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Introduction

Construction is an inter-related complex of operation whereby buildings are erected. The end product of building construction is finished building for its functional use. As such right from the germination of an idea in the mind either to an individual or a group of individuals to its realization as concrete reality, the project should be analysed critically. The building process is complex but at the same time fascinating also. There may be a need to expand existing building or to modify an existing building for putting it to some other use, there may be a altogether new project. It is always essential first to investigate its feasibility considering factors like economy and physibility.

1.1 BUILDING INDUSTRY

When new project comes up for consideration; the Civil Engineer/Architect initially requires some first hand knowledge of the locality in which the work is to be carried out, preliminary investigations are made, sketches are drawn and discussed before final design is made. Once these designs are approved then structural designs, estimates are prepared and a final tender documents are made, tenders are invited and a contract is awarded. Construction starts there after. When the project is completed it is periodically inspected and maintained in good order.

Hence right from planning stage to completion stage and then to use it, number of different persons and specialised firms are involved for its satisfactory completion. These members and personnal from specialist firms involved, form a "*Building industry*". These different persons have their own entity in itself with their own special features and problems and a different approach in each case. Following are the persons who form a building industry:

1. The owner
2. Architect
3. Consulting engineer
4. Quantity surveyor
5. Specialist firms
6. Contractor
7. User
8. Surety bondmen
9. Material suppliers.
10. Promoter and Builder

The duties and responsibility of each of them are given in subsequent articles.

1. The owner. Owner is one who intends to get a work executed as economically and as quickly as possible and wants to know in advance his ultimate financial commitments. Owner may be a government organisation, a private public body or some private enterprise or an individual one depending on type of work and financial involvement. After completion of his work and its possession, it is upto owner to arrange its utilization and maintenance.

2. Architect. An architect plays a key role in the process of building right from the start of the project till its completion. He is the first person involved in the planning stage of a building project. He should be an artist, a technician and moreover a business man. He is a qualified professional who helps his/her clients to transform their ideas or plans into concrete reality. A

registered architect is a qualified architect whose name is registered with the council of architecture established by a statues of the government of India.

Keeping the clients requirements in mind the architect works out preliminary sketches of functional layout and provisions of functional accommodation of the building. He has to make structure beautiful and functional. He should give aesthetic effect to the structure. During this planning process he is required to see that needs of all those who will be using the completed building are fulfilled. A good architect is supposed to have knowledge of development of new materials, methods of construction. He must know the building bye laws and regulations applicable to that locality and town where he is planning the building.

Once the sketches are discussed and approved by client, the preliminary sketches are finalised. These sketches are then developed to complete set of drawings showing all working details and submitted for approval of the local body and various other public authorities. He prepares specifications, other detailed working drawings and a detailed estimate for the work. He also collaborates with the structural engineer, interior designer, electrical engineer and other consultants in their design, planning and estimates or if he has an integrated office he can render any or all of these services under one roof. The mode of construction and construction agencies are fixed with his help. He also gives various architectural and structural details from time to time and supervises the construction periodically at all important stages to see that his drawings are being properly followed on site and quality of material and workmanship are maintained as per specifications.

Sometimes he also performes the job of quantity surveyor *i.e.*, to measure the work done and preparation of running bills from time to time. He is then also required to see that expenditure incurred on various building items is correct. After completion of the building, he prepares the final bill for the work.

3. Consulting Engineer. The consulting engineer is one who is whole-sole responsible for execution of work. He develops the drawings, design the structure, prepares the estimate, invites tender, gets work executed properly by contractor and gives the possession. He supervises the work and maintains the record. He is responsible for greater part of technical design and construction which affects the cost. He advises owner as well as to the contractor whenever it is required. Government organisation employ their own engineers who look after the work.

Present practice in market is that owner appoints either an engineer or an architect who does all the job. There are many work like preparation of tender documents; preparation of estimates etc., are undertaken by engineers as well as by architects also.

4. Quantity surveyor. He prepares the bill of quantities and values the work from time to time during progress of the work. This job at present is mainly done by engineers in India.

5. Specialist firms. The term implies to those firms which are specialised in anyone particular job within the industry; for example, electrical engineers, decorators, acoustic engineers etc. These firms are sometimes nominated as sub-contractors or their services may be availed by regular contractor at their own initiative. Now-a-days specialist personnels are available for many types of civil work also *viz.* Specialist of form erection, concreting gangs etc. These specialist agencies can execute their work more efficiently than others. More than 50 percent jobs are done by these specialist agencies now-a-days.

6. Contractor. When all the plans and drawings have been approved, permission to execute the work has been sought, complete details have been ascertained and moreover tender notice has been issued the contractor comes into picture. He submits his tender for undertaking the

work if his tender is accepted. When he enters into a contract he undertakes the work along with financial risk. He employes the labour, arranges materials and equipment required for execution of work and starts execution of work. He also controls and coordinates the activities of the specialist firms if required. This needs the careful planning, good organisation and a thorough knowledge of different techniques of construction. Contractor gets the work executed under the supervision of engineer in-charge.

As such, the client, the architect and the contractor executing the work have to work in harmony for the successful completion of the project. Correct choice of contractor, proper contract terms and cordial dealings with one another during construction, will give the way to the ultimate success of the project.

A contractor may be an individual doing contract business or a contracting firm consists of two or more persons duly registered or a large or small private limited company. Public limited companies also undertake very big contracts.

7. User. Strictly speaking he is not at all a party of building industry, but whatever is planned and constructed by building industry; user is a judge to decide the quality of work and facilities provided. In buildings he decides whether the house has been planned functionally well or not. He actually faces the difficulties of poor planning, hence as such becomes a party of building industry.

In many countries, in a big and mass housing project, in first stage construction, a few houses are only constructed. These houses are then given to public for usage to find their shortcomings if any. The complete project is executed only after doing genuine modifications if any as suggested by the users. This practice is not very common in India so far.

8. Surety bondsmen. It is a well establisted practice in engineering contracts for the owner to require a surety bond from each bidder that in the event of the contract being entered into with any particular bidder, the later will-fully and faithfully will make its provisions. Similarily contractor also needs surety of payment of wages timely. Hence surety bondsmen give surety to the owner as well as to the contractor that he holds responsibility for loss of wages if any. Hence a surety bond creates three concentrated situations.

