

Aam Aadmi Series - 6

HOUSE BUILDING DIGEST

(Doors and Windows)



bmtpc

Creating Enabling Environment for Affordable Housing for All

This is an attempt by BMTPC to provide useful but often ignored information about multifarious activities involved in house construction and other technical and non-technical matters associated with building materials and construction technologies. The series is being brought out with a specific rationale to reach out to common people of our nation and make them acquainted about building construction. Every individual has a dream of owning a house and through this series which is aptly named Aam Adami Series, we will slowly unravel myths and misconceptions about building construction. The language used here is lucid and simple to comprehend. The complicated technicalities are explained in a parlance which can be understood by one and all.



Doors and Windows

Doors and windows are the two most important elements of a house, whether from security considerations, functional considerations or from consideration of aesthetics etc.

Finding a quality door can be difficult, but it's an exercise requiring quite a bit of effort. The right door will provide design focus, beauty, and appropriate security to the home, but a wrong door can prove to be troublesome or uneconomical in the long run. The type of door to be provided in the house requires attention and accordingly, professionals' help should be taken.



1. Main Elements

The main elements of Doors/Windows are frame, shutter and fittings. The frame is usually made of timber due to its easy availability and that it can be made into any shape. The frames are fixed into the walls by 'holdfasts', which are concrete block with iron clips or steel running through them.

The shutter is the main door/window element which can be made in a number of ways. The shutter is fixed to the frame through hinges to facilitate easy mobility of the door/window.

Fittings like sliding bolts, tower bolts, locks, door stoppers/stays, handles are fixed into the shutter for the purpose of opening and closing/locking.

At present, there are a large number of alternatives to wood available for making doors and windows. These include metal doors, PVC doors, ferrocement doors, doors from agricultural and industrial wastes such as red mud, jute and bamboo etc.





2. Types of Door/Window

Doors can be classified in a number of ways. For example, single leaf door, double leaf door (Fig. 1), sliding doors, swing doors, revolving doors etc. Another way of classification can be batten and ledged doors, paneled doors, flush door etc (Fig. 2). Classification can also be done on the basis of the material used for its manufacture, say wooden door, steel door, aluminum door, PVC door, glass door, FRP door, ferrocement door etc.

Windows can be classified in a number of ways say, fixed windows, pivoted windows, sliding windows, double hung windows etc. Normally, windows are glazed in order to allow the entry of sufficient light.

Sizes

The size of the door in the house is closely related to its location. For example the main entry door has to be of maximum size to enable easy entry of all household goods. The doors within the house can be relatively smaller in size as their primary function is to provide connectivity between the rooms. Similarly, the doors of bath/WC/toilets can be still smaller in size as only one individual is expected to use it at a time.

Typically, the heights of all the door is kept as 2.10 m and the width of the main door is kept as 1.00 m, inner door as 0.9 m and that for bath/WC/toilets as 0.9 m

The sizes of the windows should be such that there is adequate light and ventilation in the rooms. Usually, the window sill is kept between 0.75 m to 1.00 m above the floor level. The window sills should be higher for rooms where privacy is required (for toilets, bath, WC etc). The top of the window should preferably be at the same level as that of the door.





3. Frames

Traditionally frames for doors/windows have been made in wood. Frames have two main elements, two vertical members along the walls, usually called jambs and one horizontal member at the top, usually called the head. The intersection of the members has to be made properly in order to provide rigidity to the frame.

Sizes

For a wooden frame where only one door is to be fixed, its size can be 10 cm x 6 cm. However, where 2 doors are to be fixed in one frame the size can be kept as 12.5 x 6 cm. Typically, a niche is made all along the vertical and horizontal members of the frame to accommodate the door shutter.

Door frames can also be made out of steel (angle or T-sections), aluminum, precast cement concrete, ferrocement etc., which will have different sizes.

Frames for windows can also be made as for the doors except that their sizes are comparatively smaller. For pivoted door/window shutters no frames are required.

4. Shutters

Shutters for doors can be in single leaf (where only one shutter covers the door opening) or double leaf (where two shutter leaves cover the door opening, with each leaf hinged to each of the two vertical members of the frame). Shutters can also be made as folding (where individual shutters are hinged to each other and ultimately hinged to the frame on one side only).

