



OCCUPATIONAL PATTERNS OF ENGINEERING PERSONNEL



DIRECTORATE OF EVALUATION AND MANPOWER
PLANNING AND SOCIAL WELFARE DEPARTMENT

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PREFACE

This study on "Occupational patterns of Engineering Personnel in Mysore State" seeks to determine the engineer and craftsman components in manufacturing and construction industries in the State. Such a study would be useful in Manpower Planning and would also help in employment counselling. To a limited extent, it also is of use in plans of project expansion.

The study is based mainly on data furnished by the Director of Employment and Training and his help is gladly acknowledged. Sri K. Shivappa, Assistant Director of Manpower, was in charge of this study.

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1.0. Introduction :

Planning, to be effective, requires an intelligent appraisal of the monetary, material and manpower resources. Manpower can be as vital an asset to a developing nation as capital. The timely and scientific assessment of manpower requirements and the optimum training facilities available, help in keeping development Programmes within the ambit of practical achievement and avoiding ambitious targets which cannot be fulfilled for want of technical personnel. The rapid pace of industrialisation during the Second and Third Plans has witnessed significant changes in the occupational structure of industrial employment showing a rising trend. This has created certain problems in the estimation of manpower requirements and employment pattern of engineers and craftsman employed in various industries. Since one of the object of the Plans is to create employment opportunities to the employable manpower of the country, an attempt has been made in this report to give a picture of pattern of employment particularly of engineers and certain categories of craftsmen obtaining in the manufacturing and construction industries in the private and public sectors in Mysore State.

1.1 Objective of the Study :

The objective of the study is :

1. to determine the proportion of engineering personnel to the total employment in the manufacturing and construction industries.
2. to determine the inter-se-ratios between certain selected categories of engineers and craftsmen.

It is possible from this study to laydown a workable base for estimation of future requirements of engineering personnel on the assumption that the occupational structure in a given sector tends to remain fairly constant over a period of time provided no major changes occur in the field of industrial development, specially technological changes.

1.2. Source and Coverage :

It was not intended to collect any statistical data afresh for this study. This study is based on the data collected by the Employment

Market Information Unit of the Directorate of Employment and Training in Mysore, Bangalore, at quarterly and biennial intervals, under the provisions of the Employment Exchanges (Compulsory Notification of vacancies) Act 1959—public and private Sector undertakings being covered every alternate year.

The pattern of employment in the manufacturing, construction and Industrial establishments of both the sectors of Mysore State is dealt with. The subject matter covers the different categories of Engineers viz., Civil, Mechanical Electrical, Chemical and Metallurgical engineers and as many as 37 categories of craftsmen.

The information from the private sector is obtained separately from larger establishments employing 25 persons and more and from the smaller establishments employing less than 25 persons.

The data regarding the private sector relates to September, 1965 and that of the public sector to September 1964. In order to have a comparative study, the data on occupational pattern of engineers and craftsmen employed in the private Sector as on 30th September 1963 is also given.

Another useful source of information utilised in this study is the data on occupational patterns of engineers and craftsmen that existed in 1961, as indicated in the census reports of 1961, published by the Superintendent of Census Operations in Mysore, Bangalore.

In the private sector, out of the 1308 larger establishments addressed, 863 responded, the percentage of response being 65.98 per cent. Similarly out of the 2138 smaller establishments 1186 responded, the percentage of response being 54.07 per cent. Thus the response is more than 50 per cent in the private sector in both the types of establishments.

In the public sector, out of the 3190 establishments addressed, 2995 responded, the percentage of response being 93.89. The response from the Public Sector establishments is better than that of the private sector establishments.

1.3. *Concepts and Definitions :*

The concepts and definitions of different categories of engineers and craftsmen, adopted in this study are the same as those given in the National Classification of Occupations (N.C.O.), published by the Director-General of Employment and Training, New Delhi. All the categories of occupations listed under divisions 7 and 8 of N.C.O. constitute craftsmen.

The term "engineering personnel" includes not only engineers, who are degree or diploma holders but also craftsmen. For the purpose of this study the categories of "Engineers" considered are mainly those falling under civil engineering, electrical engineering, mechanical engineering and metallurgical engineering. The categories selected under "Craftsmen" comprise of 37 occupations most of which are basic engineering trades, which are considered to be common to a number of industries.