Firstly, between owner and contractor; secondly, between owner and surety bondman and thirdly, between contractor and surety bondman. This practice of surety bondsman has not become very popular and common in India so far. Only for solving legal complications and to perform all official formalities between owner and purchaser or owner and supplier, brokers are there to do all this business. But they are not surety bondman. They do not assure the quality of work or payment of wages, they simply complete the formalities required for business transaction including official works, if any.

Whether they are a part of building industry or not is a matter of personnel discussion but strictly speaking they are a part of building industry provided such persons or companies are involved in.

9. Material suppliers. These are the persons who supply material to the contractor or owner on demand 60 to 80 percent cost of project is invested in materials. But whether they form a part of building industry or not is a matter of subject discussion.

The object of all the persons involved in building industry is creation of something which will serve the purpose for which it is built. Good qualitative construction is the ultimate objective.

10. Promoter and Builder. The job of promoters and builders is to construct flats, shops etc., on his own plot and then to sell them on ownership basis. The promoter buys a vacant plot or a plot with some structure standing thereon. He then gets plans and estimates prepared for a building containing self contained apartments or for a group of residential buildings. He gets the plans approved by the local bodies and floats an apartment scheme. The scheme can also be for shops, offices or self contained units for any other use. He sells these units before or during the construction itself to buyers who are in need of such units. The buyers pay the price in instalments. The price per unit area of the unit is fixed according to any of the following modes:

1. Carpet area of the unit *i.e.*, the floor area excluding the area of walls.
2. Built-up area of the unit. It is inclusive of area of the inner and outer walls; the area of walls common between two adjacent units is shared by the adjoining purchasers. Built-up area comes to about 15% to 20% more than the carpet area.
3. Super-built-up area of the unit is the sum of the built up area of the unit and proportional built-up area of common facilities like passages, staircase etc. This mode is obviously the most expensive.

In most of the cases, the promoter/builder takes power of attorney from the owner of the plot to develop the property in the owner's name. The owner should take care to have clauses inserted in the agreement which provide him with indemnity by the promoter against any losses, legal actions etc. Both promoter/builder and owner should take help of a legal advisor. Complete investment of course is to be made by promoter and builder. The owner of plot gets his share of profit from the total profit earned by promoter and builder. Sometimes promoter instead of giving monetary profit, gives a few flats to the owner of the land as the agreement is being decided between owner and builder/promoter.

Co-operative Society. In a cooprative society, a minimum of ten preferably eleven individuals come together to form the society. Each member holds share of a certain amount as prescribed by its bye-laws. It selects its own chairman; secretary and managing committee. Society frame its own constitution and bye-laws within the parameters of the laws of the state. It must be registered in the district office of registrar of cooperative societies. The society generally buys a piece of land and gets a layout prepared and approved.

It constructs building, which is a unit or a portion of them, in turn belong to its members. Each member has an undivided proportionate share in the common property and facilities. Cooprative societies are also formed to run a shop, an industry, hospital etc.

It is easier to get a loan from a financial institution or government, at a lower rate of interest repayable in easy instalments for a cooprative body; hence construction of houses forming cooperative society has become very popular in India.

1.2 DEVELOPMENT OF BUILDING INSPECTION

The development of building inspection is created at every municipal office, corporation etc. to grant permission for development, erection, re-erection, dismenteling etc. The employees working in this department are called as building officials. The building official is appointed by appropriate authorities. The building official and authorities together appoint various officers, technical assistants, inspectors etc., for adminstration and to control construction activities in that town, city *i.e.*, jurisdiction under the consideration of the building officals. The minimum qualification required for building official is engineering graduate or an architectural graduate

having membership of civil engineering division of Institution of Engineers (India) or any other degree or diploma which makes him eligible for membership of Institution of Engineers (India). In case of architecture person must be eligible to become member of Indian Institution of Architecture as per Architect's Act 1972 and should be registered with Council of Architecture.

The building official has all the rights to enforce all provisions as per rules and regulations related to development, erection, re-erection, demolition etc. Use of materials, additions, alterations, repairs, installation of seismic equipments and the location, use, occupancy and maintenance of all buildings. He is responsible to collect applications for grant of permission, to issue permission for all above items. He is authorized to deny permission for these items with giving reasons if permission is not to be accorded. He also issues orders, notices to remove illegal or unsafe constructions, to require the necessary safe guards during construction, to require adequate exit facilities in existing buildings and to ensure compliances with all the requirements of safety, health and general welfare of the public. Upon presentation of proper credentials and with advance notice, the building official or his authorised representative can enter at any reasonable time at any building or premise to perform any duty imposed upon him by the rules and regulations as per provisions of code. He or his representative can inspect any premise and is required to submit the report of inspection to authorities for further necessary action. Even if permission for development, erection, re-erection, alternations etc., has been granted and if it is found that construction is not made according to sanctioned plan, provisions are not made as per sanctions, he can bring this to notice of appropriate person for stay of construction work. If the owner fails to comply with the requirements, building officials have power to cancel the permission issued.

Sometimes some practical difficulties are found to construct the structure as per granted permission, under such conditions if owner brings this to the notice of building officials, then building officials have rights to modify such permissions. However this can be done only after receiving written application of owner and only after getting satisfied by inspection that modification is essential. The building should be used only for intended work to which permit is issued. In case of change of occupancy nature, building official can issue order for discontinuation of use other than intended to which permission is granted. There is a provision of penalty cause and penalties can be levied as per rules and regulations depending upon violations made by owner. The penalties can also be in the form of collections of arrears of taxes, extra penalties over and above taxes as the case may be. The building officials have rights to frame, made rules and regulations as per code provisions of law only.

No notice and building permit is required for the following alternations in general if they do not violate provisions regarding general building requirements.

1. Opening/closing of any opening like door, window or ventilator, inner door.
2. Providing partitions, false ceiling.
3. Gardening.
4. White wash, colour wash, painting etc.
5. Re-tiling, re-roofing, re-flooring.
6. Plastering, pointing or any other patch work.
7. Construction of sun shades in own land.
8. Re-erection, repairs of partitions damaged due to natural calamities like earthquake, flood etc.

