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MANPOWER STUDIES : 1

**GOVERNMENT OF
MAHARASHTRA**

Studies in Occupational Patterns of Engineering Personnel in Maharashtra State

January 1964

**Manpower Wing, Planning Division
Finance Department
Government of Maharashtra**

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P R E F A C E

IN the long term economic development of the country the availability of trained manpower and adequate training facilities are vital factors in determining the measure of advancement that can be achieved. This calls for organized manpower planning. With this object in view, a Manpower Wing has been established in the Planning Division of the Finance Department of Maharashtra Government to conduct studies at the State level in manpower requirements, to assess the availability of trained personnel, to examine and suggest measures for increasing training facilities and generally to deal with problems connected with manpower.

The present study viz. "Studies in occupational Patterns of Engineering Personnel in Maharashtra State" is an official publication of the Wing. It is based mainly on basic data made available by the Employment Market Information Scheme of the Directorate of Employment, Bombay.

The rapid pace of industrialisation during the last decade has been accompanied by significant changes in the occupational structure of industrial employment. This has created difficulties in estimating and meeting manpower requirements over the vast range of projects and programmes which form part of our developmental planning. This study which relates to industry-wise distribution of workers according to occupations reveals what trades are of importance in the various types of manufacturing industries and establishes certain relationships between Engineers and Craftsmen as also *inter-se* relationships between various types of general craftsmen.

The study is expected to help in determining the Engineer and Craftsmen components of total employment likely to be generated as also the occupational distribution of such components so essential to formulation of manpower training programmes. It should also serve a useful purpose for employment counselling of fresh entrants into the employment market and provide data to Industry for estimating personnel requirements for expansion of existing units or starting of new ones.

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SACHIVALAYA,
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STUDIES IN OCCUPATIONAL PATTERNS OF ENGINEERING PERSONNEL IN MAHARASHTRA STATE

1.0. Preliminary

The primary objective of manpower planning is to assess the requirements of trained personnel and to take prompt steps to ensure an adequate inflow of such persons to the labour force. The rapid pace of industrialisation during the last decade or so witnessed significant changes in the occupational structure of industrial employment. This has created inherent difficulties in the estimation of manpower requirements. The paucity of qualitative statistical data has been one of the major drawback in the evolution of stable norms, so essential for manpower reckoning. However, with relevant data now being made available by the Employment Market Information Unit of the National Employment Service and the Population Census 1961, an attempt has been made in these studies to analyse the occupational patterns in regard to engineers and certain categories of craftsmen, obtaining in the manufacturing and construction industries in the private and public sectors in Maharashtra State.

1.1. Object of the Study

2. After broadly assessing the employment likely to be generated by correlating investment-employment, output-employment ratios to the trends of capital formation, it is necessary to distribute the employment potential so obtained among the different occupations in order that demands for particular categories of personnel can be examined in the light of their availability and adequate steps taken to balance the supply and demand. One way of doing this would be to determine the relationship between engineers and craftsmen to total employment as also the *inter-se-ratios* among the various occupations. The object of the present studies is, therefore,—

(i) to ascertain the proportion of engineering personnel to the total labour force engaged in each of the manufacturing industries and constructions ; and

(ii) to establish *inter-se-ratios* between the selected categories of engineers and craftsmen.

On the assumption that the occupational structure in a given sector of employment tends to remain fairly constant over a period of time, it is possible from such studies to lay a workable base for estimation of future requirements of engineering personnel, provided that no sudden changes in technological processes or in the pattern of economic development occur.

3. The conclusions drawn from such studies can be gainfully utilised in other ways also, such as for employment counselling of fresh entrants into the Labour Market, for highlighting trades likely to provide the greatest avenues of employment, etc. To industry, it can be a service, providing data for estimating personnel requirements for expansion of existing units or the starting of new ones.

4. A study of this type, entitled "Occupational Pattern in Manufacturing Industries, India, 1956", perhaps the first of its kind in the country, was conducted by the Planning Commission in its series of manpower studies. The exhaustive data presented in that study were further utilised by the Manpower Division of the Directorate General of Employment and Training as a base for its study, "Methods of Assessment of Training Requirements of Craftsmen for the Third Five-Year Plan."

In the latter study it was established that the proportion of skilled craftsmen to total employment in manufacturing industries in India was 13·10 per cent in 1956. The study further went on to establish *inter-se-ratios* among certain selected occupations in the skilled categories. These studies were conducted seven years ago. The pattern of employment along with techniques of production may since have undergone certain changes. Moreover, the data regarding occupational pattern reflected in the study pertained to all-India trends; hence no State-wise conclusions could be drawn from them. As the pattern of employment in each State would vary according to its level of industrialisation and degree of mechanisation, it is felt that local studies of this nature based on more recent data will not only be enlightening but instructive.

5. In all, four studies in "Occupational Patterns" have been undertaken. They reflect the occupational patterns in different sectors such as (i) manufacturing industries in the private sector, (ii) all industries in the public sector, (iii) manufacturing industries in both sectors and (iv) construction industry in both sectors.

1.2. Concepts

6. The term "engineering personnel" includes not only engineers, who are degree or diploma holders but also craftsmen. For the purpose of these studies "Engineers" have been considered from the more important professions such as architecture, civil engineering, electrical engineering, mechanical engineering, chemical engineering and metallurgical engineering. Other engineering categories such as mining engineers, technologists, etc., have been

excluded from the purview of these studies. The categories selected from amongst "craftsmen" comprise some 28 occupations, most of which are basic engineering trades, generally considered to be common to a number of industries. The choice of occupations has been based on the occupational study conducted by the Directorate General of Employment and Training, referred to earlier. Training facilities exist in the State for most of these occupations under the "Craftsmen Training Scheme" and the "Evening Classes for Industrial Workers". Moreover, a number of them are also "designated trades" under the Apprentices Act, 1961. A list of occupations selected for the studies comprising engineers and craftsmen is given in the appendix at pages ~~32-33~~, 35.