Wooden door shutters can be made in a variety of ways and are best known by their mode of manufacture. These include the batten and ledged, paneled, paneled and glazed, flush etc.





Parts of Shutter

Shutters have a frame having vertical members called stiles horizontal members called rails. Thus for a single shutter door there will be a frame consisting of two stiles and three rails, one each at the top and bottom and one in the middle called the lock rail.

Shutter frame can be in-filled with panels or panel and glazing etc as per the requirements and design.

Size

The size of the wooden door shutter frame can typically be kept as 5 cm x 7 cm and the thickness of the panels can be kept as 1.5 cm.

Similarly the size of the wooden window frame can typically be kept as 3.5x7.5 cm with glass or other panels in between.

The sizes of the shutters made out of aluminum or other metals etc will vary as per the actual design.

Beading has to be provided all along the junction of door/window shutter frame and the infill panels in order to provide rigidity.

5. Fixing

Doors and Windows can be fixed in a number of ways depending upon the material used for their manufacture. In any case, the frame is first fixed into the wall and the shutter is subsequently fitted after the finishing works have nearly been completed in the house.

However, in case of wooden doors/windows to be fixed to a masonry wall, the following procedure is normally adopted.

The sides of the frame are initially given an anti termite treatment and a coat of primer/coaltar is applied on all surfaces which are to come in contact with the walls.





The frame is then placed in proper position, in the middle portion of the masonry wall, with the help of hold fasts. The steel hold fasts run into the frame and project outwards into the masonry wall. The projected portion is embedded in concrete, thereby fixing it into the masonry wall.

Normally three holdfasts are provided in each of the vertical members of the door frames. It would be a good practice to secure the jambs at the floor level by means of dowels. In case of normal windows only two holdfasts may be sufficient.

Before fixing the shutter a primer coat has to be applied on the entire surface and dried. The shutters are subsequently hinged to the frame with the help of screws to complete the fixing process.

Typical details of single and double leaf doors and glazed window are given in Figures 3, 4, 5 & 6.

6. Varieties of Doors/Windows

There are a large varieties of doors and windows which can either be manufactured or are available in the market for ready fixing. Based on the material of manufacture, some of their types along with their main feature, advantages and disadvantages are given here to facilitate easy selection for the house owner.

Timber/Wood

Traditionally, timber or wood as it is popularly known has been the mainstay for the manufacture of doors/windows. Its main advantage has been local availability of material and the ease with which it can be made by the local carpenters.

Presently large varieties of wood are available in the market and its selection should be made based on the properties of longevity and the budget of the house owner. Although they can be used for all locations in the house, they are best placed for exterior locations. Timber is most commonly being used for making of doors/windows.





Battened and Lugged

Battened and lugged doors are the simplest form of doors and are in use since ages. Such doors consist of vertical wooden battens of the height of the door with about 35 mm thickness which are usually tongue and groove jointed. Usually three luges (horizontal members) are provided, one each at the top and bottom and one in the middle.



Battened and lugged doors can also be either braced or braced and framed to provide rigidity and better appearance.

Such doors are commonly adopted for toilets, baths, WC etc and also in houses where economy is of prime consideration.

Framed and Paneled

These types of doors and windows are most commonly provided in the houses. The frame for the door is made out of wood and the shutter panels out of timber, plywood, block board, hard board, etc. A number of designs can be made on the panels, thereby making such door quite decorative.

The panels can also be made out of glass. In cases where part of the door is in wooden panels and the remaining is of glass panels, the door is known as paneled and glazed.



Such doors have a flexibility of design which can look aesthetically pleasing.





The design can be made according to the requirement and location in the house.

The door frame for such types of doors can be made out of wood itself or of metal sections like steel etc.

Flush

A flush door is a completely smooth door, having plywood or Medium Density Fiberboard fixed over timber frame which is comparatively light. The hollow core so obtained is often filled with a cardboard core material.

Flush doors are most commonly employed in the interior of a dwelling, although with some variations they are also used as exterior doors in houses.

The frames for such doors can be made out of wood, steel etc, which can hold its weight. The doors are usually hinged along one side to allow the door to open in one direction only.

Flush doors are commonly provided in houses these days due to the reasons of economy, pleasing appearance, durability etc and are commonly available in the market.

While providing these doors for toilets, baths and WC, the inner face of the door should be covered with aluminum sheets to provide protection against water.



