



BUILDING RESEARCH NOTE

B.R.N. 11

ECONOMICAL DOOR AND WINDOW FIXTURES FOR FRAMELESS SHUTTERS FOR RURAL HOUSES

Introduction

Traditional doors and windows normally have three components i.e., frame/chowkhat, shutters and fixtures. It is seen that cost-wise provision of doors and windows forms about 6% to 7% of total expenditure on the house, out of which only frames (Chawkhat) accounts for 1.5% to 2% of the total cost.

Hence elimination of door and window frames may lead to a substantial saving in cost and also in consumption of timber, which is scarce, specially in very low cost houses for the rural poor.

With this aim in view, Central Building Research Institute (CBRI), Roorkee had developed some new fixtures for frameless shutters about 33 years back. The fixtures were fabricated in the laboratory and were fixed in doors and windows shutters of prototype houses put up in CBRI for assessing its performance. After being satisfied with their initial design and performance, a few of them were adopted in various rural housing schemes prepared by CBRI, in Karimnagar in (1973), in Ghaziabad in (1974) in villages Sunehera and Rohalki (near Roorkee) (1978-79) and (1980), demonstration houses at NBO Exhibition, Ber Sarai, New Delhi (1976) etc., for extensive field trial.

A feed-back study was conducted to assess the performance of these fixtures. The article

describes the design, fabrication and fixing technique of these systems of fixtures, alongwith their economics. Brief discussion on the findings of the feedback study, the comments and user's reaction to fixtures are also included. A few other designs of fixture's developed and tried in the laboratory but not adopted so far in housing schemes have also been briefly mentioned.

New Systems

The new systems of fixtures developed by the Institute and adopted in many low cost housing schemes are of following types :-

- (a) Pivot system,
- (b) Fork system.
- (c) L-Type Hinge system
- (d) Clamp Type Hinge system
- (e) Bolt Hinge system

(a) PIVOT SYSTEM

The system has been named as 'Pivot System' because in it the shutter is supported on top and bottom support and rotates about a vertical axis passing through them.

Components

Fixture under this system consists of two components (a) Pivot (b) Socket. Pivot is fabricated either from angle iron or by welding mild steel flats at right angle to form into a "L"

TABLE 1
Dimension Detail of Pivot System of Hinges

Name of	Ref. to Fig.	Light Door	Heavy Door	Window
Bottom pivot	A	80	80	50
	B	60	75	40
	C	30	30	25
	D	50	50	25
	d	10	18	10
	t	4	4	3
Top pivot	A	30	30	30
	B	60	75	40
	C	30	30	25
	D	50	50	25
	d	10	18	10
	t	4	4	3
Floor Socket	E	50	50	50
	F	80	80	50
	d ₁	12	20	12
	t ₁	6	6	4
Top socket	G	30	30	30
	d ₁	12	20	12

Note :- All Dimensions are in mm.

shape bracket. A mild steel bar is welded to the shorter leg of the pivot as shown in Fig. B-1 & B-2. Required holes for screws are provided in the angle at specified spacings for fixing with the shutter (Fig. B-3). Socket is fabricated by welding a piece of G.I. pipe over a M.S. Square Plate as shown in the Fig. A-1 to A-4. The various dimensions of both the components for light/heavy type of door and window shutters is given in Table-I.

Fixing

The top socket (Fig. A-3) is embedded in the lintel either at the time of casting of lintel or a hole of a slightly bigger dimension than that of socket is left at the time of casting and then the socket is embedded afterwards at the time of fixing of shutter at exact location. Similarly, the bottom socket (Fig. A-1) is embedded in the floor of the pivot is inserted in the respective socket and the pivot which is placed over the shutter in position

is temporarily held by screws. The plumb and the smooth rotation of the shutter is checked. Bottom socket is preferably provided with steel balls for fractionless operation of the shutter.

When correct alignment of the shutter is ensured, the pivots are screwed firmly to the shutters. The fixtures for the door is normally provided at the corner of the shutter, while for the window it may be provided in the centre for single leaf shutter and at the corner double leaf shutter. It is preferable that for fixing frameless door and window shutter's jambs may be rebated either in the masonry itself or in the plaster to cover the gap normally formed in such fixture between the edge of the shutter and the jamb. The pivot hinge should preferably be fixed over the inner face of the shutter to avoid pilferage of fixture. Fig. B-4 and B-5 shows the sectional detail of fixing and elevation of pivot door respectively of the pivot system of fixtures.