1.3 APPLICATION FOR DEVELOPMENT/BUILDING PERMIT

Any civil engineering structure whether in public sector or private sector, needs permission for its construction from appropriate authorities. Unless the permission is sought the work can not be treated as legal one.

In case of buildings, every person either in public sector or private secter if intends to develope to erect; re-erect or make alterations in any place in a building has to give notice in writing to the authority of his said intention in prescribed form and such notice must be accompanied by plans and statements in triplicate as required. These drawings are required to be prepared and signed by some registered architects, registered engineers or by licensed supervisors of the corporation; municipal office or any other appropriate office having power to grant permission as per the rules and regulations laid down by authorities. The proforma of prescribed form and notice is given herewith.

Once this form and notice are submitted in the office, it is responsibility of corporation office to go through it. The corporation engineeer has to approve the drawings if drawn as per building bye-laws. If these drawings show that building bye-laws have not been followed by the architect/engineer, the corporation engineer/city engineer has all the rights to or not to approve these drawings. He further will have to inform the owner that permission for construction is not accorded due to specified reasons. These causes will have to be illustrated clearly. He has to further inform the owner to submit corrected drawings before specified date. It is also a responsibility of registered architect/engineer to follow the building bye-laws laid down by corporation or other authorities strictly.

Once the drawings are approved by city engineer/municipal engineer permission for erection/re-erection etc., is accorded by corporation specifying certain conditions if required to be followed by owner. The notice submitted by owner must accompany the necessary fee charged by authorities based on total floor area of the building. No notice is referred as valid unless and until the person giving notice has paid the fees to the authority and an attested copy of the such receipt of such payment is attached with the notice. The permission for construction must be accorded within a month from the date of receiving of notice. Further if authorities have any objection the owner must be informed within two weeks from the date of receipt of the notice and plans regarding objections to the proposed construction.

The permission is generally accorded on the plans submitted by owner. Two sets of copies out of three sets submitted are returned to owner. The fee paid once is not refundable under any circumstances whether the permission accorded or not. In the event of a building permit is not issued; the owner is always permitted to resubmit the notice/drawings without any fee after complying with all the objections raised by authority within a period of one year from the date of rejection after which fresh fee will have to be paid.

If within 30 days of the receipt of the notice the authority fails to intimate in writing to the person who has given the notice of its refusal or sanction, the notice with its plans and statements is deemed to have been sanctions, provided the fact is immediately brought to the notice of the authority in writing by the person who has given notice and having not received any information from the authority within fifteen days of giving such written notice subject to the conditions mentioned in this clause; nothing can be constructed to authorise any person to do anything in contravention of or against the terms of lease or titles of the land or against any other regulations bye-laws or ordinance operating on the site of the work.

In the case of refusal, the authority must quote the reason and relevant sections of the code which the plans contravene. The authorities should as far as possible advise all the objections to the plans and specifications in the first instance itself and ensure that no new objections shall be raised when they are resubmitted after compliance of earlier objections.

Once the plan has been scrutinised; objections pointed out and modified plans are resubmitted after complying with the objections raised and if the authorities find further objections on resubmitted plans, the plans are generally rejected.

Duration of Sanction. The sanction once accorded remains valid upto three years. One must get permit revalidated before the expiration of this period; but then revalidation can be given subject to the rules and regulation then in force and not on to the basis of previous one.

Daviations during construction. Under no circumtances owner can deviated the construction work from approved and sanction drawings accorded. If during construction of building any departure of a substantial nature from the sanctioned plan is intended to be made sanction from the authorities must be obtained before any change is made. The revised plan showing deviations be submitted.

FORM FOR FIRST APPLICATION TO DEVELOPMENT/ ERECT/ RE-ERECT OR TO MAKE ALTERATION IN ANY PLACE IN A BUILDING

To,

Sir,

I, hereby give notice that I intend to erect/re-erect/to make alteration in the building No. ------- or/to ------ on/in plot No. ------- in survey No. ------ in colony/street -------- mohalla/bazar/road ------- city ------- (state) and in accordance with the building code of ------- clause ------- of ------- corporation and I forward herewith the following plans and specifications in triplicate duly signed by me and ------- the registered architect/engineer/licensed supervisor registration No. ------- who will be supervising the work of erection/re-eretion/alteration.

1. Key plan
2. Site plan
3. Sub-division Layout plan
4. Building plan
5. Service plan
6. Specifications, general and detailed
7. Ownership title
8. Other details if any

I request that the construction may be approved and permission accorded to me to execute the work.

Signature of owner ----------

Name of owner (in block letters)

Date : -------

Address of owner ----------

FORM FOR SUPERVISION

I hereby certify that the development/erection/re-erection/material alteration in/or building No. ---- or the ---- on/in plot No. ---- in colony/street ---- mohalla/bazar/road ----- city ----- shall be carried out under my supervision and I certify that all the materials (type and grade) and the workmanship of the work shall be generally in accordance with the general and detailed specifications submitted along with and that the work shall be carried out according to the sanctioned plans.

Signature of architect / engineer / licensed supervisor

Name of architect / engineer / licensed supervisor

Registration No. of architect / engineer / licensed supervisor

Date : ------

Address of architect / engineer / licensed supervisor

INFORMATIONS ACCOMPANYING NOTICE

Building permit and commencement certificate are essentially required from competent authority to carry out any development work including development of land by laying out into suitable plots or development of land as group housing scheme or erection, re-erection or making alterations or demolition of any building or causing the same to be done without first obtaining a separate building permit and commencement certificate for each such building. Even temporary construction can not be carried out without obtaining prior approval of planning authorities. The authorities may either sanction or refuse the plans or may sanction them with such modifications, conditions or directions, it may deem necessary and thereupon may communicate its decision to the person giving the notice in the prescribed form.

The notice submitted by owner for grant of permission for erecting/re-erecting the house must accompany the following documents in appropriate method.

1. Ownership title
2. Key plan (location plan)
3. Site plan
4. Building plan
5. Service plan
6. Specifications
7. Certificate of supervision
8. Attested copy of fee receipt *i.e.*, building permit fee
9. Sub-division layout plan
10. Other details, if any.