Frames for such doors/windows can be made in any of the traditional manner.

Glass

Glass is usually provided for doors and windows, mostly for paneling. However if the owner so desires, doors can be made out of glass for specific locations. Normally such doors are provided on the backside





of the house as it provides unobstructed view of the backyard or garden.

Front doors made of glass are equally beautiful, but care should be taken to ensure both privacy and durability. Cut glass panels set into wooden frames are a frequent and beautiful option for front doors. Such doors are costly and require good maintenance.

They are usually heavier than other doors besides being costly.

Steel

Steel or other such metal construction has been used for years as they are efficient and are a sturdy option for exterior and interior doors alike. These doors can be either be solid or hollow.

It has been found to be a good substitute for wood and is being used extensively for making frames. The frames can be made out of angles, Tee, channels or pressed steel plates. Holdfasts and hinges are normally welded to the frame in case of steel frames.

Normal shutters made out of wood etc can be fixed on these steel frames.

Steel frames are quite popular and are being used extensively for houses and other locations as they are economical than the conventional wooden frames.

Shutters can also be made out of Mild Steel (MS) sheets, welded or riveted to a frame of angle iron or channel section, properly braced.

Steel doors can also be made in high quality in cold rolled mild steel, precision engineered. They are long lasting requiring minimum maintenance. They are available in beautiful shades with various wood grain texturing

These can invariably be used where security is of a greater concern.





PVC

PVC is a common term for the product called PolyVinyl Chloride. It is basically a plastic material commonly used for making various products including water tanks, pipes, fittings etc for houses. The use of PVC for the manufacture of doors has become very popular and a large variety of the same are available in the market in different colours and designs.

The advantages of using PVC doors are that they are termite proof, durable, anti corrosive, light weight, moisture resistant etc. They are also easy to fabricate and install.

However they are not suited for entry doors as they are very light in weight, not weather proof like wooden or metal doors, also they cannot resist the harsh environmental conditions.



Such doors are available in the market and can prove to be economical when compared with wooden doors.

Nowadays windows are also being made out of PVC products and are available in the market.

Fiberglass

Fiberglass is a glass which is drawn into fibrous form and woven into cloth. It is strong, light & non-flammable and has a high tensile strength. Glass fibres bonded with resin that can be used to manufacture a range of products including bathtubs, doors and windows etc.

Fiberglass is said to be one of the most hardened materials with relatively low maintenance costs as compared with wood and steel. Fiberglass doors are expected to be stable as they do not warp, bow or twist. They are foam filled and offer good insulation properties. They can also be painted as per design.





Doors and windows made out of fiberglass can be provided with wooden panels on the surface to improve upon the aesthetics. Doors made out of fiberglass can be used for both exterior and interior locations. The exterior doors have designer options such as beveled glass and door stiles.

These doors are available in the market to match any architectural style.

Fiber Reinforced Plastics

Fiber Reinforced Plastics popularly known as FRP is a general term relating to the reinforcement of plastic with fibrous glass. Due to its high strength it can be put to many uses including manufacture of doors. Typically, the tensile strength is about ten times that of PVC. FRP moulded doors are available in many colours and finishes including natural wood finish in the market. The standard door thickness is 30/35 mm and are available with fire retardant properties.



These doors can also have two leaves of 1.5 mm thickness. The leaves are moulded over a core material forming a sandwich panel. Necessary wooden supports are provided for fixing the handles, locks, stoppers and other accessories. FRP doors are in good demand these days for use in modern houses.

Aluminum

Aluminum is a metal which has been put to a large number of uses due to being light in weight. A large number of products made out of aluminum are available in the market including doors, windows, partitions, curtain walls etc.





Aluminum frames for doors and windows have the distinct advantage of resisting difficult environmental conditions. Being light in weight they transfer less loads to the foundations. Aluminum frames are not affected by termites and as such they are longer lasting.

Doors and windows made out of aluminum can be side hung or sliding and are suitable for exterior or interior locations. Aesthetically they are quite pleasing and are quite economical in the long run.

Bamboo-Jute Composite

Bamboo is one of the fastest renewable plant with a maturity cycle of 3-4 years, making it a good natural resource compared to forest hardwoods. Bamboo offers good potential for processing it into composites as a wood substitute. Bamboo laminates could replace timber in many applications including for doors & windows and their frames etc.