TABLE II

Component	Material	Total Length	Fork cum bracing							Material	Total length	Hold Fast						
			a mm	b mm	c mm	d mm	e mm	f mm	g mm			a mm	b mm	c mm	t mm	d mm	e mm	
	Double (U) Clamp	M.S. Flat + M.S. Bar	2a +2f +2t	900	40	50	5	12	25	70	M.S. Flat + M.S. Bar	a+ e	200	40	35	6	15	50
Door Heavy	Single Clamp	—do—	a+ +2f +2t	900	40	50	5	12	25	70	—do—	—do—	200	25	35	3	15	50
	Double (U) clamp	—do— +2f +2t	2a	900	40	30	5	10	25	70	—do—	—do—	200	25	35	3	15	50
Door light	Single clamp	—do—	a+ +2f +2t	900	40	50	5	10	25	70	—do—	—do—	200	25	35	3	15	50
	Double (U) clamp	—do—	2a +2f +2t	400	40	50	5	10	25	70	—do—	—do—	180	25	35	3	15	50
WINDOWS																		
	Single clamp	—do—	a+ +2f +2t	400	40	50	5	10	25	70	—do—	—do—	180	25	35	3	15	50

Note :- All Dimensions in mm.

(b) FORK SYSTEM

The system has been named as fork system, since a "U" shaped clamp of mild steel flat in the form of a fork, has been used as bracing cum hinge along with the conventional holdfast.

Components

The fork-cum-hinge is fabricated from a mild steel flat by bending it into a "U" shape clamp and a mild steel bar pin is welded to the fork at the inside face of the bend (Fig. C-1). The size and length of the fork varies according to specification of shutter adopted for door or windows as given in Table-II. For example, a flat of 25 mm × 3 mm having a length of 900 mm for door and 410 mm for window respectively, have been found to be adequate for a 38 mm thick single battened and braced shutter. The U clamp has been found to be adequate to prevent warping in horizontal plane as well as helps in preventing in the vertical plane which is always more since planks are longer in that direction. As an alternative, a single mild steel flat bracing having one edge bent into the shape of a loop and the mild steel bar pin welded inside this loop (Fig. D-1) may be adopted in which case wooden batten has to be provided on the other face. Holdfast is fabricated from mild steel flat having its one edge split and bent in opposite direction. The other edge is to have a hole of required diameter to hold the pin of the bracing (Fig. D-2 to D-4). For lighter shutter, simple holdfast from a 16mm dia mild steel rod as per the shape shown in Fig. C-3 & C-4 may be fabricated.

Fixing

Necessary holes at specified spacing for screws are provided on the fork cum bracing as specified in Fig. C-2. A short groove is cut in the shutter at the edge at specified spacing, so that the bent portion of the bracing cum hinge remains within the width of the shutter. This method avoids any gap which remains between the shutter and the jamb. The bracing is loosely screwed on the shutter at specified position. The holdfasts are embedded in the concrete in the masonry of the jamb in wall as usual in the traditional manner at specified position, at the

time of erection of masonry. The projected portion of the holdfast having hole also is housed in the groove of the shutter. The shutter is placed in position and is aligned for, the bracing cum hinge to be fixed correctly over the shutter keeping the pin downward in the groove, so that it sits over the hole of the holdfast as known in the figure. Two such bracing cum hinges are provided for a single door shutter one at top and other at bottom. When the position of bracing cum hinge is finalised and checked, the bracing is screwed firmly to the shutter.

(c) L-Type Hinge System

The simplest form of another fixture ("L" Typehinge System) for a door shutter is where a M.S. Flat is bent into 'L' shape clamp having a hole in the shorter leg Fig. E-1. The clamp is fixed to the vertical edge of shutter keeping the shorter leg outward which sits on the M.S. pin of the holdfast Fig. E-2. The shorter edge, alternatively, may be kept inward by cutting a groove at the edge of the shutter. The latter has got the advantage over the former that no gap remains in between the shutter and the jamb.

(d) Clamp Type Hinge System

For window a smaller clamp type hinge system as shown in Fig. E-3. Fixing details shown in E-4 could be adopted as hinge with traditional type of hold fast named as clamp type hinge system.