1.3. Sources of information : their coverage and limitations

7. It was not intended to collect any statistical data afresh. The studies are based on information already available in the various Government publications. Since these data were not collected primarily for manpower planning, they had to be further processed to meet the requirements of these studies.

8. The first two studies, namely occupational pattern in manufacturing industries in the private sector and occupational pattern in the public sector are mainly based on occupational data collected by the Employment Market Information Unit of the Directorate of Employment, Bombay. The information is collected biennially—public and private sector undertakings being covered every alternate year—under the Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959. The information from the public sector used in the study relates to September 1960, whereas the data from the private sector pertain to September 1961.

9. All industrial establishments in the private sector, engaging 50 or more workers fall within the purview of the Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959. In 1961, about 1,900 establishments in the private sector employing about 7.87 lakh workers were covered by the Act. Of these, 1,313 establishments, representing 69 per cent of the total coverage and engaging 4.90 lakh workers or about 53.5 per cent of the total estimated employment filed the returns. It would, therefore, appear that even though the returns are statutory, the response has not been quite encouraging, as about 30 per cent of the undertakings employing about 46 per cent of the total number of workers have been left out of the coverage.

10. In the public sector, all establishments are required to file the biennial occupational return. Of the 2,910 establishments employing 8,72,419 workers in the public sector, 2,792 undertakings or 95.9 per cent, engaging 7,36,916

workers or 84.4 per cent of the total responded to the returns. The data in the public sector cover all activities, such as manufacturing, construction, mining, transportation, trade and commerce, but excludes agriculture.

11. Another useful source of information utilised in the remaining studies is the data provided by the Census of Population, 1961. The Census gives a broad picture of occupational employment in all sectors. The data cover all persons in the State who were gainfully employed. Such persons are distributed according to broad occupational families in various industrial activities in both the public and private sectors. The two studies bring out patterns of employment of engineering personnel in manufacturing and construction industries. In the former, however, occupational information is not available according to the various industries.

12. One of the limitations of these studies is that it has not been possible to distinguish between a graduate engineer and an engineer holding a diploma. Such a differentiation would have been helpful, particularly as the training requirements and the rate of outturn of degree and diploma holders are different. Another drawback is that, it has not been possible to identify engineers according to their professional qualification in such cases, where they may have been classified in the returns according to their functional designations such as, General Manager, Factory Manager, Works Manager, Works Superintendent, etc. However, despite the limitations, the studies on hand should provide sufficient data to enable a meaningful analysis to be made of the occupational structure in the various industries and sectors.

2.0. Survey Results :

2.1. Occupational Pattern in manufacturing industries in the private sector

13. The study covers employment in establishments engaged in manufacturing industries in the private sector employing 50 or more workers.

14. In all, 1,531 engineers were identified in a total employment of 3,22,319 persons. Engineers thus constitute 0.47 per cent of the total employment in manufacturing industries in the private sector. Industry-wise ratios of engineers to total employment are given in Table No. 1. The highest percentage of 7.84 is recorded in the manufacture of machine tools, followed by 4.00 per cent in the manufacture of and repairs to air transport equipment, including aeroplanes and aeroengines. The proportion is fairly high *i.e.* between 3 per cent and 4 per cent in the manufacture of motor vehicles,

engine parts and accessories (3·80 per cent), heavy electrical machinery and equipment (3·31 per cent) and dyes, paints, colours and varnishes (3·23 per cent). The percentages are between 2 and 3 in industries such as production of edible fats and oils (2·08 per cent) and manufacture of structural wooden goods (2·62 per cent). The proportion of engineers in the total employment is between 1 to 2 per cent in respect of ten other industries, while in the case of the remaining industries it is less than 1 per cent or nil.

15. The total number of engineers is further distributed among the selected categories of engineers with a view to ascertaining their relative proportion in the total employment of engineers. The breakup will be found in Table No. 2. Mechanical engineers returned the largest proportion of 58·26 per cent, followed by civil engineers who constituted 21·75 per cent. Electrical engineers formed 11·24 per cent of the total employment of engineers. Others constituted 2·61 per cent of the total.

16. The study recorded in all 486 draftsmen in a total employment of 3,22,319 persons in the manufacturing industries in the private sector. Draftsmen thus constitute 0·15 per cent of the total employment.

17. Craftsmen in the occupations selected for the study constitute 50,207 persons in the manufacturing industries in the private sector giving an overall ratio of 15·58 per cent of the total employment. This ratio is higher than the all-India ratio of 13·10 per cent arrived at by the Directorate General of Employment and Training in 1956. This may, perhaps, be attributed to Maharashtra being comparatively an industrially advanced State. Industry-wise ratios of craftsmen to total employment are given in Table No. 1.

The manufacture of machine tools again has returned the highest percentage of 93·41 per cent craftsmen to total employment. Since the selected occupations are basically of an engineering type, their weightage is particularly pronounced in the engineering industries such as metal, electrical, transport, general engineering, etc. Craftsmen constitute more than 50 per cent of the total employment in the following industries :—

Manufacture of iron and steel furniture (89·35 per cent), scientific, medical and surgical instruments (88·21 per cent), machinery except textile machinery (76·73 per cent), assembling and repairing of watches and clocks (75·78 per cent), electrical machinery, apparatus and appliances (69·25 per cent), metal products (63·49 per cent), heavy electrical machinery and equipment (62·14 per cent), batteries (58·37 per cent), textile machinery (57·87 per cent), motor vehicles, engine parts and accessories

(56.65 per cent), repairing and servicing of motor vehicles (55.68 per cent) and manufacture of wood allied products (55.17 per cent). The proportion of craftsmen to total employment is very low, being less than 1 per cent in industries such as manufacture of food products, cotton weaving in handlooms, sawing and planing of wood, manufacture of common salt and the like.