2.0. *Findings of the study :*

General: Occupational pattern of engineers and craftsmen as on 30th September 1965 in the manufacturing industries of the private sector (separately for larger and smaller establishments) and those employed in the public sector establishments are given in Tables I to IV of the Appendix. The percentage distribution of engineers and craftsmen, in manufacturing, construction and other industries as per 1961 census are detailed in Tables VII to X of the Appendix. The proportion of selected categories of engineers and craftsmen in the private sector establishments as on 30th September 1965 are given in Tables No. XI and XII of the Appendix.

2.1. *Occupational Pattern in Manufacturing Industries in the Private sector as on 30th September 1965.*

From the manufacturing industries of the State, 26 categories of larger establishments and 19 categories of smaller establishments were selected to study the proportional employment of engineers and craftsmen to the total employment.

Out of 77,846 persons employed in larger establishments of the private sector, 888 were found to be engineers constituting 1.14 percent of the total employment.

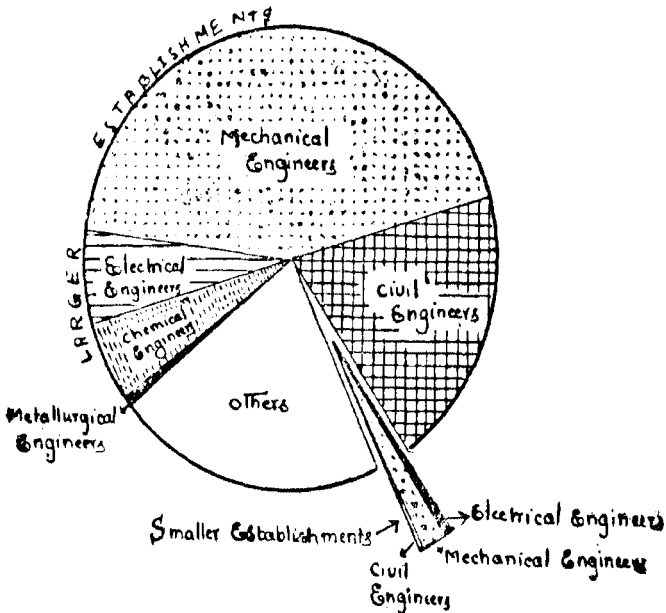
The industrywise ratios of engineers to total employment are given in Table No. 1. The highest percentage of 7.70 is recorded in the manufacture and assembling of prime movers and boilers and machine tools, followed by 5.02 per cent in the manufacture of Electrical machinery and equipment. The proportion is fairly high, i.e., between 2 and 3 per cent in the sugar mills (2.32 per cent) and other basic metals industry (2.42 per cent). The percentages are between 1 per cent and 2 per cent in the case of paper manufacturing (1.52 per cent), Machinery other than electrical (1.70 per cent) and transport equipment (1.36 per cent). In all other industries it is below one per cent.

Similarly, out of the 77,846 employed in the larger establishments of the private sector, 63,237 were found to be craftsmen forming 81.23 per cent of the total employment. The industrywise ratios of craftsmen to total employment are given in Table No. 1. The highest percentage of 96.06 is recorded in the rice mills, followed by 92.93 per cent in the case of silk textile industry, 91.50 per cent in the case of other textiles and 91.13 per cent in the case of non metallic mineral products. Craftsmen constitute more than 50 per cent but below 90 per cent of the total employment in all other industries except in the case of rubber and petroleum products industries where the proportion is only 28.87 per cent.

In the case of smaller establishments, only 26 engineers were working out of the total employment of 5074, forming only 0.51 per cent. The industrywise ratios to total employment are given in Table No. II. The highest percentage of 3.33 is recorded in the case of miscellaneous manufacturing industries followed by 1.64 per cent in the case of cotton textile industry. In all other industries it is below one per cent.

Out of the 5074 employed in the smaller establishments of the private sector, 4163 are craftsmen forming 82.05 per cent. The industrywise ratios are presented in Table No. II. The maximum percentage is recorded in the case of miscellaneous manufacturing industries followed by paper and paper product industries (97.17 per cent). In all other cases it is more than 50 per cent but below 90 per cent.