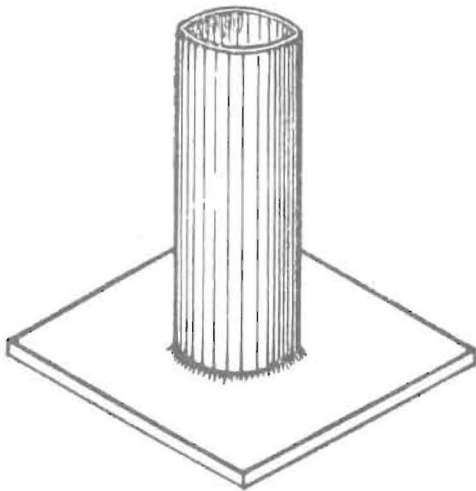
(e) Bolt Hinge System

In another design the hinge as well as the holdfasts are of same design and dimension. A loop of 12 mm dia is formed at one edge by fabrication on both the flat. One is fixed as hinge on shutter and the other as an holdfast in the appropriate position, one above the other as shown in Fig. F. The two loops are connected together with a bolt and nut on which the shutter operates. It is called "Bolt hinge system".

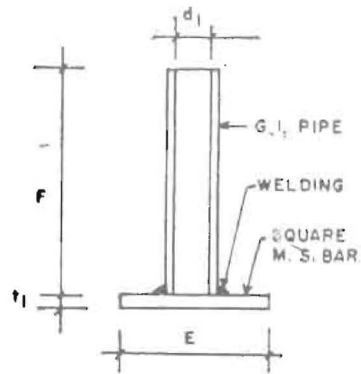
Cost Economics

The cost of providing various system of fixtures described in this paper will depend upon the cost of material and labour prevailing in that

