

Short Communication

A Laboratory Under-Reamer

by

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Under-reamed piles are largely used in Black Cotton Soil area, and the research on model studies of under-reamed piles is comparatively recent (Babu Shankar 1965). Bulk of the model study was conducted by suspending the model piles and forming clay beds around them (Cooke 1964). In 1965 Cooke of Buildings Research Station London fabricated a laboratory under-reamer by means of which it was possible to form bell shaped under-reams (Cooke 1975). Most of the under-reamed piles employed in India have however elliptical under-reams, for which laboratory handy under-reamer is not easily available (Jain 1975). The authors have fabricated a laboratory under-reamer with which it is possible to form elliptical under-reams. This short communication describes this laboratory under-reamer and it is hoped that this tool will be great aid to model testing of under-reamed piles.

First a bore of uniform diameter 76.2 mm is drilled to a desired depth in the clay bed by conventional tool such as carpenter's auger. Figures 1, 2 and table 1 outlines the component parts of this under-reamer. The cutter frame of the under-reamer shown in figure is lowered in the drilled hole to a depth at which the under-reaming for the pile is desired. The handle is rotated in the clockwise direction so as to lower shaft L along with top of the cutter frame consisting of scraper blades P_1 P_2 , and to lift the bottom plate R through equal distance by action of right hand and left hand screw threads, which come into action simultaneously. It results in gradual expansion of cutter frame consisting of 4 blades P_1 P_3 of desired length and shape hinged together, and collection of excavated soil in the bucket u provided at the bottom. The operation of the rotation of handle in clockwise direction is continued till the final shape of the desired under-ream is obtained. This is ensured by position of lock nut F screwed on spindle D. The position is adjusted with respect to graduations on scale E. Scale E is rivetted to clamp A and graduations marked on it. The cutter frame is then unexpanded to its original position by rotating the handle in anti-clockwise direction and equipment taken out of the core. The under-reaming at various depths can be carried out by clamping the equipment at required height with the help of suitable conventional frame or by varying pile lengths.

Though the authors have carried out the successful operation of this equipment in clay bed, they have no research project in hard on model

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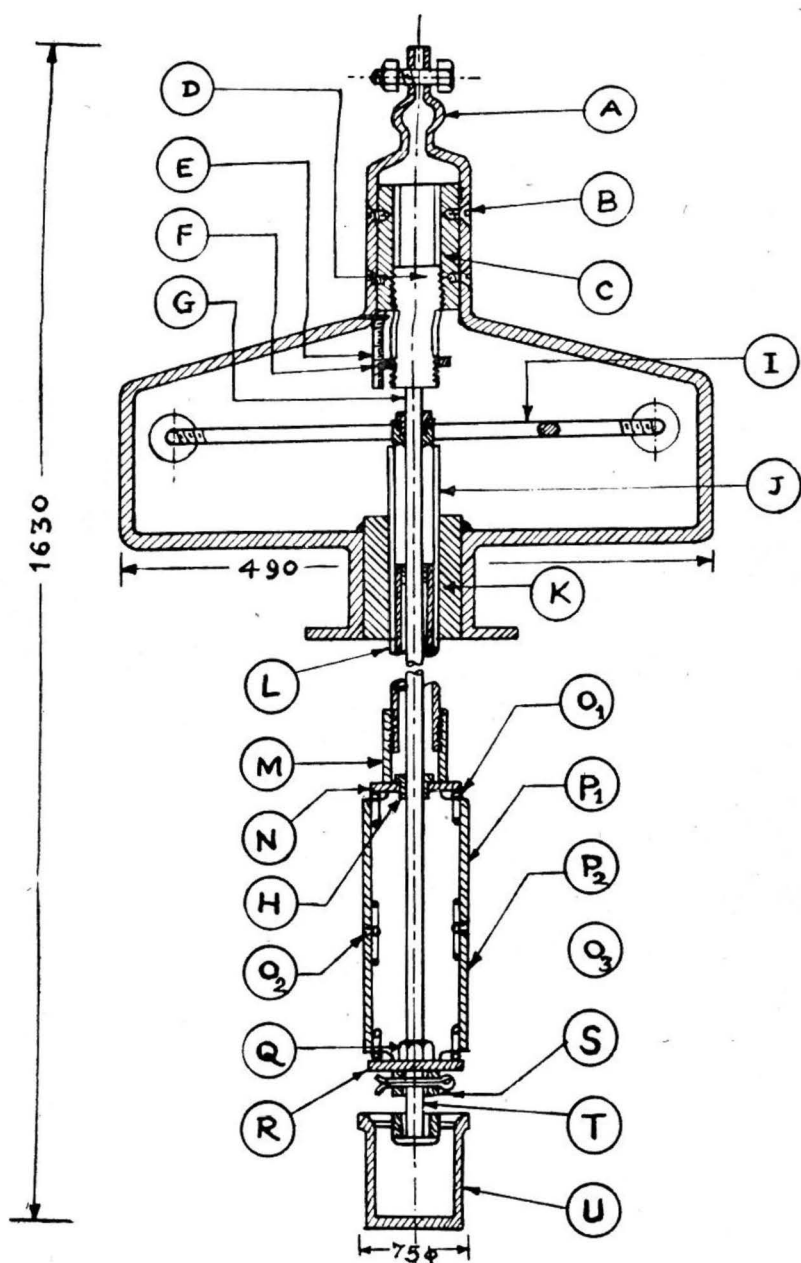