18. The *inter-se* proportion of the selected occupations of craftsmen may be found in Table No. 3. Machine tool makers, machinists and related workers returned the highest percentage of 17.89, followed by machine tool operators comprising 17.73 per cent of the total craftsmen. Fitter machinists, tool makers and machine tool setters and fitter assemblers and machine erectors form about 10.3 per cent each. Other important occupations are mechanics repairmen (6.72 per cent) and carpenters, joiners and pattern makers (5.70 per cent). Occupations such as furnacemen, annealers temperers and related heat treaters, rolling mill operators, metal drawers and extruders, plumbers and pipe-fitters, electro-platers, dip-platers and related workers, precision instrument makers, electrical and electronic fitters and mechanics repairmen (radio) show less than 1 per cent of the total employment of craftsmen.

2.2. Occupational pattern in the Public Sector according to Employment Market Information.

19. The data relate to all public sector establishments engaged in non-agricultural activities, such as manufacturing industries, construction, etc.

20. In all, 9,164 engineers were shown to be employed forming 1.24 per cent of the total employment in the public sector. The *inter-se* proportion of the selected categories of engineers to the total number of engineers may be seen in Table No. 4. It would appear that Civil Engineers preponderate, constituting 63.11 per cent of the total number of engineers in the Public Sector. Electrical and mechanical engineers form only 6.96 per cent and 4.95 per cent respectively, of the total number of engineers in this sector. Others account for 24.82 per cent of the total. The comparatively high percentage in this category is mainly due to the number of surveyors, who form 24.12 per cent of the total.

21. Craftsmen number 41,264 in the public sector constituting 5.60 per cent of the total employment. The *inter-se* proportion of the selected occupations to the total number of craftsmen in the public sector may be seen in Table No. 5. Fitter assemblers and machine erectors and mechanics repairmen constitute 17.83 per cent and 17.63 per cent of the total craftsmen, respectively. They

are followed in weight of numbers by carpenters, joiners and pattern makers (8.22 per cent) and machine tool operators (7.35 per cent). Other important occupations in this Sector are fitter machinists, tool makers and machine tool setters (6.32 per cent), other tool makers (6.68 per cent) and linemen and cable jointers (5.03 per cent).

22. In all 1,616 draftsmen are reported to be employed in the public sector. They thus form 0.22 per cent of the total employment in the public sector.

2.3. Occupational Pattern in Manufacturing Industries according to Population Census, 1961

23. The study covers employment in both public and private sectors in manufacturing industries other than household industry.

24. The Population Census, 1961, returned 5,514 engineers of various categories in a total employment of 13,04,335 persons in manufacturing industries other than household industry. Engineers thus constitute 0.42 per cent of the total employment. The ratio of different types of engineers to the total number of engineers is indicated in Table No. 6. Mechanical engineers form slightly more than half the number of engineers, whereas Electrical and Civil engineers constitute about 22 per cent and 18 per cent of the total number of engineers, respectively.

25. As regards craftsmen, the Census recorded 2,59,175 persons from the occupations selected for this study. They constitute 19.79 per cent of the total employment in the manufacturing industries. The relative proportion of each of the selected occupations to their total number may be seen in Table No. 7. It is apparent that mechanics repairmen assume the highest percentage, namely, 18.08 per cent followed by carpenters, joiners and pattern makers, who form 17.82 per cent of the total employment of craftsmen. Other important occupations are fitter machinists, tool makers and machine tool setters (14.51 per cent) and machine tool operators (8.37 per cent).

26. There are 1,340 draftsmen in a total employment of 13,04,335 in the manufacturing industries, assuming approximately 0.10 per cent of the total number of workers.

2.4. Occupational Pattern in the Construction Industry according to Population Census, 1961

27. The study covers employment in the construction industry in both public and private sectors.

28. In all, 4,254 engineers were recorded in the Population Census, forming 1·81 per cent of the total employment. The relative proportion of selected categories of engineers may be seen in Table No. 8. Civil engineers form about 75 per cent of the total number of engineers, while Mechanical and Electrical Engineers constitute only 10·70 per cent and 2·63 per cent of the total respectively. "Others" constitute 11·70 per cent of the total. Among others, Architects alone form 7·43 per cent of the total number of engineers.

29. Craftsmen comprising the selected occupations assume 28·59 per cent of the total employment in construction. As compared with the ratio of craftsmen to total employment in the manufacturing industries, the ratio in construction appears to be unduly high mainly because of the preponderant number of bricklayers and masons in the total number of craftsmen in this industry. Table No. 9 gives the relative proportion of workers in each of the selected occupations to the total number in such occupations in construction. Bricklayers, plasterers and masons represent the single largest group, constituting 76·57 per cent of the total craftsmen. Carpenters and painters form 6·30 per cent and 5·63 per cent respectively, of the total craftsmen. The other occupations forming more than 1 per cent but less than 3 per cent of the craftsmen are fitter machinists, tool makers and machine tool setters, mechanics repairmen, plumbers and pipe fitters.

30. The Census returned 602 draftsmen in a total employment of 2,35,616 workers in the construction industry, constituting 0·26 per cent of the total.

2.5. Concluding observations

31. Normative studies in occupational patterns serve a useful purpose in that they not only help to determine the engineer and craftsmen components of total employment likely to be generated in a given sector, but also help to determine the occupational distribution of such components so essential to formulation of manpower training programmes.