PIVOT - SYSTEM - COMPONENTS FOR FRAMELESS DOORS & WINDOWS



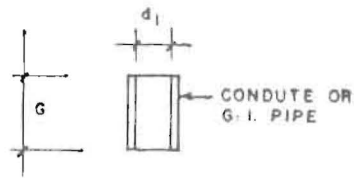
A - 1
FLOOR SOCKET - VIEW



A - 2
FLOOR SOCKET - SECTION

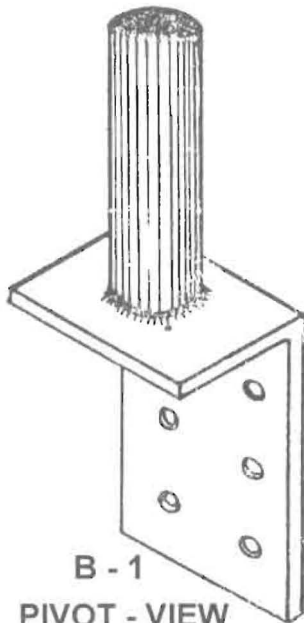


A - 3
TOP SOCKET VIEW

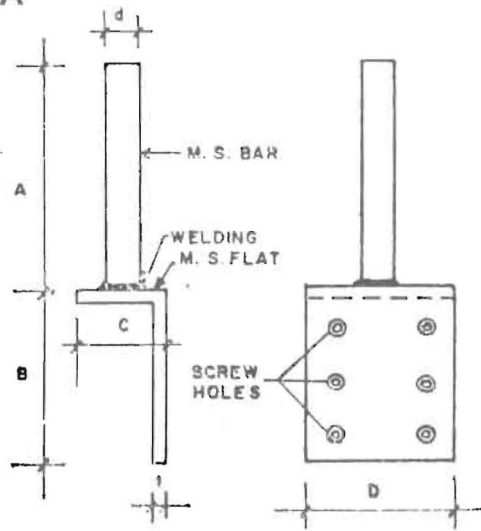


A - 4
TOP SOCKET - SECTION

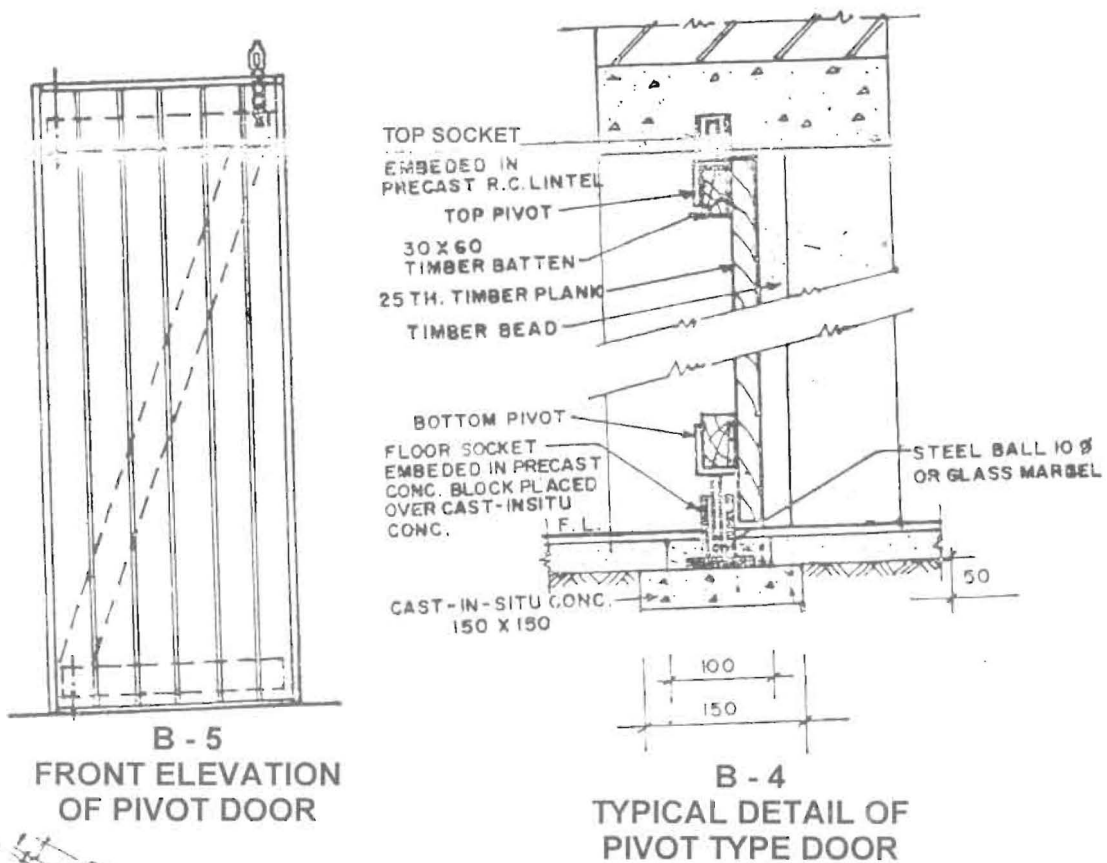
FIG - A



B - 1
PIVOT - VIEW



B - 2 **B - 3**
PIVOT - SECTION PIVOT - ELEVATION
FIG - B



FORK SYSTEM - FIXTURES

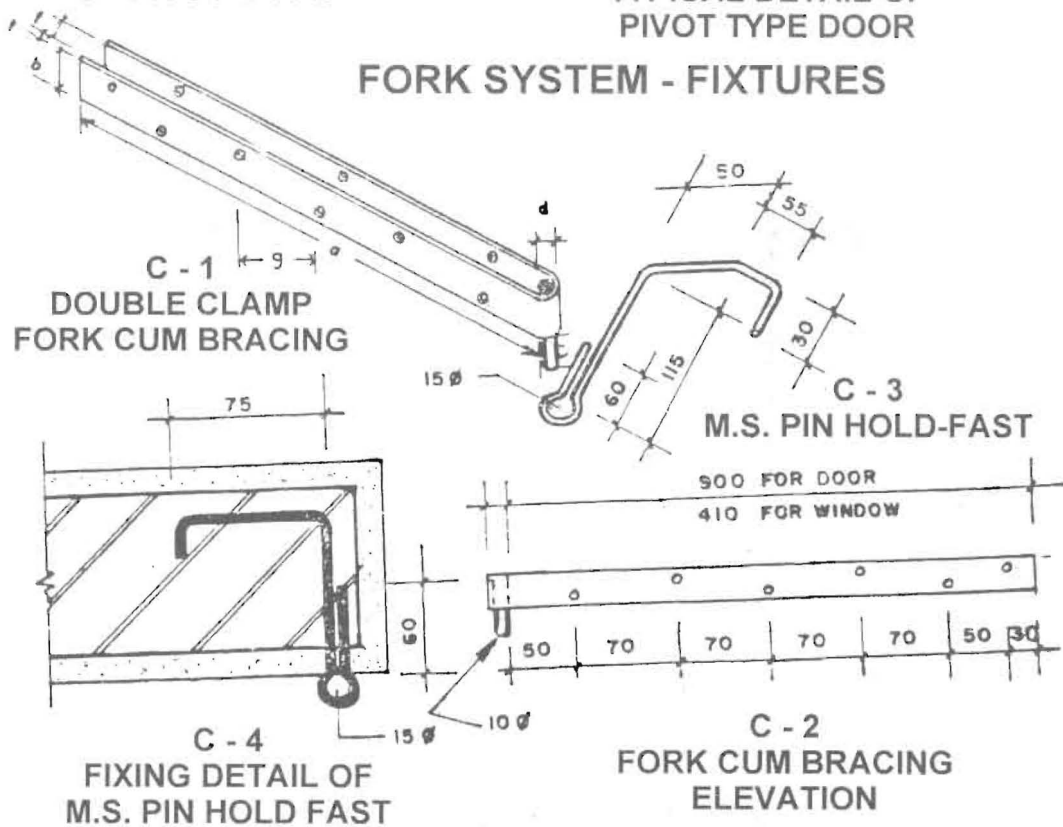