Key plan. (or location plan). A key plan drawn to a scale of not less than 1:10000 is required to be submitted along with the application for a building permit and commencement certificate showing the boundary locations of the site with respect to neighbourhood land marks.

Site Plan. The site plan submitted with an application for permit should be drawn to a scale of not less than 1:500 for a site upto 1 hectare and not less than 1:1000 for a site more than 1 hectare and must show:

(*a*) Boundaries of the site and of any contiguous land belonging to the owner thereof.

(*b*) Position of site in relation to neighbouring streets and the name of streets.

(*c*) All existing building standing on, over or under the site.

(*d*) Means of access from the street to the building, and to all other buildings (if any) which the applicant intends to erect upon his contiguous land referred to.

(*e*) Space to be left about the building to secure a free circulation of air admission of light and access for scavenging purposes.

(*f*) The width of the street (if any) either in front or at the side or near the building.
(*g*) Direction of NORTH relative to the plan of the buildings.
(*h*) Any physical feature, such as well, drains culvert, if any.
(*i*) Any other particulars as may be prescribed by the authority.

Building plan : The plan of the buildings and elevations and sections accompanying the notice should be drawn to a scale of 1:100. The plan should include :

(*a*) Floor plan of all the floors together with the covered area clearly indicating the size and spacings of all framing members and sizes of rooms and the position of staircases ramps and liftwells.
(*b*) Show the use of occupancy of all parts of the building.
(*c*) Exact location of essential services like W.C., sink, bath etc.
(*d*) Include sectional drawings showing clearly the sizes of footings thickness of different walls; size and spacing of framing members, details of floor slabs roof slabs and their material of construction. The section should also indicate the heights of building and rooms and also of parapet. This should further indicate the drainage and slope of roof. In case of buildings having staircase one section must be drawn going through staircase.
(*e*) Must show all street elevations.
(*f*) Must give dimensions of all projected portions beyond permissible building line.
(*g*) Include terrace plan indicating the drainage and slope of roof.

Service plan. Service plan showing all details of private water supply, and sewage disposal system, if any, should be drawn. General practice is to show these in building plans and elevation. Different colours are used to indicate them in building plan. Table 1.1 gives the colouring of plans.

Specifications. Specifications both general and detailed giving type and grade of materials to be used duly signed by the registered architect/engineer/licensed supervisor must be attached to notice.

Supervision. The notice must be accompanied by a certificate in prescribed form by the registered architect/engineer/licensed supervisor undertaking the supervision; further all the drawings submitted to the authorities regarding permission for construction of building must also be signed by registered architect/engineer/licensed supervisor.

Building Permit Fee. While submitting notice to accord permission, it is essential to deposit fee along with development charges, if any. This fee depends on class of municipal council and area of construction. Without this fee, permission is never granted.

Sub-division Layout Plan. In the case of development works, the notice should be accompanied by the sub-division layout plan which should be drawn on a scale of not less than 1:500 containing the following:

(*a*) Scale used and north line
(*b*) Location of all existing and proposed roads within the land and width of each.
(*c*) Dimensions of plots alongwith building lines showing the dimensions of the setbacks, within each plot.
(*d*) Location of drains, sewers, public facilities and service and electrical lines etc.
(*e*) Table showing size area and use of all the plots in the sub-divisional layout plan.

(*f*) A statement indicating total area of site, area utilised under roads, open spaces, space for parks, play ground, recreaction, and development plan reservations, schools, shopping and other public spaces along with their percentages with reference to the total area of site proposed to be sub-divided.

Means of access from roads of individual space is also required to be drawn.

Table 1.1. Colouring of Plans

Sr. No.		Site plan			*Building plan*		
	Item	White Plan	*Ammonia Print*	*Blue Print*	*White Plan*	*Ammonia Print*	*Bule Print*
1	Plot lines	Thick black	Thick black	Thick black	Thick black	Thick black	Thick black
2	Existing streets	Green	Green	Green	—	—	—
3	Future street if any	Green dotted	Green dotted	Green dotted	—	—	—
4	Permissible Building lines	Thick dotted Black	Thick dotted Black	Thick dotted Black	—	—	—
5	Open space	No colour	No colour	No colour	No colour	No colour	No colour
6	Existing work	Black (outline)	Blue	White	Black	Blue	White
7	Works to be demolished	Yellow hatched	Yellow hatched	Yellow hatched	Yellow hatched	Yellow hatched	Yellow hatched
8	Proposed work	Red filled in	Red	Red	Red	Red	Red
9	Drainage and sewerage works	Red dotted	Red dotted	Red dotted	Red dotted	Red dotted	Red dotted
10	Water supply works	Black dotted thin	Black dotted thin	Black dotted thin	Black dotted thin	Black dotted thin	Black dotted thin

Once the permission is accorded, the owner can start the erection/re-erection of his work with an intimation in writing to the authorities intimating the date of commencement of work in the prescribed form given below:

FORM FOR SANCTION OR REFUSAL OF DEVELOPMENT/BUILDING PERMIT

To

Sir,

With reference to your application ..... dated ..... for grant of permit for the development, erection, re-erection or material altertion in the building No. or to ..... on/in plot No. ..... in colony / street ..... mohalla / bazaar ..... city ..... .

I have to inform you that the sanction has been granted/ refused by the authority on the following grounds.

1.

2.

3.

.....

Office Stamp — Signature of the Authority

Office (Communication) No. Date — Name, Designation and Address of the Authority

FORM FOR NOTICE FOR COMMENCEMENT

I, hereby certify that the development/erection/re-erection or material alteration in/of building No. --- or the --- on/in plot No. --- in colony/street --- mohalla/bazar/road ---- city/town ---- will be commenced on ---- as per your permission vide letter No. ---- dated ---- under the supervision of ----- registered architect/engineer/licensed supervisor registration No. ---- and in accordance with the plans sanctioned vide No. ---- dated ---- .

Signature of owner
Name of owner
Date ---- Address of owner

Similarily, once the construction is over; owner should report to the authority through registered architect/engineer/licensed supervisor regarding his completion of work. Registered architect/engineer issues completion certificate which is submitted to the authorities. The authorities then, after inspecting the site issue occupancy certificate to the owner to occupy that building for luman habitation. Authorities are required to inspect the work at regular intervals and if finds that the construction work is not going as per approved and sanctioned plans, can stop the work at any time serving a notice to the owner and pointing out the deviations made.