III. Percentage Distribution of Selected Categories of Engineers in Manufacturing Industries in Private Sector as on 30.9.65:—



The total number of engineers in both the larger and smaller establishments of all the manufacturing industries of the private sector is 931 and 26 respectively. Categorywise details of engineers are furnished in Table No. III. Mechanical engineers formed the highest percentage of 44.90 and 62.93 in the larger and smaller establishments respectively. Next come Civil Engineers with 20.19 and 7.69 per cent respectively followed by Electrical engineers with 6.08 and 19.23 per cent respectively for larger and smaller establishments. Chemical engineers and Metallurgical engineers are found only in the case of larger establishments. (Table III).

Similarly, the interse proportion of selected occupations of craftsmen are available in Table No. IV. The total number of craftsmen in both the larger and smaller establishments of the private sector was 16837 and 876. The distribution between the larger and smaller establishments was, Machine repairmen were 6.22 per cent and 31.28 per cent and Tool makers and Tool setters 13.62 per cent and 11.53 per cent respectively. The percentage distribution of some other important occupational categories among craftsmen are given below :—

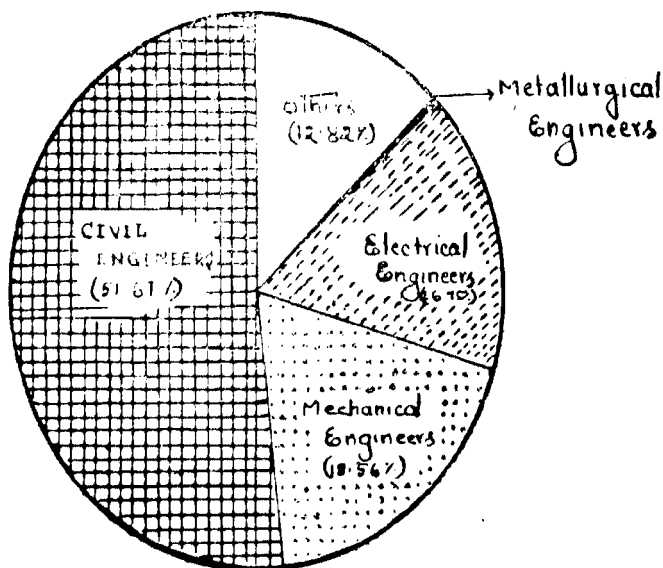
<i>Occupation</i>	<i>Larger establishments.</i>	<i>Smaller establishments.</i>
Machine tool operators ..	12.30	8.79
Tool makers, machinists, plumber.	18.13	2.05
Blacksmith and Hammersmith ..	2.02	4.22
Furnace men metal ..	1.44	2.85
Electricians ..	1.72	2.17
Electricians and related workers n.e.c.	2.74	1.03
Carpenters ..	2.77	7.31
Tobacco preparers and product makers.	7.84	3.65
Cheroot, Cigar and Bidi makers ..	8.16	4.57
Masons ..	3.90	0.11
Oilers and greasers, stationary engines, Motor vehicles, and related equip- ments.	2.64	5.82

Note :—n.e.c.=not elsewhere classified.

2.2. Occupational Pattern in the public sector according to Employment Market Information as on 30th September 1964.

The distribution of selected categories of engineers in public sector establishments (engaged in non-agricultural activities such as, manufacturing industries construction, etc.) are given in Table No. V.

V Percentage Distribution of Selected Categories of Engineers in public Sector as on 30.9.64



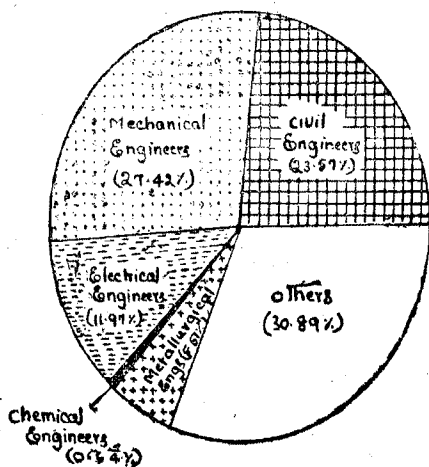
In these establishments, the total number of engineers employed was 8369, out of which 4324 constituting 51.67 per cent of the total were civil engineers, 1553 forming 18.56 percent were mechanical engineers and 1402 forming 18.56 percent were electrical engineers. Chemical and Metallurgical engineers contributed less than one per cent.