32. The study reveals that in manufacturing industries in the private sector, engineers constitute 0·47 per cent and craftsmen 15·58 per cent of the total employment, respectively. Among engineers, Mechanical engineers comprising 58 per cent of the total number of engineers predominate, whereas Civil and Electrical Engineers form only about 22 per cent and 11 per cent of the total complement of engineers in this sector of employment. The *inter-se* proportion of certain selected occupations amongst craftsmen occupations, generally considered to be common to a number of industries, show that metal working trades such as machine tool makers, machinists and related workers and

machine tool operators form the largest group with approximately 18 per cent each of the total number of craftsmen employed. Fitter machinists, tool makers and machine tool setters, and fitter assemblers and machine erectors come next constituting about 10 per cent. each of the total craftsmen in manufacturing industries.

33. In public sector establishments, engineers assume 1.24 per cent and craftsmen 5.60 per cent of the total employment respectively. Among engineers, Civil engineers predominate constituting about 63 per cent of the total number of engineers. The concentration of Civil engineers in the public sector is attributed to the preponderance of construction activity in that sector. Amongst craftsmen, fitter assemblers and machine erectors, and mechanic repairmen each form about 18 per cent of the total number of craftsmen.

34. According to the 1961 population census, engineers assume 0.42 per cent of employment in manufacturing industries and 1.81 per cent of employment in construction. In manufacturing industries Mechanical engineers comprise little more than half the number of engineers, whereas Electrical and Civil engineers constitute about 22 per cent and 18 per cent of the total engineers, respectively. In the construction industry, Civil engineers compose about 75 per cent of the total number of engineers employed, whereas the Mechanical and Electrical engineers constitute only about 11 per cent and 3 per cent respectively of the total engineers.

STATISTICAL TABLES

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TABLE NO. 1

Percentage of Engineers and Craftsmen to total employment in manufacturing industries in the Private Sector

Code No.	Industry	Percentage of Engineers to total Employment.	Percentage of Craftsmen to total employment.
200	Production of Rice, Atta, Flour, etc., by Milling dehusking and processing of crops and food grains.	0·16	4·64
201	Production of Sugar and Syrup from sugarcane in mills.	1·78	17·27
202	Production of Indigenous Sugar, Gur from sugarcane or palm juice and production of candy.	....	27·31
203	Production of Food-Products such as Jam, Jelly, Sauce and canning and Preservation of fruits.	....	0·85
205	Production of Bread, Biscuits, Cake and other Bakery products.	0·77	2·43
207	Production of Edible fats and Oil (other than hydrogenated oil).	2·08	24·13
208	Production of hydrogenated oils (Vanaspati)	1·92	18·44
209	Production of other food products such as sweetmeat and condiments, muri, marki, chira, khoi, cocoa, chocolate, toffee, lozenge.	0·14	1·72
210	Production of distilled spirits, wines, liquor from alcoholic, malt, fruits and malts in distillery and Brewery.	....	10·00
214	Production of aerated and mineral water ..	....	3·18
217	Processing of tea in factories ..	....	0·15
218	Processing of coffee in curing works ..	0·61	5·52
222	Manufacture of cigarette & Cig. tobacco ..	0·15	16·89
226	Manufacture of other tobacco products ..	0·12	11·06
230	Cotton ginning, clearing, pressing and baling.	1·67	19·97
232	Cotton Spinning and Weaving in Mills ..	0·08	6·70
233	Cotton dyeing, bleaching ..	0·18	13·51
234	Cotton weaving in powerlooms ..	....	1·60
235	Cotton Weaving in handlooms ..	0·29	0·37
237	Printing of Cotton textile ..	0·28	6·15
238	Manufacturing of cotton nets ..	....	37·50

TABLE No. 1—*contd.*

Code No.	Industry.	Percentage of Engineers to total employment.	Percentage of Craftsmen to total employment.
239	Manufacturing of cotton, cordage rope and twine.	....	22·59
252	Wool spinning and Weaving in mills ..	0·06	3·96
255	Wool weaving in handloom ..	....	1·09
260	Spinning and Weaving of Silk textile in mill ..	1·03	13·83
271	Manufacture of hosiery and other knitted fabrics and garments.	....	9·93
273	Making of textile garments including raincoats and headgear.	....	18·47
279	Processing and Manufacture of textile products not covered above.	0·50	11·17
280	Sawing and Planing of Wood ..	....	0·85
281	Manufacture of wooden furniture and fixtures	....	44·00
282	Manufacture of structural wooden goods (including treated timber) such as beams, posts, doors, windows.	2·62	20·09
283	Manufacture of Wooden industrial goods other than transport equipment such as bobbin and similar equipment and fixtures.	....	22·22
287	Manufacture of boxes and packing cases other than plywood.	....	1·89
288	Manufacture of materials from cork, bamboo, cane, leaves and other allied products.	1·21	10·08
289	Manufacture of other wood and allied products not covered above.	0·18	55·17
290	Manufacture of pulp from wood, rage, waste-paper and other fibres and the conversion of such pulp into any kind of paper and paper boards in mill.	0·68	10·05
300	Printing and publishing of newspaper and Periodicals.	0·07	1·69
301	Printing and Publishing of books ..	....	1·18
302	All other types of printing including lithography, engraving, etching, block making and other work connected with printing industry.	0·08	1·72
310	Currying, tanning and finishing of hides and skin and preparation of finished leather.	....	9·00
321	Manufacture of Rubber footwear ..	....	20·00