The proforma of completion certificate and occupancy certificate are given below.

FORM FOR COMPLETION CERTIFICATE

I, hereby certify that the development/erection/re-erection/material alteration in/of building No. ---- or the ---- on/in plot No. ---- in colony/street ---- mohalla/bazar/road ---- town ---- of Mr. (name of owner) ----- has been supervised by me and has been completed on ---- according to the plans sanctioned vide letter No. ---- dated -----. The work has been completed to my best satisfaction; and workmanship and all the materials (type and grade) have been used strictly in accordance with general and detailed specification. No provisions of building bye-laws; no requisitions made conditions prescribed or orders issued thereunder have been transgressed in the course of work. The building is fit for use for which it has been erected, re-erected or altered, constructed and enlarged.

Date ------- Signature / Name / Registration No. / address of
Registered Architect / Engineer / Licensed Supervisor

FORM FOR OCCUPANCY CERTIFICATE

I, hereby certify that the development/erection/re-erection/alteration in/of building No. ---- or the ---- on/in plot No. ---- in colony/street ----- mohalla/bazar/road ----- town ----- completed under the supervision of Mr. ----- registered architect/engineer registered No. ----- has been inspected by me and I declare that the building confirms in all respect to the requirements of the building bye-laws in respect of use group, structural safety; fire safety; hygienic and sanitary conditions inside and in the surroundings and is fit for occupation.

Office stamp Signature of the Authority.
Date --------

1.4 BUILDING PLANS FOR MULTI-STOREYED/SPECIAL BUILDINGS

For multi-storeyed buildings which are more than 15 m height and for special buildings like assembly, institutional, industrial, storage and hazardous and mixed occupancies with anyone of the aforesaid occupancies havig area morethan 500 sq.m., following informations other than already specified in building plans are required to be furnished in addition. These are:

(*a*) access to fire appliances/vehicles with details of vehicular turning circle and clear motorable access way around the building.

(*b*) Size *i.e.*, width of main and alternate staircases alongwith balcony approach, corridor ventilated lobby approach.

(*c*) Location and details of lift enclosures.

(*d*) Location and size of fire lift.

(*e*) Smoke stop lobby/door where provided.

(*f*) Refuse chutes, refuse chamber, service duct etc.

(*g*) Vehicular parking spaces.

(*h*) Refuse area if any.

Other details depending upon type of building are:

(*i*) Details of building services—air-conditioning system with position of fire dampers, mechanical ventilation system, electrical services, boiler, gas pipe etc.

(*ii*) Details of exists including provisions of ramps etc., for hospital and special risks.

(*iii*) Location of generators, transformers and switch gear room, details of fire alarm system, network.

(*iv*) Smoke exhaust system, if any.

(*v*) Location of static water storage including its capacity, pump room and connection details.

(*vi*) Location and details of fixed fire protection installations such as sprinklers, wet risers, hosereels, drenchers etc. and

(*vii*) Location and details of fire aid fire-fighting equipments and installations.

1.5 BUILDING PROJECT REPORT

The most important part of buildings design and drawing is the preparation of project report for construction of any building. The basic idea of this report is to give each and every detail regarding that building like typical floor plans, sections giving all details service plan showing water supply and sanitary fittings; foundation plan; structural plan etc. As far as architects point of view, few more drawings are required to be incorporated in the project report. These are working drawing details, perspective drawing and axnometric drawing. A set of all these drawings is called a project report of that building. It is always desirable that this project report must be accompanied by estimate and materials requirement to assist site engineer during execution of construction. Following drawings are included in a project report:

1. Layout plan showing different buildings, internal roads; compound wall; entrance gates; garden; electric and telephone poles; trees etc., and generally drawn to a scale of 1:500 or 1:1000 or so.
2. Plan of various floors/typical floor plan; showing all the items at various floors; their dimensions; passages, staircase etc to a scale of 1:50 or 1:100.
3. Elevation front elevation, side elevation, rear elevation to a scale of 1:50 or 1:100.

4. Sections—giving almost all the details passing through staircase, toilet block; lift etc. If all the details are not possible to be shown in one section; more sections are drawn. All vertical dimemions are given. This is drawn generally to scale of 1:50 or 1:100.
5. Layout plan showing details of water supply and sanitary arrangement, position of man- holes, inspection chamber, air valves, meter position; main pipe etc., to a suitable scale.
6. Foundation plan — showing size of pit to be excavation, footing size, depth. Centre to centre spacing of columns, joints of walls, check-lines etc., to a scale of 1:50 or 1:100.
7. Structural plan and details if any, type of slab: column, beam, reinforcement details, schedule of reinfacement etc., bar bending bentup bars; hooks etc., to a suitable scale.
8. Perspective view of building to give an idea about its look after the construction is over.
9. Working drawings — showing details of doors, windows, staircase, steel grills etc. This helps to carpenter, welder to prepare windows, grills etc., this also helps in interior decoration. This is drawn to a suitable scale of 1:10 to 1:20.
10. Axnometric view to show internal details of the building furniture placement etc.
11. Furniture position — their circulation etc., details are drawn.
12. Notes — General notes regarding construction material, quality of construction must be given, other details required are room schedule, construction schedule, room finishes, door windows and other opening schedule etc.

Other details required to be shown on drawings are:

1. North direction *i.e.*, orientation
2. Permissible built up area at ground floor and actual built up area at ground floor
3. Permissible FAR/FSI and proposed FAR/FSI
4. Owner of the land/building
5. Name of architect/engineer/structural consultant/supervisor etc.
6. Location of site *i.e.*, survey number of that land ------- town planning clearance date and place:district etc.

The usual procedure of preparing a project report consists of:

1. Visiting the site; collecting site plans; survey number of the area and plot, surrounding details etc.
2. Visiting a few buildings of that nature, having a look of each and every element of those building; collecting informations regarding utility of each and data regarding size and function and their circulation.
   Based on these: a list of various rooms and halls required for that building is prepared and size of each is decided.
3. Based on data collection above the rough planning of that building is made considering building bye-laws regarding open spaces around a building, permissible FSI/FAR and permissible built-up area at ground floor.
   Number of stories are also decided as per total accommodation required; plot size ground permissible coverage and FSI/FAR.
   Various alternative plans are drawn and one best suited to the site and owner taking owner view into consideration is selected.