The inter-se ratios of craftsmen in the Public sector is given in Table No. VI. The total employment of craftsmen in 37 selected occupations was 34,090 out of which 4,155 (12.9 per cent) were

tool makers and tool settlers, 9,536 (27.97 per cent) were machine repairmen, 3,753 (11.01 per cent) were mechanics (Radio and television), 2,198 (6.45 per cent) were machine tool operators, 2,027 (5.95 per cent) were linemen and cable jointers, 1,326 (3.88 per cent) were carpenters, the remaining occupations being less than 3 per cent.

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

VII. Percentage Distribution of Engineers in Manufacturing Industries as per 1961 census:-

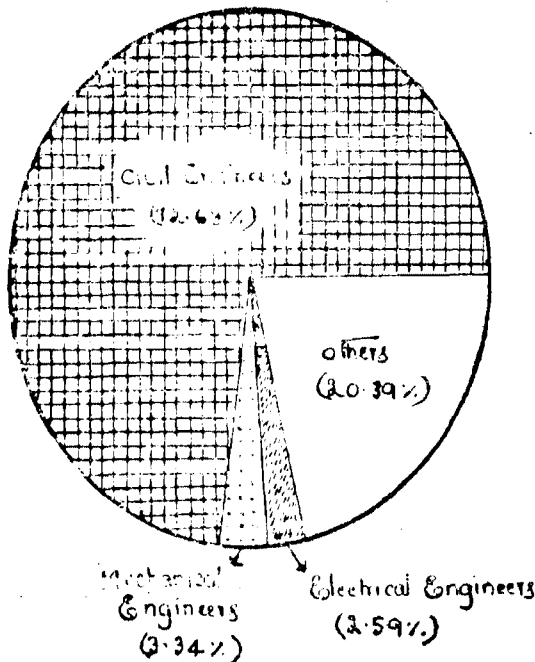


According to the 1961 census there were 1871 engineers in manufacturing industries (Private and Public Sector combined) other than household industry from the occupations selected for the study, out of which 441 persons constituting 23.57 per cent of the total were Civil Engineers, 513 persons (27.42 per cent of the total) were Mechanical Engineers and 224 persons (11.97 per cent of the total) were Electrical Engineers. All the three categories together constitute more than 60 per cent of the total, whereas Metallurgical Engineers and Architects, Engineers and Surveyors constitute 5.51 and 29.93 per cent respectively (Table No. VII).

As regards craftsmen, the population census of 1961 recorded 1,33,633 persons from the occupations selected for this study. The relative ratio of each of the selected occupations to their total number is given in Table No. VIII. As many as 29,527 (22.10 per cent of the total) persons were cheroot, cigar and bidi makers followed by carpenters 24,216 persons (18.12 per cent of the total). Machine repairmen constitute 16.88 per cent of the total (22,554 Persons), where as Tool makers, Machinists, Plumbers formed 7.04 per cent of the total (9,407 persons) followed by Tool makers, Tool setters and Fitter machinists forming 5.54 per cent of the total (7,405 persons). But Blacksmiths and Hammersmiths and Forgemen claimed 4.74 per cent of the total (6,339 persons), the rest claiming less than 3 per cent of the total.

2.4. Occupational Pattern in Construction on Industry According to Population Census, 1961.

Percentage of Engineers in Construction Industries as per 1961 Census:—



3,474 Engineers were recorded in the occupations selected for the study according to different categories in construction industries of the State in the 1961 census. The inter-se-ratios of engineers are furnished in Table No. IX. Civil Engineers constitute 72.68 per cent of total (2,525 persons) followed by Architects, Engineers and Surveyors forming 12.58 per cent of the total. Architects claimed 5.21 per cent (181 persons) of the total, the rest (including Mechanical and Electrical Engineers) constitute less than 4 per cent of the total.

36,214 craftsmen comprising the selected occupations were recorded in the construction industry in the 1961 census. Table No. X gives the relative proportion of workers in construction industry. Masons represent 86.95 per cent (31,488 persons) of the total craftsmen, followed by carpenters *viz.*, 4 per cent (1,448 persons) of the total. The rest of the categories claimed less than 2 per cent.