One of the alternatives to wood product is the jute-coir composite board which can be utilized for the manufacture of doors. Natural hard fibres such as coir and jute impregnated with phenolic resins can be used for manufacturing these boards. Bamboo-jute composite doors have the advantage of being water resistant, corrosion resistant, termite resistant, eco-friendly, bio-degradable and cost effective.

Such doors are being manufactured by a number of entrepreneurs and can be easily adopted as a substitute for wooden or other type of doors in the house.

7. Hardware for Doors and Windows

Hardware for doors and windows are as important as the door/window. Hardware normally includes the bolts, knobs, handles, locks etc. These can be made in iron, steel, aluminum etc and can be coated to give elegant looks.

The details of the hardware will be dealt in a subsequent digest.





8. Selection of Doors and Windows

Appropriate selection of the right type of doors and windows for the house would greatly enhance its overall looks and appearance. Doors and windows have to be sturdy, long lasting and having a good aesthetic appeal. The task of selection becomes difficult as there are many types and varieties of doors and windows available in the market.

There are several factors to be considered before finalizing the option for their adoption in the house.

Factors for Consideration

There are many factors which influence the type of doors/windows to be provided. These include the climatic conditions, function and location, type of material, architectural design etc.

In areas closer to the sea it would be advisable to use a material which is not affected by corrosion and accordingly, steel frames and shutters would not be a good option. Similarly, in extreme climatic conditions (either hot or cold) the sizes of the doors and windows should be such that there is least effect of the external environment to that within the house. In a moderate climate the extent of sunlight coming into the house has to be considered and accordingly the area for glazing has to be decided.

Doors should be picked out according to the function they are expected to perform. For example, a front door and a back door may have two totally different sets of requirements, and they are different from interior doors. Exterior doors should always be of a sturdy material and should have secure fastenings. Interior doors, on the other hand, should be light enough for all family members to handle easily.

Careful consideration has to be given to the type of material to be used, many of which have been indicated in this booklet. Good materials include heavy wood, steel, glass, or fiberglass construction, which will serve well for many years.





The final step would be to choose the design including colour scheme of the door/window, the liking and taste of which varies from individual to individual.

9. Conclusion

From the forgoing it is evident that doors and windows are amongst the key element in the house. Their shapes, sizes and styles have a considerable influence on the appearance of the house.

At present large varieties of doors and windows are readily available in the market to choose from. Accordingly, the home owners should go through the magazines which are available on the subject. The details of the manufacturers in different cities are on their websites. The matter should also be discussed with the Architect who would be able to give suggestions and advice.

The final decision rests with the home owner which depends amongst other things on the available budget for the construction of the house. It should also be kept in mind that the overall costs of the doors and windows may be about 15% or more of the Civil construction cost of the house.





Fig. 1 :