4. This selected plan is then developed to a suitable scale and shown to owner for his comments, if any. Once this plan is approved by the owners, other various drawings like plan, elevation, section, layout plan, perspective etc., are drawn.
5. The sizes of structural elements are decided on thumb rule, if actual design is not possible at this level. The various thumb rules can be used are:-

(*a*) Size of footing in sq. m. ($l \times b$) of a column $\dfrac{\text{Load on that column in KN}}{\text{Safe bearing capacities of soil in KN/m}^2}$

∴ The length and breadth of column footing is generally taken three times of its lateral dimensions. *viz.* if a column is of size 20×30 cm^2 than size of footing will be approximately 60 cm × 90 cm and rests on plain cement concrete projected 15 cm on all four sides beyond footing.

(*b*) The width of beam is taken equal to that of column size but in no case less than 20 cm

The depth of beam $= \dfrac{\text{Span in meter}}{12}$

(*c*) The thickness of roof/floor slab is taken $\dfrac{1}{30} \times$ span in cm but in no case it should be less than 8 cm.

(*d*) The size of column in sq cm is taken equal to load on that column in N divided by 600.

These dimensions are used for drawing plan, elevation and section, otherwise in general structural designs are required to be made.

6. The approximate cost of construction is taken by plinth area rate in market.

Therefore, cost of Building = Plinth area × plinth area rate in market for such building in that vicinity.

7. In the last, a project report is made in corporating these details and drawings attached. 4 to 6 sets of project reports are required to be made.

Distribution of land for colony development

This, however, depends on class of municipal council, a tentative distribution is given below:

Total area if 100% then it is distributed as

Plots	—	50%
Roads	—	20%
Open space	—	10%
Amenities	—	20%

1.6 LINES

Lettering and dimensioning

The importance and beauty of showings much more depend upon its expression *i.e.* how the drawings are expressed, what type of lines and their thickness have been used, methodology of writing letters and more over their dimensiones. A beautiful drawing using poor or ugly letter may product bad expression.

Various types of lines used in general and civil engineering in particular are shown in table 1.2.

Table 1.2. Types of Lines and Section Line

Sr.No.	*Uses*	*Illustration*	*Description*
1.	Outline of Paris	THICK	The outline to be outstanding in the drawing
2.	Dimension, Extension, Construction and Hatching Lines	THIN	For hatching, lines to be spaced evenly to make a shaded effect
3.	Hidden Lines	MEDIUM	Short dashes, closely and evenly spaced
4.	Centre and Locus Lines	THIN	Alternate long and short dashes in a proportion ranging from 6 : 1 to 4 : 1 closely and evenly spaced in anyone drawing; the ratio selected should be maintained
5.	Cutting Plane Lines	THICK	One long and two short dashes alternately and evenly spaced
6.	Break Lines for Short Break	THICK	Free hand lines
7.	Break Lines for Long Breaks	THIN	Rules lines and free hand zigzags

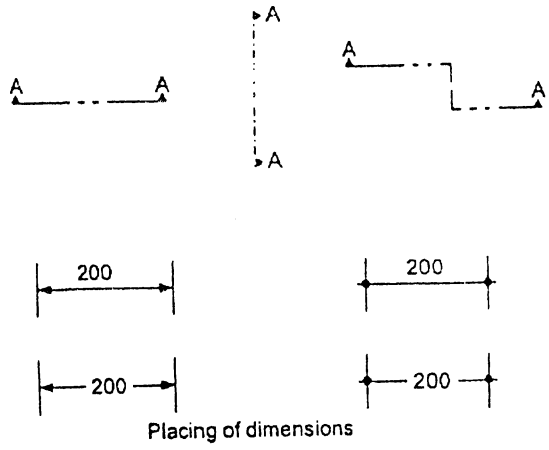

Fig. 1.1. Placing or Dimensions

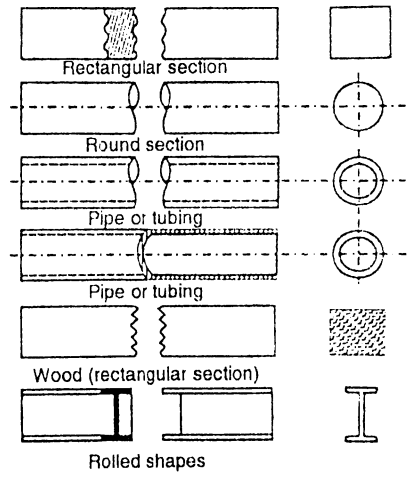

Fig. 1.2. Conventional Breaks

Lines drawn to represent visible edges and surface boundaries are called outlines or principal lines. These are continuous lines. Interior and hidden edges, lines or surface or parts that are not visible but if required to be represented or expressed are shown by dotted lines. Thin lines are used to show dimensions and are drawn on outside the figure whenever possible. These are also called extension lines. The dimension lines are terminated at the outer ends either by a point or pointed arrow heads touching the outline or extension line. These are extended by about 3 mm beyond the dimension lines.

Writing of titles dimensions, notes and other important particulars and details on a drawing is called 'Lettering'. It is an important part of a drawings and makes drawings either beautiful or ugly. Lettering therefore should be done properly in clear legible and uniform style. It should be in plain and simple style so that it could be done freehand and speedily. Use of drawing

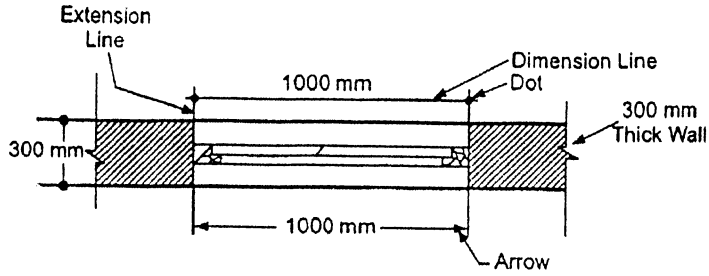

Fig. 1.3. Methods of Dimension Horizontal Section through Window

instruments for lettering takes considerable time. Efficiency in the art of lettering can be achieved by regular practice.