FIGURE 1. Assembly of an Laboratory under-reamer—Dimensions in mm.

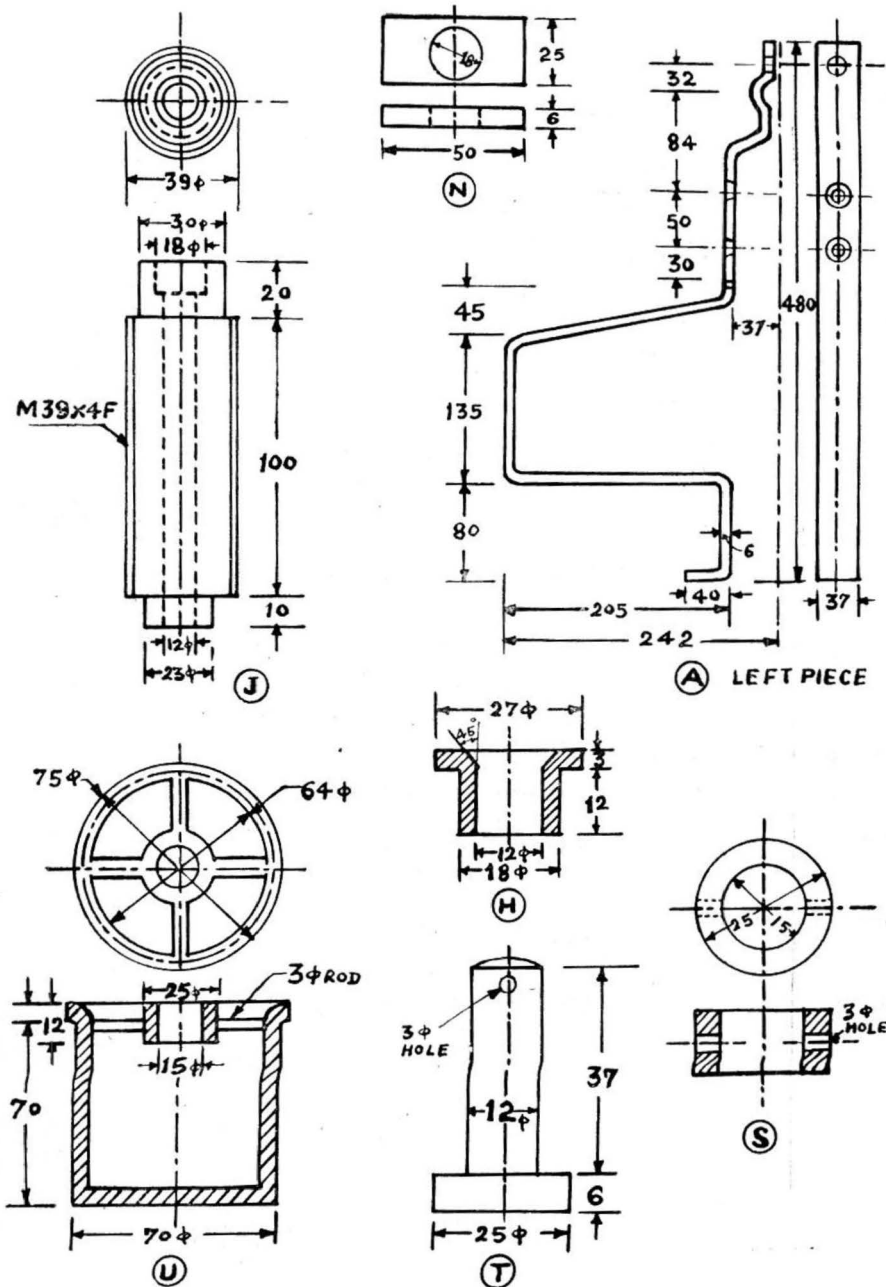


FIGURE 2. Details of Laboratory under-reamer—Dimensions in mm

TABLE I

Part list of a Laboratory under-reamer—Dimensions in mm

Part	Name of Part	Description/Size	Qty.	Remarks
A	CLAMP	M.S. Flat 37×6	Left Right	Welded to K & Screwed to C
B	SET SCREW	10 mm ϕ	4	For Screwing A to C
C	SQUARE NUT	M.S. 75×75×100 ht	1	Left hand Thread M39×4F
D	SPINDLE UPPER	M.S. 39 ϕ ht 100	1	Left hand Thread M39×4F Engaged with C
E	GRADUATED SCALE	60 mm. Long Aluminium Angle 6×6	1	Riveted to A
F	LOCK NUT	Inner 39 ϕ , Outer 55 ϕ , 6 Thickness	1	Left hand Threads to Engage with C
G	CENTRAL ROD	12mm ϕ , 1255 long, lower end Threaded (R.H. Thread)	1	Sliding & Rotating in H one end welded to 'D' and other screwed to nut 'Q'
H	BRASS BUSH	Inner 12 ϕ , Collar 27 ϕ Outer 18 ϕ , ht 15	2	Press fit in I & N sliding tolerance with G
I	HANDLE ROD	M.S. 10 ϕ , 185 Long	4	Welded to J, Ball of 30 ϕ screwed at the end
J	SPINDLE LOWER	Outer 39 ϕ , 130 ht, Threads M 39×4F (RH)	1	Lower end welded to L, Engages with nut K
K	SQUARE NUT	M.S. 75×75×100 ht.	1	M 39×4F, R.H. threads to engage with 'J', welded to 'A'
L	G.I. PIPE	25 ϕ , 870 Long	1	Upper end welded to 'J' and lower end screwed to 'M'
M	G.I. COUPLING	25 mm ϕ	1	Screwed at lower end of 'L' welded to 'N' screwed length 35mm, G.I. Pipe + Coupling = 890 mm