TABLE No. 1—*contd.*

Code No.	Industry	Percentage of Engineers to Total employment.	Percentage of Craftsmen to total employment.
322	Manufacture of rubber goods used for industrial purpose.	....	7·84
323	Manufacture of all kinds of other rubber products from natural or synthetic rubber including rubber raincoat.	....	0·89
324	Productions of petroleum, Kerosene and other petroleum products in petroleum refineries.	0·71	18·04
330	Manufacture of basic industrial chemicals such as acids, alkalis and their salts not elsewhere specified.	1·75	12·98
331	Manufacture of dyes, paints, colours and varnishes.	3·23	9·06
333	Manufacture of ammunition, explosives and fireworks.	....	1·71
334	Manufacture of matches .. ..	....	9·54
335	Manufacture of medicines, pharmaceutical preparations, perfumes, cosmetics and other toilet preparations except soap.	0·41	6·49
336	Manufacture of soap and other washing and cleaning compounds.	0·11	7·04
337	Manufacture of turpentine synthetic, resin and plastic products and materials (including synthetic rubber).	0·20	15·34
338	Manufacture of common salt ..	....	0·41
339	Manufacture of other chemicals, chemical products, not covered above (including inedible oils and fats)	0·20	9·49
340	Manufacture of structural clay products such as brick, tile.	0·05	2·73
341	Manufacture of cement and cement products	0·84	2·75
350	Manufacture of earthenware and earthen pottery.	0·06	11·23
354	Manufacture of Glass apparatus ..	....	38·46
357	Manufacture of Glass and Glass products, except optical and photographic lenses and glass products covered above.	0·04	5·59
360	Manufacture of iron and Steel including smelting, refining, rolling conversion into basic forms such as billets, blooms, tubes, rods.	0·41	44·51

TABLE No. 1—concl.

Code No.	Industry.	Percentage of Engineers to total employment.	Percentage of Craftsmen to total employment.
361	Manufacture including smelting, refining of non-ferrous metals and alloys in basic forms.	....	31·80
363	Manufacture of structural steel products such as joist, rail, sheet, plate.	1·95	41·77
364	Manufacture of iron and Steel furniture ..	0·13	89·35
365	Manufacture of brass and bell metal products.	0·20	48·26
366	Manufacture of aluminium products ..	....	32·43
367	Manufacture of metal products (Other than of iron brass, bell metal and aluminium) such as tin can.	0·44	63·49
368	Enamelling, galvanising, plating (including electro plating), polishing and welding of metal products.	....	31·40
369	Manufacture of sundry hardwares such as G. I. pipe, wire net, bolt, screw bucket, cutlery (This will also include the manufacture of sundry ferrous engineering products, done by jobbing engineering concerns which cannot be classified in major groups 36, 37, 38 and 39).	0·84	37·85
370	Manufacture and assembling of machinery (other than electrical) except textile machinery.	1·64	76·73
371	Manufacture and assembling of prime mover and boilers other than electrical equipment such as diesel engines, road rollers, tractors.	0·14	48·39
372	Manufacture of machine tools	7·84	93·41
373	Manufacture of textile machinery and accessories.	0·93	57·87
374	Manufacture of heavy electrical machinery and equipment such as motors, generators, transformers.	3·31	62·14
375	Manufacture of electric lamps and fans ..	....	9·12
376	Manufacture of insulated wires and cables ..	0·83	25·21
377	Manufacture of all kinds of battery ..	....	58·37
378	Manufacture of electronic equipment such as radio, microphone.	1·83	40·44

TABLE No. 1—*contd.*

Code No.	Industry.	Percentage of Engineers to total employment.	Percentage of Craftsmen to total employment.
379	Manufacture of electric machinery and apparatus, appliances not specified above.	1·63	69·25
382	Manufacture and assembling of motor vehicles of all types (excepting motor engines).	0·43	44·29
383	Manufacture of motor vehicles engine parts and accessories.	3·80	56·65
384	Repairing and servicing of motor vehicles.	0·22	55·68
386	Building and Repairing of water transport equipment such as ships, boats and manufacture of marine engines.	0·50	53·23
387	Manufacture and repair of air transport equipment including aeroplanes, acro-engines.	4·00	36·00
390	Manufacture of optical instruments and lenses, ophthalmic goods and photographic equipment and supplies.	....	25·27
391	Manufacture of scientific, medical and surgical instruments and equipment and supplies.	....	88·21
392	Assembling and repairing of watches and clocks.	....	75·78
393	Manufacture of jewellery silverware and wares using gold and other precious metals.	....	3·14
395	Manufacture of stationery articles not covered elsewhere such as pencil, pen-holder, fountainpen.	0·17	34·50
399	Manufacture and repair works of goods not assignable to any other group.	0·16	38·20
350	Manufacture of other non-metallic mineral products not elsewhere specified.	0·37	34·46
	All Industries ..	0·47	15·58

Source.—Primary data Employment Market Information.

TABLE No. 2

Relative proportion of selected categories of Engineers to the total Number of Engineers in manufacturing industries in the private sector.

Code No.	Category of Engineers	No. of Engineers	Percentage to total.
001	Civil Engineers (including Overseers)	333	21·75
002	Mechanical Engineers (including Automobile Engineers).	892	58·26
003	Electrical Engineers (including Telecommunication Engineers).	172	11·24
004	Chemical Engineers	94	6·14
	Others	40	2·61
	Total Engineers ..	1,531	100·00

Source—Primary data Employment Market Information.

TABLE No. 3

Relative proportion of workers in selected occupations to the total No. of Craftsmen in manufacturing industries in the private sector

Code No.	Occupation	No. of Craftsmen.	Percentage to total.
730	Furnacemen, Metal ..	460	0.92
731	Annealers, Tamperers and Related Heat Treaters.	64	0.13
732	Rolling Mill Operators, Metal ..	87	0.17
733	Blacksmiths, Hammersmiths, and Forgemn.	1,388	2.76
734	Moulders and Coremakers ..	1,270	2.53
735	Metal Drawers and Extruders ..	52	0.10
739	Furnacemen, Rollers, Drawers, Moulders and Related Metal Making and Treating Workers, (n. e. c.)	454	0.90
740	Precision Instrument Makers, Watch and Clock Makers and Repairmen.	102	0.20
750	Fitter-Machinists, Toolmakers and Machine Tool Setters.	5,164	10.29
751	Machine Tool Operators ..	8,904	17.73
752	Fitter-Assemblers and Machine Erectors (Except Electrical and Precision Instrument Fitter-Assemblers).	5,174	10.31
753	Mechanics-Repairmen (Except Electrical and Precision Instrument Repairmen).	3,372	6.72
754	Sheet Metal Workers ..	929	1.85
755	Plumbers and Pipe Fitters ..	155	0.31
756	Welders and Flame Cutters ..	1,310	2.61
757	Metal Plate and Structural Metal Workers.	513	1.02
758	Electro Platers, Dip-Platers and Related workers.	297	0.59
759	Toolmakers, Machinists, Plumbers, Welders, Platers and Related Workers (n. e. c.) (Including Metal Engravers other than printing).	8,980	17.89
760	Electricians, Electrical Repairmen and Related Electrical Workers.	1,356	2.70
761	Electrical and Electronics Fitters ..	459	0.91
762	Mechanics Repairmen, Radio and Television.	309	0.62
764	Linemen and Cable Jointers ..	1,289	2.57