According to ISI; both vertical and inclined type of letters and numerals are suitable for general use. All letters should be capital, except where lower case letters are accepted in international uses. Letters and numerals are designated by their height. For drawing main title and drawing number 6, 8, 10 and 12 mm height letters are generally used. Sub-titles and headings are written with 3, 4, 5 and 6 mm size of letters. The notes, schedule materials and dimensions are written by 2, 3, 4 and 5 mm height letter. Figures shows single stroke vertical and inclined capital letters and numerals, for inclined letters in an inclination of 75 degree is recommended.

All letters should be uniform, in shape, slope, size, shade and spacing. For maintaning uniformity in size thin and light guide lines may be drawn first and lettering may be done between these guide lines. The spacing should be such that they should not, appear too close or too much apart.

ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890 CONDENSED
1234567890
ABCDEFGHIJKLMNOPQRSTUWXYZ
1 2 3 4 5 6 7 8 9 0 EXTENDED
a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
ABCDEFGHIJKLMNOPQRSTUVWXYZ ITALIC
1 2 3 4 5 6 7 8 9 0 *1 2 3 4 5 6 7 8 9 0*
Sizes for letters and numerals for drawing.
2mm to be used only toleranced dimensions

Table 1.3

Sr. No.	*Purpose*	*Size of letters and numbers*
1	Main title and drawing no.	6, 8, 10 and 12
2	Sub-titles or headings	3, 4, 5 and 6
3	Notes such as legends, schedules, materials and dimension	2, 3, 4 and 5

Dimensioning

Dimensioning has an important role in civil engineering drawing. Every figure drawn must show its size which is indicated by its length; breadth, height, thickness, size etc. Representation

of these informations on the drawing is called as dimensioning. Dimension line and extension line used to denote measurement have been illustrated in figure and Tabular form above.

'LEADERS' or pointer lines are thin, straight lines terminated by arrow heads or dots and are drawn for notes and figures. These are drawn at any convenient angle usually 30°, 45° or 60°. These are never drawn horizontal or vertical or curved. Use of long leaders should be avoided. If space is not sufficient to draw arrow heads from inside, can be placed from outside also. If the space is insufficient to give dimension, it may written above the extended dimension line. Leaders are illustrated in Fig. 1.4 to Fig. 1.5.

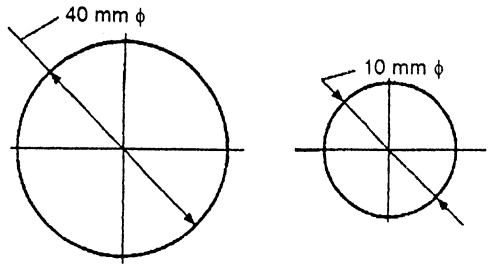

Fig. 1.4.

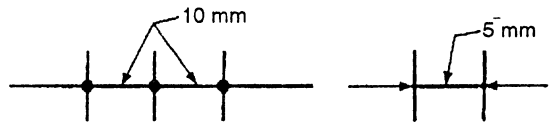

Fig. 1.5.

Dimensioning should be done completely so as to avoid un-necessary calculations, assumptions and direct measurements from the drawing. As far as possible dimensions should be placed outside the drawing and only at relevant positions. These should not be further repeated. These must not cross each other as otherwise lines create confusion. Dimensioning between dotted or dashed lines should be avoided.

These should be drawn clearly easily readable. Arrow heads used should be pointed and filled. It should be about 3 mm long and its maximum width should be about 1/3 of its length. The spaces of arrow heads should be filled. Dimension figures are usually placed perpendicular to dimension lines and in such a manner that they can be read from bottom or right hand edge of the drawing sheet. They should be placed near the middle and above, but clear of the dimension line.

1.7 TRACING AND PRINTS

The drawings prepared on drawing sheet are required to be produced in many number. Their several copies are required either for submission to the appropriate authorities or to the supervisor at site for construction. In order to get several copies, tracings are drawn from drawing sheets either on tracing cloth or tracing paper from which Ammonia prints or blue prints are developed. Present practice is to draw drawing on tracing paper directly using black pencil and once they are finalised, their prints are developed. For linking the tracing paper or tracing cloth. Wrecto graph, *i.e.*, grapho pen or crew quill and water proofing pen is used to draw these drawings and lettering, tracing paper or tracing cloth must be opaque and distinct to have legible copies or prints.

"Blue-print" is obtained by using ferrorpapr *i.e.*, obtained by dipping ordinary paper in a solution of ferric ammonium citrate and potassium ferricyanide. The blue colour is mainly due to potassium ferricyanide. After applying this solution, the paper is dried in the dark. For taking out blue point, the tracing cloth or tracing paper is kept in blue printing frame and ferrow paper over it. It is then exposed to either sunlight or other equally powerful artificial light. The light

thus passes through blank portion of the line work and lettering. This is then dipped in water and dried and blue prints having white line and lettering developes. This method of developing print is costly and hence used only be limited organisation. The use of "Ammonia prints" being convenient and economical are developed. In this, the original paper is coated on one side with light sensitive diazo chemicals. The sensitive paper is put in contact with the tracing paper in machines and is then exposed to light for a controlled amount of time. This exposed paper is then fed into a dry-developer *i.e.*, ammonia vapours which turn the background of the print white and the lines become blue or black or sepia as per the chemical used. Only this sort of prints are used now-a-days.

Now-a-days computerised plotters are used to draw the drawings. These plotters are available of various sizes and large drawings can be produced through these plotters. In due course of time blue prints/Ammonia prints though are very common to day, are likely to become obsolete in future.

1.8 USE OF COMPUTER IN BUILDING PLANNING

The old traditional system of drawing board; Tee, sets square etc., is becoming obsolete slowly due to introduction of computer in building planning. Use of computer for working drawings has become very popular in last one decade. Big size plotters are available which are attached to computers and once the instructions are fed to computer, it plots all the drawings on plotter. AutoCAD is a complete teaching guide used to computer Aided Drafting and Design Programme.