2.5. Occupational Pattern in Private Sector Establishments as on 30th September 1963.

The number of Engineers and craftsmen in larger, smaller and all establishments of the private sector as on 30th September 1963 is given in Table XI and XII.

Out of 1,161 Engineers employed, 1,125 were in larger and 36 in smaller establishments. Mechanical Engineers claimed the highest percentage of 36.61 followed by Electrical Engineers (17.31 per cent) and Civil Engineers (15.76 per cent) in the case of all establishments. The same order is maintained in larger and smaller establishments. (Table XI).

Out of the 16,926 craftsmen employed, 14,940 were in larger and 1,986 in smaller establishment. Machine tool operators claimed the highest percentage of 30.12 per cent followed by Tool makers and Tool setters (13.99 per cent) and Machine repairmen (8.12 per cent) in all establishments. The other occupations formed less than 8 per cent of the total in the case of all establishments. The same order is maintained in the case of larger establishments with 33.13, 14.43 and 7.74 per cent respectively, whereas this order is not found in the case of smaller establishments. In the latter, cheroot, cigar and bidi makers claimed the highest percentage

(16.93 per cent) followed by curers, graders and blenders (15.00 per cent), whereas machine repairmen and Tool makers and Tool setters claimed 10.93 and 10.67 per cent respectively. (Table No. XII).

2.6. Summary and Conclusions :

To summarise the results of the study, a comparative picture of the percentage distribution of Engineers according to different categories, employed in manufacturing industries of the private sector as on 30th September 1965, all industries of public sector as on 30th September 1964, manufacturing and construction industries of both the sectors indicated by the 1961 census and all the industries of private sector as on 30th September 1963 is furnished below :—

Sl. No.	Category of Engineers	Private sector as on 30-9-65		Public Sector as on 30-9-1964	Both Sectors 1961 census		Private sector as on 30-9-63		
		Manfg. Industry		All Industries	Manfg. Industry	Constn. Industry	Larger Establishments	Smaller Establishments	
		Larger Establishments	Smaller Establishments		Indus-try	Indus-try	Estab-lish-ments	Estab-lish-ments	
1	2	3	4	5	6	7	8	9	
1.	Civil Engineers.	20.19	7.69	51.67	23.57	72.68	16.27	..	
2.	Mechanical Engineers.	44.90	69.23	18.56	27.42	3.34	35.20	80.56	
3.	Electrical Engineers.	6.93	19.23	16.75	11.97	2.59	17.33	16.67	
4.	Chemical Engineers.	5.69	..	0.02	0.64	..	0.09	..	
5.	Metallurgical Engineers.	0.54	..	0.18	5.51	..	0.27	..	
6.	Others	..	21.70	3.85	12.82	30.89	21.39	30.84	2.77

In both the larger and smaller establishments of the manufacturing industries of the private sector, the total number (as on 30th September 1965) of mechanical engineers were the highest comprising 44.90 and 69.23 per cent of the total employment. They are followed by Civil Engineers (20.19 per cent) in larger

establishments and 7.69 per cent in the smaller establishments, and Electrical Engineers (19.23 per cent in smaller and 6.93 per cent in larger establishments). It can also be seen that there are very few number of metallurgical Engineers in these industrial establishments.

On the contrary, it is found that Mechanical Engineers occupy the second place, (18.56 per cent of the total), in the public sector establishments on 30th September 1964. Civil Engineers with a percentage of 51.67 constitute the major part of the total. Next to these two categories come Electrical Engineers with an employment of 16.75 per cent of the total.

According to 1961 census, in manufacturing industries of both the sectors of Mysore State, Mechanical Engineers have an important role since they constitute the highest percentage of the total. Similarly, in construction industries of the State, Civil Engineers dominate.

In the private sector establishments in the State (as on 30th September 1963) the percentage of Mechanical Engineers was the highest in both larger and smaller industrial establishments. Thus, it is evident that Mechanical Engineers together with Electrical and Civil Engineers play a significant role in the manufacturing and other industries of the State.

From the tables relating to the distribution of craftsmen it could be seen that the total number of craftsmen in larger establishments varies from 53 to 96 per cent of the total employment and in smaller establishments it varies from 57 to 97 per cent of the total.