TABLE No. 3—*contd.*

Code No.	Occupation	No. of Craftsmen.	Percentage to total.
769	Electricians and Related Electrical and Electronics Workers, (n. e. c.)	702	1.40
770	Carpenters, Joiners, Pattern Makers (Wood).	2,861	5.70
780	Painters and Paper Hangers ..	1,185	2.36
791	Bricklayers, Plasterers and Masons ..	559	1.11
870	Operators, Stationary Engine and Related Equipment.	1,098	2.19
871	Boilermen and Firemen ..	1,714	3.41
Total Craftsmen ..		50,207	100.00

Source : Primary data-Employment Market Information

TABLE No. 4.

*Relative proportion of selected categories of Engineers to the total No. of Engineers
in the public sector undertakings*

Code No.	Category of Engineers	No. of Engineers.	Percentage to total.
001	Civil Engineers	5,783	63·11
002	Mechanical Engineers	454	4·95
003	Electrical Engineers	638	6·96
004	Chemical Engineers	15	0·16
	Others	2,274	24·82
	Total Engineers ..	9,164	100·00

Source : Primary data—Employment Market Information.

TABLE No. 5

Relative Proportion of Workers in Selected Occupations to the total Number of Craftsmen in Public Sector

Code No.	Occupation	No. of Craftsmen	Percentage to total
730	Furnacemen, Metal	394	0.95
731	Annealers, Tamperers and Related Heat Treaters.	51	0.12
732	Rolling Mill Operators, Metal	10	0.02
733	Blacksmiths, Hammersmiths and Forgemn.	1,329	3.23
734	Moulders and Coremakers	380	0.92
735	Metal Drawers and Extruders	24	0.06
739	Furnacemen, Rollers, Drawers Moulders and Related Metal Making and Treating Workers, (n. e. c.).	289	0.70
740	Precision Instrument Makers, Watch and Clock Makers and Repairmen.	346	0.85
750	Fitter-Mechinists, Toolmakers and Machine Tool Setters.	2,600	6.32
751	Machine Tool Operators	3,034	7.35
752	Fitter-Assemblers and Machine Erectors (Except Electrical and Precision Instrument Fitter-Assemblers).	7,359	17.83
753	Mechanic-Repairmen (Except Electrical and Precision Instrument Repairmen).	7,273	17.63
754	Sheet Metal Workers	580	1.41
755	Plumbers and Pipe Fitters	237	0.57
756	Welders and Flame Cutters	979	2.37
757	Metal Plate and Structural Metal Workers.	594	1.44
758	Electro-Platers, Dip-Platers and Related Workers.	208	0.50
759	Toolmakers, Machinists, Plumbers, Welders, Platers and Related Workers (n. e. c.) (Including Metal Engravers other than printing).	2,754	6.68
760	Electricians, Electrical Repairmen and Related Electrical Workers.	1,628	3.95
761	Electrical and Electronics Fitters	501	1.21
762	Mechanics, Repairmen, Radio and Television.	320	0.78
764	Linemen and Cable Jointers	2,077	5.03

TABLE No. 5—contd.

Code No.	Occupation	No. or Craftsmen	Percentage to total
769	Electricians and Related Electrical and Electronics Workers (n. e. c.)	618	1.50
770	Carpenters, Joiners, Pattern Makers (wood).	3,393	8.22
780	Painters and Paper Hangers ..	1,396	3.38
791	Bricklayers, Plasterers and Masons ..	1,279	3.10
870	Operators, Stationary Engine and Related Equipment.	533	1.29
871	Boilermen and Firemen	1,069	2.59
	Total Craftsmen ..	41,264	100.00

Source : Primary data, Employment Market Information.

TABLE No. 6

* *Relative Proportion of Selected Categories of Engineers to the total Number of Engineers in Manufacturing Industries*

Code No.	Category of Engineers.	No. of Engineers.	Percentage to total.
001	Civil Engineers	968	17.55
002	Mechanical Engineers	2,854	51.76
003	Electrical Engineers	1,201	21.78
004	Chemical Engineers	317	5.75
	Others	174	3.16
	Total Engineers	5,514	100.00

Source : Primary data—Population Census, 1961.