N	RECTANGULAR PLATE (UPPER)	M.S. Flat 50×25×6th.	1	Bush 'H' fitted, hinges 'O' ₁ welded on bottom face
O ₁	BACK FLAP HINGES (TOP)	25×25 mm	2	One flap welded to 'N' on the bottom face, centre dis- tance 50mm other flap wel- ded to 'P' ₁

TABLE 1 (Contd.)

Part	Name of Part	Description/Size	Qty.	Remarks
O ₂	BACK FLAP HINGES (MIDDLE)	25 × 25 mm	2	One flap welded to 'P' ₁ and other flap welded to 'P' ₂
O ₃	BACK FLAP HINGES (BOTTOM)	25 × 25 mm	2	One flap welded to 'P' ₂ and other flap welded to top face of R with c/c 50 mm
P ₁	SCRAPER BLADES (UPPER)	M.S. Flat, 25 × 5 mm, 100 mm Long	2	Welded to 'O' ₁ and 'O' ₂ and one edge sharpened
P ₂	SCRAPER BLADES (LOWER)	M.S. Flat, 25 × 25 mm, 100 mm. Long	2	Welded to 'O' ₂ and 'O' ₃ and one edge sharpened
Q	HEXAGONAL NUT	M.S. 12mm ϕ , R.H. Threads	1	Welded to 'R' on top face
R	RECTANGULAR PLATE (LOWER)	M.S. Flat, 50 × 25 × 6 th.	1	'O' ₃ and 'Q' welded on top face 'S' welded on bottom face
S	COLLAR AND SPLIT PIN	M.S. Inner 15 ϕ , Outer 25 ϕ , Split Pin 3 mm	1	Welded to 'R' on bottom face 3mm through hole for split pin
T	PIN	M.S. 12mm ϕ with 25mm ϕ Collar	1	Attached to 'S' by split pin lower end in hub of 'U'
U	CYLINDRICAL BUCKET	M.S. 75mm ϕ , 75mm ht 3mm Thick	1	Hub and 4 Rods of 3mm welded at top and attached to 'R'

testing of under-reamed piles. As such they request the discipline to use this tool in their research project.

References

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