As in the case of Engineers, the percentage employment of craftsmen in selected occupations can be summarised as follows:—

No.	Category of Craftsmen	Private Sector as on 30-9-65		Public sector as on 30-9-64		Both Sectors 1961 Census		Private Sector as on 30-9-63	
		Manufacturing Industry		All Industries.	Manfg. Industry	Constn. Industry	Larger Establishments	Smaller Establishments	
		Larger Establishments	Smaller Establishments						
1	2	3	4	5	6	7	8	9	
1.	Tool makers and Setters ..	13.32	11.53	12.19	5.54	2.08	14.43	10.67	
2.	Machine tool Operators ..	12.30	8.79	6.45	1.96	0.63	33.13	7.60	
3.	Machine Repairmen ..	6.22	31.28	27.97	16.88	1.37	7.74	10.98	
4.	Tool makers, machinists and plumber	18.13	2.05	2.43	7.04	0.72	1.90	0.50	
5.	Carpenters ..	2.77	7.31	3.88	18.12	4.00	4.63	4.23	
6.	Cheroot, Cigar and Bidi makers	8.16	4.57	..	22.10	..	5.90	16.93	
7.	Tobacco, preparers and product makers ..	7.84	3.65	..	0.95	
8.	Oilers, greasers, stationary Engines Motor Vehicles and related workers ..	2.64	5.82	1.87	0.32	0.18	6.34	7.16	
	Percentage to total No. of Craftsmen ..	71.38	75.00	54.79	72.81	9.03	74.19	53.06	

As could be seen from the above table, the eight categories of Craftsmen comprise the majority of the selected 37 categories of occupations in all industries. But in the case of construction industries, these eight categories of craftsmen constitute only 9.03 per cent of the total, which may be due to the high percentage of masons in this type of industry.

Among the eight categories of craftsmen under study, Tool makers and setters constitutes, 13.92 and 11.53 per cent of the total employment in the larger and smaller establishments of manufacturing industries of the private sector as on 30th September 1965, 12.19 per cent in the public sector Industries during year ended on 30th September 1964 and 5.54 per cent and 2.08 per cent in the manufacturing and construction industries of both the sectors (as per 1961 census). The percentages of tool makers and setters as on 30th September 1963 were 14.43 and 10.67 in the larger and smaller establishment of the private sector industries of the State. Similarly, we find 12.80 and 8.79 per cent of machine tool operators in the larger and smaller establishments of the manufacturing industries as on 30th September 1965 and 6.45 per cent in all industries of the public sector as on 30th September 1964. The contribution of these craftsmen to the manufacturing and construction industries in 1961 is very low being only 1.86 and 0.68 per cent of the respective total employment in these industries according to the 1961 census, but it has improved in the case of all industries of the private sector by 1963.

A fairly high percentage of Machine Repairmen is found in the smaller establishments of the manufacturing industries of the private sector. During the year ended 30th September 1965, 31.28 per cent of the total employment were Machine Repairmen in the smaller establishments of manufacturing industries of the private sector. We also find a fairly good percentage of Machine repairmen in all the industries of the public sector on 30th September 1964 (27.97 per cent), in the Manufacturing Industries of 1961 census (16.88 per cent of the total) and in the smaller establishments of the private sector as on 30th September 1963 (10.98 per cent of the total).

Out of the remaining categories of craftsmen, Tool makers, Machinists and Plumbers are found to be highest in numbers, constituting 18.13 per cent of the total in the larger establishments of manufacturing industries of the private sector as on 30th

September 1965. Cheroot, Cigar and bidi makers constitute a sufficiently high percentage of 22.10 per cent and 16.93 per cent of the total employment in the manufacturing industries of the 1961 census and the smaller establishments of the private sector industries as on 30th September 1963.

Studies of this type serve a useful purpose in helping to determine the engineers and Craftsmen components of total employment which are likely to be generated in a given sector. It also helps to determine the occupational distribution of engineers and craftsmen which is essential for the formulation of manpower training programmes in the State. These inter-se-ratios will also help to determine the share of engineers and craftsmen in various industries and indicate a definite trend to estimate the future requirements of engineering personnel.

3.0. STATISTICAL TABLES—APPENDIX:

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