TABLE No. 7

*Relative Proportion of Workers in Selected Occupations to the total Number of Craftsmen
in Manufacturing Industries*

Code No.	Occupation	No. of Craftsmen.	Percentage to total.
730	Furnacemen, Metal	1,256	0.49
731	Annealers, Tamperers and Related Heat Treaters.	275	0.11
732	Rolling Mill Operators, Metal ..	530	0.21
733	Blacksmiths, Hammersmiths, and Forgemn.	14,288	5.51
734	Moulders and Coremakers	4,677	1.81
735	Metal Drawers and Extruders	309	0.12
739	Furnacemen, Rollers, Drawers, Moulders and Related Metal Making and Treating Workers (n. e. c.).	3,840	1.48
740	Precision Instrument Makers, Watch and Clock Makers and Repairmen.	3,508	1.35
750	Fitter-Mechinists, Toolmakers and Machine Tool Setters.	37,606	14.51
751	Machine Tool Operators	21,698	8.37
752	Fitter-Assemblers and Machine Erectors (Except Electrical and Precision Instrument Fitter-Assemblers).	8,042	3.10
753	Mechanics-Repairmen (Except Electrical and Precision Instrument Repairmen).	46,865	18.08
754	Sheet Metal Workers	9,057	3.50
755	Plumbers and Pipe Fitters	925	0.36
756	Welders and Flame Cutters	6,411	2.47
757	Metal Plate and Structural Metal Workers.	1,280	0.49
758	Electroplaters, Dip-Platers and Related Workers.	3,129	1.21
759	Toolmakers, Machinists, Plumbers, Welders, Platers and Related Workers (n. e. c.) (including Metal Engravers other than printing).	15,012	5.79
760	Electricians, Electrical Repairmen and Related Electrical Workers.	5,915	2.28
761	Electrical and Electronics Fitters ..	1,509	0.58
762	Mechanics, Repairmen, Radio and Television.	1,813	0.70
764	Linemen and Cable Jointers	5,796	2.24

TABLE No. 7—contd.

Code No.	Occupation	No. of Craftsmen	Percentage to total
769	Electricians and Related Electrical and Electronics Workers (n. e. c.).	3,143	1.21
770	Carpenters, Joiners, Pattern Makers (Wood).	46,193	17.82
780	Painters and Paper Hangers	7,058	2.72
791	Bricklayers, Plasterers and Masons .. .. .	.....	.....
870	Operators, Stationary Engine and Related Equipment.	4,183	1.61
871	Boilermen and Firemen	4,857	1.88
Total, Craftsmen ..		2,59,175	100.00

SOURCE : Primary data—Population Census, 1961.

TABLE No. 8

Relative proportion of selected categories of Engineers to the total number of Engineers in construction industry

Code No.	Category of Engineers.	No. of Engineers.	Percentage to total.
001	Civil Engineers (Including Overseers)	3,189	74.97
002	Mechanical Engineers	455	10.70
003	Electrical Engineers	112	2.63
	Others	498	11.70
Total, Engineers		4,254	100.00

SOURCE : Primary data—Population Census, 1961.

TABLE No. 9

Relative proportion of workers in selected occupations to the total number of Craftsmen in construction industry

Code No.	Occupation.	No. of Craftsmen.	Percentage to total.
730	Furnacemen, Metal ..	13	0.02
731	Annealers, Tamperers and Related Heat Treaters.	31	0.05
732	Rolling Mill Operators, Metal ..	....	....
733	Blacksmiths, Hammersmiths and Forgemen ..	150	0.22
734	Moulders and Coremakers ..	18	0.03
735	Metal Drawers and Extruders ..	....	....
739	Furnacemen, Rollers, Drawers, Moulders and Related Metal Making and Treating Workers (n.e.c.).	13	0.02
740	Precision Instrument Makers, Watch and Clock Makers and Repairmen.	....	....
750	Fitter-Machinists, Toolmakers and Machine Tool Setters.	1,622	2.41
751	Machine Tool Operators	252	0.37
752	Fitter-Assemblers and Machine Erectors (Except Electrical and Precision Instrument Fitter-Assemblers).	252	0.37
753	Mechanics-Repairmen (Except Electrical and Precision Instrument Repairmen).	794	1.18
754	Sheet Metal Workers	7	0.01
755	Plumbers and Pipe Fitters	1,477	2.20
756	Welders and Flame Cutters	171	0.25
757	Metal Plate and Structural Metal Workers ..	48	0.07
758	Electroplaters, Dip-Platers and Related Workers.	5	0.01
759	Toolmakers, Machinists, Plumbers, Welders, Platers and Related Workers (n.e.c.) (Including Metal Engravers other than printing).	144	0.21
760	Electricians, Electrical Repairmen and Related Electrical Workers.	1,056	1.57
761	Electrical and Electronics Fitters ..	109	0.16
762	Mechanics, Repairmen, Radio and Television.	....	....

TABLE No. 9—*contd.*

Code No.	Occupation	No. of Craftsmen.	Percentage to total.
764	Linemen and Cable Jointers	643	0·95
769	Electricians and Related Electrical and Electronics Workers (n.e.c.).	385	0·57
770	Carpenters, Joiners, Pattern Makers (Wood).	4,240	6·30
780	Painters and Paper Hangers	3,795	5·63
791	Bricklayers, Plasterers and Masons	51,583	76·57
870	Operators, Stationary Engine and Related Equipment.	502	0·75
871	Boilermen and Firemen	54	0·08
Total, Craftsmen		67,364	100·00

SOURCE : Primary data—Population Census, 1961.

STATISTICAL ABSTRACT

(Percentages)

Code No.	Category of Engineers.	Source : Employment Market Information		Population Census 1961	
		Sector : Private	Public	Both	Both
		Industrial Classification	Mfg. Industry	All Industries	Mfg. Industry	Construction industry
<i>Engineers</i>					
000	Architects	0.07	0.39	0.80	7.43
001	Civil Engineers (including Overseers).	21.75	63.11	17.55	74.97
002	Mechanical Engineers (including Automobile Engineers).	58.26	4.95	51.76	10.70
003	Electrical Engineers (including Telecommunication Engineers).	11.23	6.96	21.78	2.63
004	Chemical Engineers	6.14	0.16	5.75	....
005	Metallurgical Engineers	1.50	0.31	0.94	0.09
007	Surveyors	1.05	24.12	1.42	4.18
Percentage of Engineers to total employment.		0.47	1.24	0.42	1.81
<i>Draftsmen</i>					
Percentage of Draftsmen to total employment.		0.15	0.22	0.10	0.26