When one drafts directly at his drafting table; he uses pencil, paper, eraser etc. But when one drafts with AutoCAD, the programme acts as an intermediatery between hand and the finished hard copy drawing. Therefore, as an intermediatery ; AutoCAD will not slow down your speed of drawings, contarary it will act as a super-charger for elbow. Moreover, the impression of drawing will be uniform throughout. The stencils for writing notes will not be required, AutoCAD will do all this job.

Various software available for civil works are

Auto CAD — is Auto computer Aided Designs

CADD — Computer Aided Architectural Design

CADD — Computer Aided Design and Drafting

Auto Civil — This is the most comprehensive civil enginering software and can be used for surveying, contouring terminal modelling, roads, canals, sewers etc.

STAAD — III for Structural Analysis and Design of RCC and Steel Structures

Build Master — for Building, design, drawing and estimation

Draft-Aid — for preparing structural drawings for steel trusses steel columns, etc

Steel Master — for steel structures

Many other firms and software engineers have developed their own software used for works civil engineering works. Most of these softwares work on Finite Element Analysis. However users are required to have the knowledge of FEA. Almost all these softwares are friendly user software and after getting some training can be used easily.

The AutoCAD programme knows a lot about drawing. It knows how to draw straight line, right angle etc. It also knows how to insert standard symbols for details etc. One, therefore, should be aware of use of AutoCAD. Now-a-day various softwares also available are used for

Civil Engineering drawing works. However, this itself is one subject and beyond the scope of this book, hence not dealt much. Only it is emphasised with this clause that now-a-day use of computer has become very common and students must know its importance.

Loan Sanctioning Bodies — Whenever a building is planned and constructed, and the owner always like to have loan for its construction. He gets many benefits because of loan depending upon type of construction, cost of construction, purposes etc. Even businessman constructs his/her premise by taking a loan from some financing company.

Though this article can not be a part of building planning, however a list of financing bodies is given here for the sake of knowkledge to a person intending to construct a building either residential or commercial. Each finacing body have their own rules and regulations, interest rate etc. A person willing to have loan must go into details of each financing body before a final decision is made. Many bodies have hidden charges that they do not disclose and later on the borrower comes into trouble or unnecessary harasment and mental torture.

1. Almost all Nationalised:Scheduled and Co-operative banks.
2. Private Banks like ICICI, IDBI, UTI etc.
3. Housing and Urban Development Corporation (HUDCO)
4. Co-oprative Housing Finance Corporation
5. Life Insurance Corporation
6. Housing Boards
7. Centre and State government — through Provident fund
8. Private financing Bodies like Dewan Housing Development Corporation Ltd.
9. Housing Development financial corporation (HDFC)
10. Maharashtra Housing and Area Development Authorities (MHADA)
11. Co-operative Societies.

1.9 REALTORS AND DEVELOPERS

Realtors called as real estate agents or real estate brokers or real estate expeditors are middle men in property transaction of real estate properties. A real estate broker is a term that describes a party or an organisation who act as an intermediatery between seller and buyer of real estate or real property and attempts to find seller who wish to sell and buyers who wish to buy. Estate agent is a person or organisation whose business is to market real estate on behalf of client. The actions and liabilities of broker and estate agents however vary in each country. Realtors do not have a direct economic interest in the property, however they get a fixed percentage commission from either or both the partices involved *i.e.*, seller and buyer by consummating a transfer of ownership. They in general recommend a fair market price to buyer and seller. They study the property under consideration in details, find its condition, location, life, review its previous records and also study market price of similar property in the same vicinity had been sold earlier and then decide the fair market value of that property. Realtors may have been appointed either by buyer or seller, however he does juistice with both the parties. Only licence realtors have right to collect commission else it is illegal. Many a times lawyer or councillors are authorised to work as mediator i.e. realtor to complete all these formalities of transaction.

Real estate development is a multifaceted business, encompassing activities that range from the renovation and re-lease of existing building or to purchase a raw / bare land, improve it or

develop it and then the sale of improved or developed parcel to others. Developers are the coordinators of the activites, converting ideas on paper into real property. They purchase or acquire a piece of land, prepare plans for proposed use of the property, seek permission from appropriate authorities for its development and once all formalities are made develop it and put into the market for sale. They create, imagine develop/invest fund, control and orchestrate the process of development from the begining to end. They take the risk in creation or renovation of real estate and receive the greatest rewards. Developers work with many different counterparts at each step of the process like architects, city planners, engineers, surveyors inspectors, contractors, leasing agents and so on. They are required to develolp property as per town and country planning act. Developers are required to take financial risk and to invest considerable amount and time before they start getting return for their investment and efforts made. They either themselves or through real estate brokers in part or full put the property into market to get return of investement made. It is essential to developer to complete the project honestly in reasonable time schedule else various problems are likely to arise.

No matter, how talented an individual, development is a team effort. A development team can be put together in one of several ways. At one extreme, a large company might include many services from architecture to engineering. At the other end of spectrum, a development company might consist of one main person and a few staff hired or contracted with other companies and professional services of many persons / companies is needed. Assembling a team of professionals to address the environmental economic, physical and political issues inherent in a complex development project is critical. A developers success therefore depends on the ability to coordinate the completion of a series of interrelated activities efficiently and at the appropriate time.

The development process requires skills of many professionals: architects, landscape architects, and site planners to address project design; market consultants to determine demand and a project's economics; attorneys to handle agreements and government approvals; environmental consultants and soil engineers to analyze a site's physical limitations and environmental impacts; surveyors and title companies to provide legal descriptions of a property; and lenders to provide financing.

Land development. Purchasing unused land for a potential development is sometimes called **speculative development.**

Subdivision of land is the principal mechanism by which communities are developed. Technically, subdivision describes the legal and physical steps a developer must take to convert raw land into developed land. Subdivision is a vital part of a community's growth, determining its appearance, the mix of its land uses, and its infrastructure, including roads, drainage systems, water, sewerage, and public utilites.

In general, land development is the riskiest but most profitable technique as it is so dependent on the public sector for approvals and infrastructure and becasue it involves a long investment period with no positive cash flow.

After subdivision is complete, the developer usually markets the land to a home builder or other end user, for such uses as a warehouse or shopping center. In any case, use of spatial intelligence tools mitigate the risk of these developers by modelling the population trends and demographic make-up of sort of customers a home builder or retailer would like to have surrounding their new locations.