spatial distance and density of habitation and should be determined by the following equations :

$$R = 56 \quad P/NZ$$

where

R = distance in meter
P = population to be served
N = Net density in person/hectare
Z = Land use percentage

B.10.40 SPACE REQUIREMENTS FOR EDUCATIONAL BUILDINGS

The space requirements of nursery, primary and higher secondary should be worked out per 1000 population. keeping in view the amenities to be provided, nature of development and the socio-economic conditions of the population to be served. The space can be determined by the following equation :

$$E = \frac{A \times Q \times M}{100 \times 1000 \times F \times 100} = \frac{A \times Q \times M}{100 \times 100 \times C \times S \times 100}$$

where

A = Number of children per 1000 population in the age-group pertaining to nursery or primary or higher secondary
Q = Percentage of expected enrolment in the particular type of school
E = Site area in hectare per 1000 population
M = Gross built-up area in sq.m. per child for particular type of school
C = Coverage in percentage

B.10.50 SPACE REQUIREMENTS FOR OUTDOOR RECREATIONAL ACTIVITIES

The space can be determined by the following equation for total lots, play fields at primary level and play fields including parks at higher secondary level per 1000 persons.

$$A = \frac{A \times Q}{100 \times 1000} + \frac{(A1 \times R1 \times M1)}{L1 \times D1 \times 1000} + \frac{A2 \times R2 \times M2}{L2 \times D2 \times 100} + \ldots + \frac{(An \times Rn \times Mn)}{Ln \times Dn \times 100}$$

where

A = number of children per 1000 population in age group pertaining to that amenity

Q = percentage per expected utilisor in that age group

$A_{1,2,\ldots n}$ = Area for provision and operation of amenity 1,2,...nth respectively

$R_{1,2,\ldots n}$ = Average time upto which a particular batch plays on amenity 1,2.....nth respectively

$M_{1,2,\ldots n}$ = Percentage of users out of the total users interested in amenity 1,2..... nth respectively

$L_{1,2,\ldots n}$ = Load in terms of users of the amenity 1,2,.....nth respectively.

$D_{1,2,\ldots n}$ = Duration for which amenity 1,2,.....nth respectively generally remains in use

B.10.60 SPACE STANDARDS OF HEALTH BUILDINGS

In order to find out the space requirements for health buildings, the following equation may be used :

$$\frac{1000 \times Q \times A}{100 \times 100} \times \frac{M}{F \times 100} = \frac{M}{C \times S \times 100} \times \frac{1000 \times Q \times A}{100 \times 100}$$

where

E	=	Site area in hectare
A	=	Percentage of population using the facility
Q	=	Population at risk in percentage
M	=	Gross built-up area in sq.m. per patient
F	=	Floor Area Ratio
C	=	Coverage in percentge
S	=	Number of storeys

B.10.70 SPACE REQUIREMENTS FOR SHOPPING FACILITIES

The shopping requirements at different levels depend upon the expenditure pattern of the households of the residential area. The space requirements for shopping should be worked out per 1000 persons with the help of following equation :

$$E = \frac{1000}{A} \times \frac{M}{F \times 100} = \frac{1000}{A} \times \frac{M}{C \times S \times 100}$$

where

A	=	Population to support one shop
M	=	Built-up area per shop
E	=	Space requirements for shopping at each level
F	=	Floor Area Ratio
C	=	Coverage in percentage

B.10.80 AFFORDABLE SHELTER - A SCIENTIFIC APPROACH

An approach consisting of six steps for arriving at optimum housing option has been worked out as given below :

Step One : Establish the rent paying capacity for the selected groups of households and the housing demand in different urban pockets.

Step Two : Establish correlation between rent paying capacity of the different households and the capital cost of housing in relation to rate of interest and period of amortisation.

StepThree : Apportion optimally the capital cost of housing per dwelling into the three components viz cost of land, cost of infrastructure and cost of construction.

Step Four : Establish correlation between plot size net land use percentage of housing, land cost and cost component of housing each dwelling arrived at in step three.

The relationship is governed by the following equation :

$$C = (10{,}000/P \times 100/Z)\, LP$$

where

C = Cost of land per dwelling unit
P = Net density in plots per hectare
Z = Land use percentage allocation in net housing
LP = Price of land in Rs. per sq.m.

Step Five : Establish correlation between costs of infrastructure (provision of amenities) and community facilities costs of infrastructure development and its component per dwelling as arrived in step three. The provision of on-site and off-site infrastructure is very imporant and the cost of provision affects the economic viability of the total project. The following equation is suggested to determine the cost of infrastructure per dwelling for varying parameters :

$$A = 10{,}000 / D \times B$$

where

A = Cost (in Rs.) of infrastructure development per house (apportioning the total cost of development per dwelling unit)

D = Gross residential density in dwellings per hectare.

B = Cost of infrastructure development per sq.m. (taking total area under development).

Step Six : Establish correlation between built-up space and cost component per house for superstructure as arrived in step three.

The provision of plot size, land use extent of infrastructure services on minimum acceptable land for specific situation determines the cost of superstructure within the specified cost of the house assigned in step two. Therefore, the cost of superstructure should be viewed as function of several alternatives of plot area and its cost (after examining various alternatives based on above steps) so as to lead to an acceptable and affordable shelter solution within the existing cost limits.

APPENDIX - C

SIMPLIFIED DEVELOPMENT PROMOTION REGULATIONS

APPENDIX - B

NORMS AND STANDARDS

B.1.00 THE BASIC FRAMEWORK

1. The basic objective of suggesting various norms and standards for urban development plans formulation is to provide a basis for taking decision. The suggested norms and standards are indicative and can be suitably modified depending upon the local conditions. Variations in the norms and standards, as applicable to small and medium towns and large cities as classified by UDPFI Guidelines, have been given. Variations in respect of urban centres located in hill areas have also been provided at appropriate level.

2. Table B.1 gives the classification of urban centres by population size and location in plains and hill areas.

3. Norms and standards have been provided for :

a. Distribution of land use,

b. Infrastructure, further classified as :

i) Physical infrastructure including :

Water supply
Sewerage
Drainage
Electricity, and
Solid waste

ii) Social Infrastructure covering :

Education
Health
Socio-cultural Facilities including :
- Religious Sites
- Community Room
- Community Hall and Library
- Recreation Club
- Music, Dance and Drama Centre
- Meditation and Spiritual Centre
- Socio-cultural Centre
- Museum and Art Gallery