FIG C-1 TO 4

FORK SYSTEM - FIXTURE

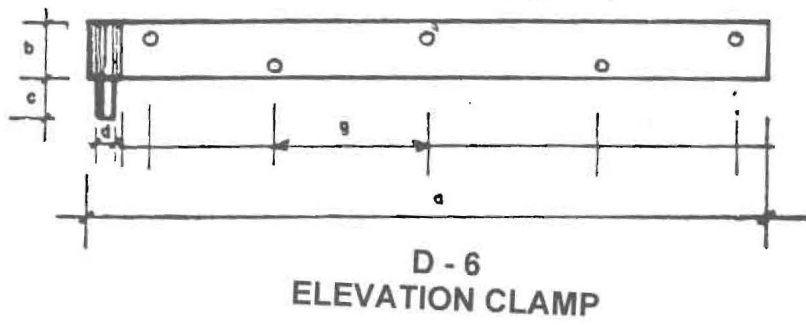
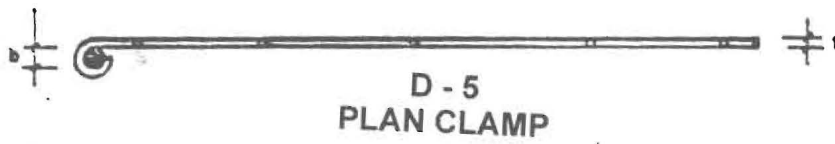
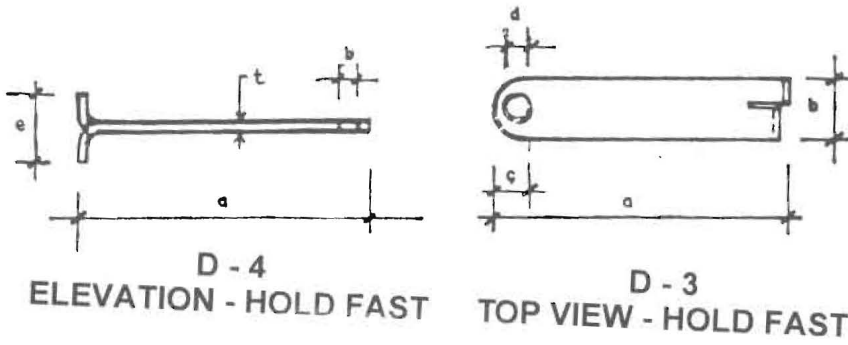
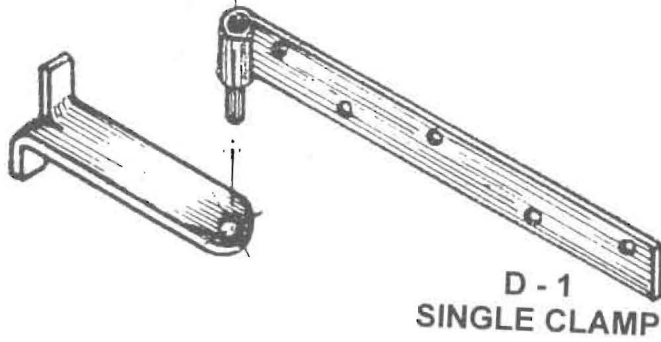
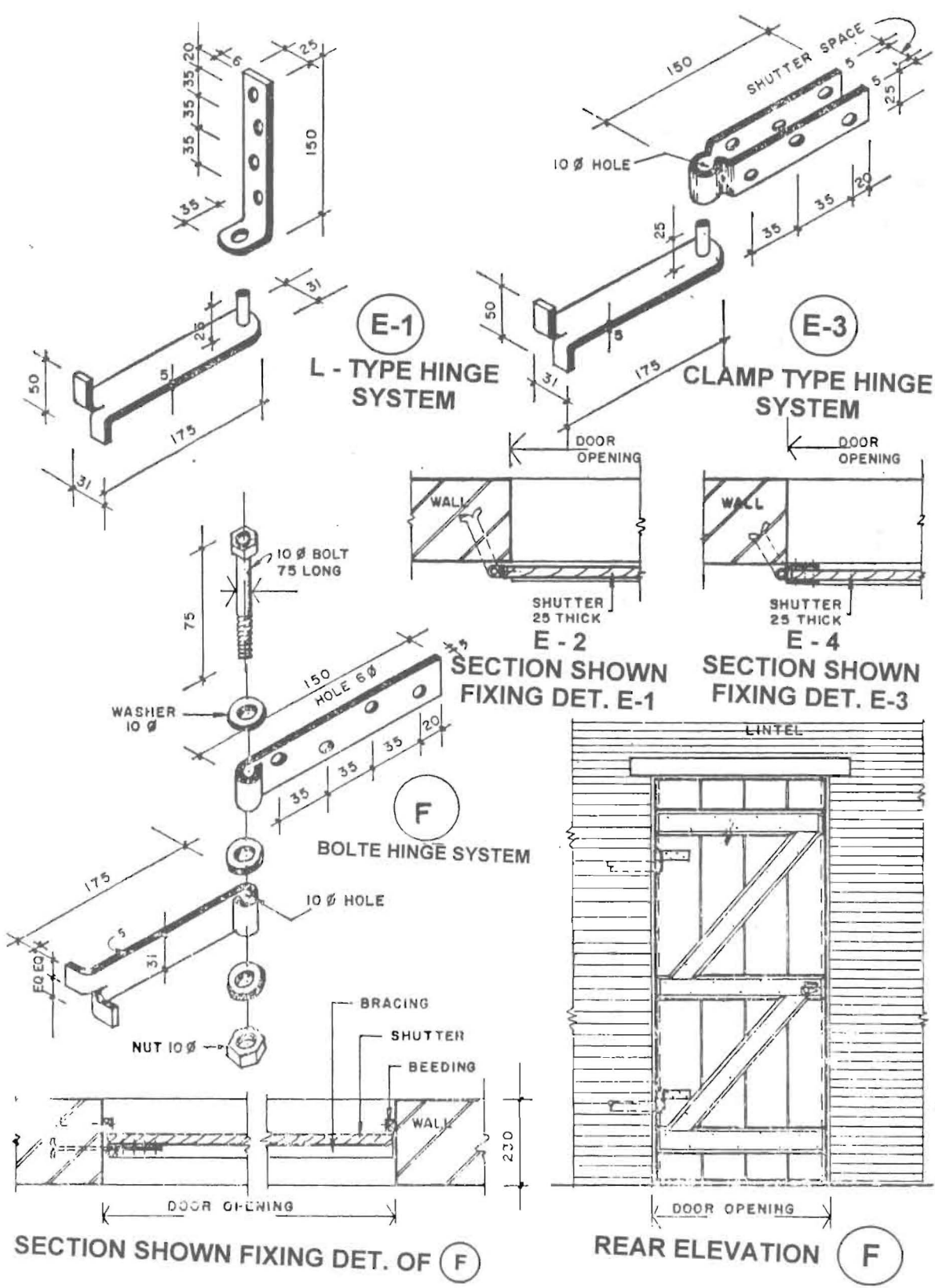


FIG. D - 1 TO 6



locality. Since these fixtures are to be provided in the schemes, where frameless doors and windows are to be adopted, the elimination of frame alone for the door or window will save about 30% cost of the shutter. In various housing schemes mentioned earlier where, such fixtures have been adopted, substantial economy have been reported.

Conclusion

The test and performance of these fixtures have shown that fabrication should have no problem in the villages, local artisan can fabricate these fixtures for frameless shutters of doors and windows. It has been established that fixtures can be adopted in low cost rural housing schemes to achieve economy in the construction of these houses.

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