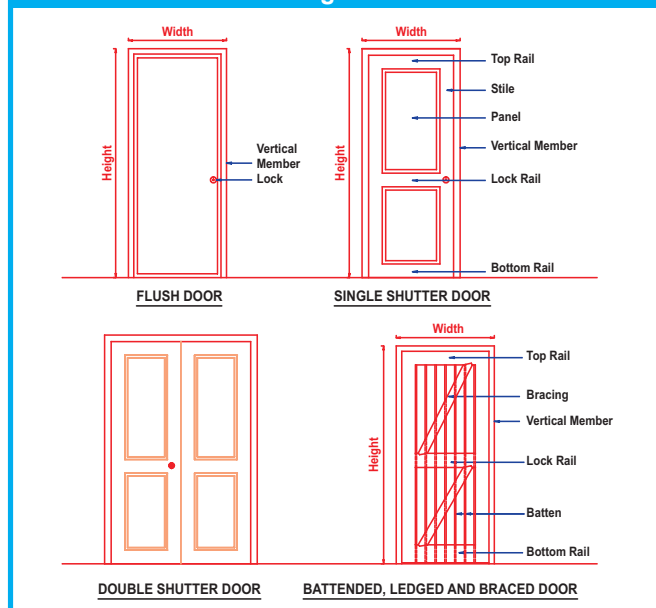


Fig. 2 : Details of Different Types Doors



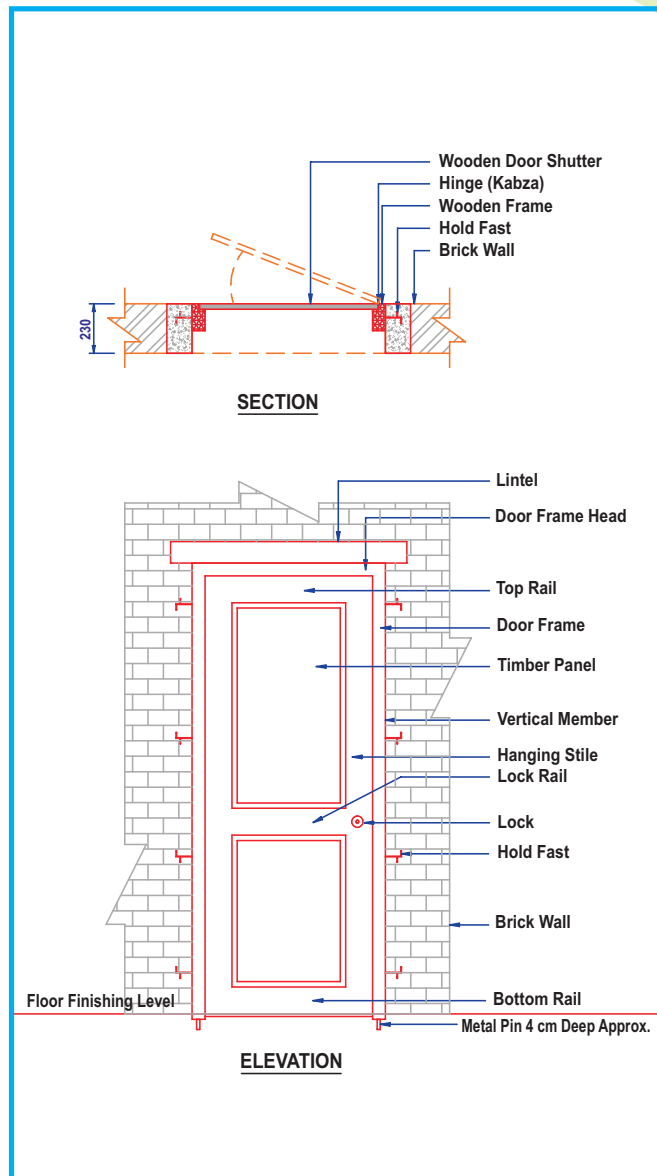


Fig. 3 : Typical Details of Single Shutter Wooden Door



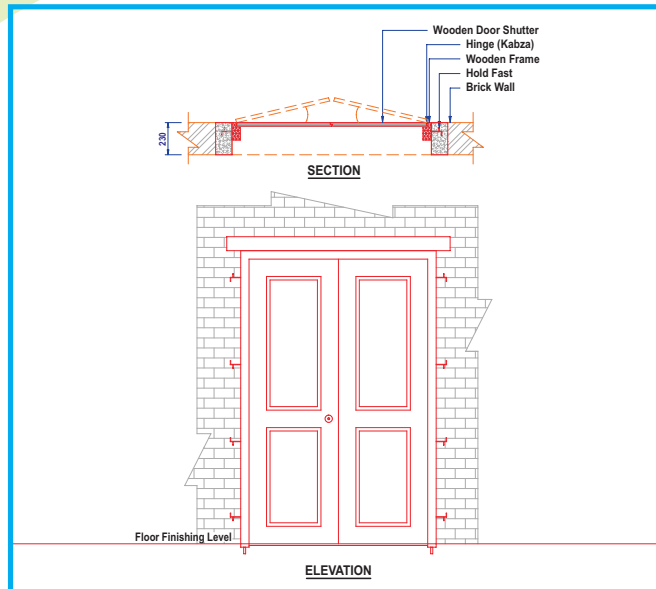


Fig. 4 : Typical Detail of Double Shutter Wooden Door

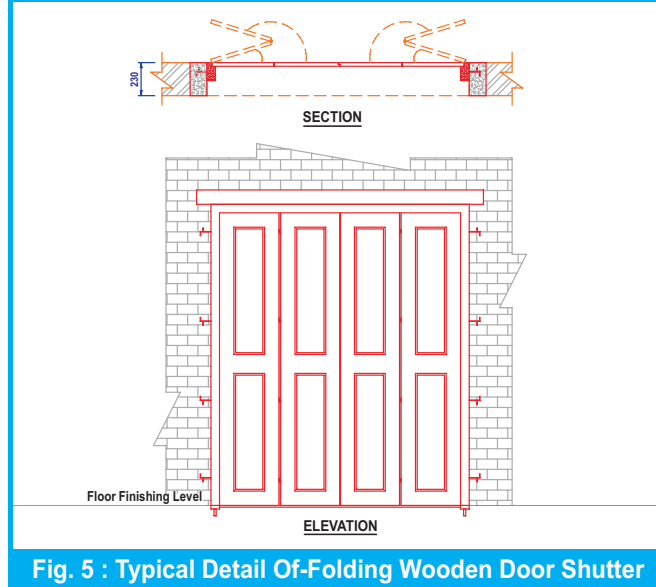


Fig. 5 : Typical Detail Of-folding Wooden Door Shutter



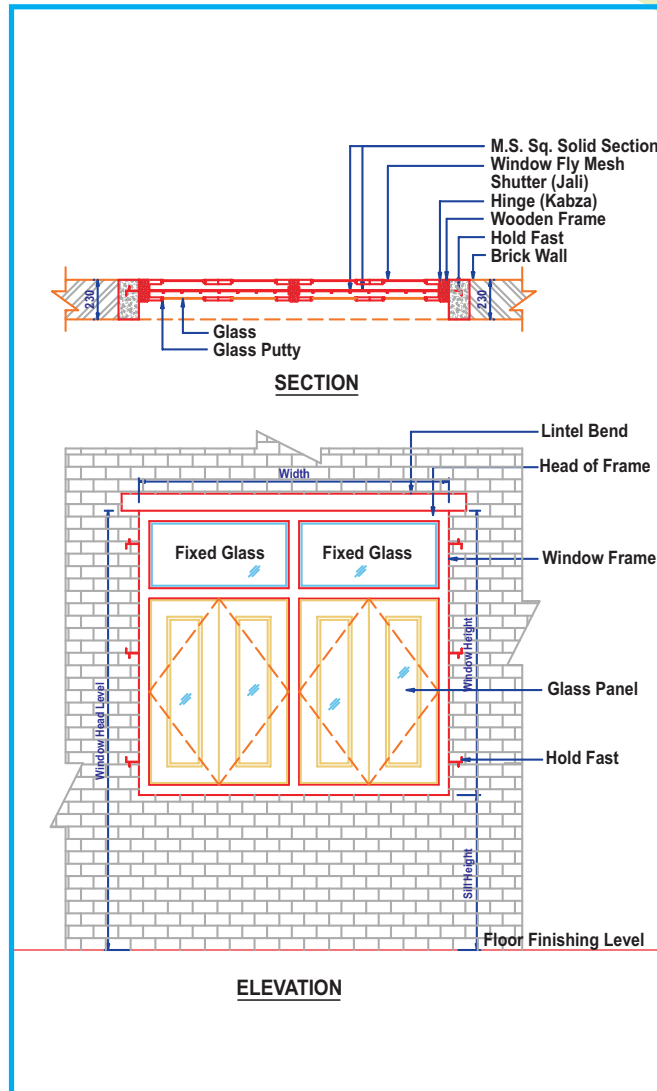


Fig. 6 : Typical Glazed Window Detail

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BMTPC

The Building Materials & Technology Promotion Council (BMTPC) was setup in 1990 as an inter ministerial organisation under the Ministry of Housing and Urban Poverty Alleviation to bridge the gap between the laboratory research and field level application.

VISION

BMTPC to be world class knowledge and demonstration hub for providing solutions to all with special focus on common man in the area of sustainable building materials, appropriate construction technologies & systems including disaster resistant construction.

MISSION

To work towards a comprehensive and integrated approach for promotion and transfer of potential, cost effective, environment-friendly, disaster resistant building materials and technologies including locally available building materials from lab to land for sustainable development of housing.

For your queries please contact :-
Executive Director



Building Materials and Technology Promotion Council (BMTPC)

Ministry of Housing and Urban poverty Alleviation, Government of India
Core 5A, First Floor, India Habitat Centre,
Lodhi Road, New Delhi 110 003
Tel: +91-11-24638096 Fax: +91-11-24642849
E-mail: bmtpc@del2.vsnl.net.in
Website: www.bmtpc.org