STATISTICAL ABSTRACT—*contd.*

(Percentages)

Code No.	Occupation	Source : Employment Market Information			Population Census 1961		
		Sector :		Private	Public	Both	Both
		Industry Type	Mfg. Industry	All Industries	Constru- ction Industry	Mfg. Industry	
<i>Craftsmen</i>							
730	Furnacemen (Metal) ..	....	0·92	0·95	0·02	0·49
731	Annealers, Tamperers & Related Heat Treaters.	....	0·13	0·12	0·05	0·11
732	Rolling Mill Operators (Metal)	....	0·17	0·02	....	0·21
733	Blacksmiths, Hammersmiths & Forgemn.	....	2·76	3·23	0·22	5·51
734	Moulders & Coremakers ..	....	2·53	0·92	0·03	1·81
735	Metal Drawers and Extruders..	....	0·10	0·06	..	0·12
739	Furnacemen, Rollers, Drawers, Moulders and Related Metal Making & Treating workers (n.e.c.).	....	0·90	0·70	0·02	1·48
740	Precision Instruments Makers, Watch & Clock Makers & Repairmen.	....	0·20	0·85	..	1·35
750	Fitter-Machinists, Tool Makers & Machine Tool Operators.	....	10·29	6·32	2·41	14·51
751	Machine Tool Operators (i.e. Machinists).	....	17·73	7·35	0·37	8·37
752	Fitter-Assemblers & Machine Erectors (Except Electrical & Precision Instruments Fitter-Assemblers).	....	10·31	17·83	0·37	3·10
753	Machanics-Repairmen (Except Electrical & Precision Instrument Repairmen).	....	6·72	17·63	1·18	18·08
754	Sheet Metal Workers ..	....	1·85	1·41	0·01	3·50
755	Plumbers and Pipe Fitters ..	....	0·31	0·57	2·20	0·36
756	Welders and Flame Cutters ..	....	2·61	2·37	0·25	2·47
757	Metal Plate & Structural Metal Workers.	....	1·02	1·44	0·07	0·49

STATISTICAL ABSTRACT—concl'd.

		(Percentages)				
Code No.	Occupation	Source : Employment Market Information			Population Census 1961	
		Sector :		Public	Both	Both
		Industry Type	Mfg. Industry	All Indust- ries	Constru- ction Industry	Mfg. Industry
<i>Craftsmen—contd.</i>						
758	Electroplaters, Dip-platers and Related Workers.	....	0·59	0·50	0·01	1·21
759	Tool Makers, Machinists Plum- bers, Welders, Platers and Related workers (n.e.c.) (in- cluding metal Engravers other than Printing).	....	17·89	6·68	0·21	5·79
760	Electricians, Electrical Repair- men and Related Electrical workers.	....	2·70	3·95	1·57	2·28
761	Electrical and Electronics Fitters	....	0·91	1·21	0·16	0·58
762	Mechanics-Repairmen, Radio and Television.	....	0·62	0·78	..	0·70
764	Linemen and Cable Jointers ..	....	2·57	5·03	0·95	2·24
769	Electricians and Related Electri- cal and Electronics workers, (n.e.c.).	....	1·40	1·50	0·57	1·21
770	Carpenters, Joiners, Pattern makers (wood).	....	5·70	8·22	6·30	17·82
780	Painters and Paper Hangers ..	....	2·36	3·38	5·63	2·72
791	Bricklayers, Plasterers and Masons.	....	1·11	3·10	76·57	..
870	Operators, Stationary Engine and Related Equipment.	....	2·19	1·29	0·75	1·61
871	Boilermen and Firemen ..	....	3·41	2·59	0·08	1·88
Percentage of Craftsmen to total Employment.		....	15·58	5·60	28·59	19·79

APPENDIX

List of Selected Categories of Engineers and Craftsmen

ENGINEERS

Code No.	Category
001	Civil Engineers (including Overseers.)
002	Machanical Engineers (including Automobile Engineers)
003	Electrical Engineers (including Telecommunication Engineers)
004	Chemical Engineers
....	Others (includes Architects, Metallurgical Engineers and Surveyors.

CRAFTSMEN

Code No.	Category
730	Furnaceman, Metal.
731	Annealers, Tamperers and Related Heat Treaters.
732	Rolling Mill Operators, Metal.
733	Blacksmiths, Hammersmiths and Forgemen.
734	Moulders and Coremakers.
735	Metal Drawers and Extruders.
739	Furnacemen, Rollers, Drawers, Moulders and Related metal Making and Treating Workers (n.e.c.).
740	Precision Instrument Makers, Watch and Clock Makers and Repairmen.
750	Fitter-Machinists, Toolmakers and Machine Tool Setters.
751	Machine Tool Operators.
752	Fitter-Assemblers and Machine Erectors (except Electrical and Precision Instrument Fitter-Assemblers).
753	Mechanics-Repairmen (except Electrical and Precision Instrument Repairmen).
754	Sheet Metal Workers.
755	Plumbers and Pipe Fitters.
756	Welders and Flame Cutters.

CRAFTSMEN—*contd.*

Code No.	Category
757	Metal Plate and Structural Metal Workers.
758	Electro Platers, Dip-Platers and Related workers.
759	Toolmakers, Machinists, Plumbers, Welders, Platers and Related Workers (n.e.c.) (including Metal Engravers other than Printing).
760	Electricians, Electrical Repairmen and Related Electrical Workers.
761	Electrical and Electronics Fitters.
762	Mechanics Repairmen, Radio and Television.
764	Linemen and Cable Jointers.
769	Electricians and Related Electrical and Electronics Workers (n.e.c.).
770	Carpenters, Joiners, Pattern Makers (Wood).
780	Painters and Paper Hangers.
791	Bricklayers, Plasterers and Masons.
870	Operators, Stationary Engine and Related Equipment.
871	Boilermen and Firemen.

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