

# PLANNING AND COST ANALYSIS FOR SETTING UP OF A NEW RMC PLANT NEAR BELAGAVI

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**Abstract** – Ready mixed concrete is an advanced technology, which involves high degree of mechanization and automation. Ready mix concrete is a ready to use material that is mixed in a batching plant according to the specification of the customer and is delivered through transit mixers to the clients site.

The owner/client wants to set up a new RMC plant in Belagavi. The clients entrust the engineer or contractor to propose a plan for setting up of a new RMC plant in Belagavi.

The ready mix concrete sector is less familiar and requires significant investment, therefore a thorough investigation is required before establishing a new plant. In this work a feasibility analysis for construction of new RMC plant is carried out. A case study on an existing RMC plant in Belagavi is conducted to examine all the prerequisites required to establish a new RMC plant. With reference to the case study a plan for the proposal of new RMC plant is developed.

**Key Words:** Ready mixed concrete, Feasibility, Case study, Project management, Planning, Scheduling etc.

## 1. INTRODUCTION

The construction industry in India has historically been labour-oriented and simple buildings were built years ago, as mechanisation progressed rather slowly. Therefore, as technology advanced, concrete became more valuable than any other building material, and its usage has been increasing rapidly. Prior to undertaking the actual building process, contractors and builders had to buy, gather and stockpile the raw materials needed for the project. However, this method cannot be used in small and crowded regions with limited space since it requires clean, vacant space for the storage of raw materials at the building site. As a result, ready mix concrete was designed as a solution to this issue. Now the rapidly expanding urbanization has resulted in commercial projects like shopping malls, retail stores, multiplexes, convention centres, and other real estate projects, which have significantly increased the market demand for high-quality concrete while also making the structures earthquake-resistant. In developed nations, ready-mix concrete accounts for roughly 70% of cement utilization, with recast cement accounting for the remaining 25%. The ready-mix concrete sector is the largest in the world and is expected to generate more than \$600 billion in revenue by 2025.

## 1.1 Feasibility Analysis

Feasibility analysis is the process where the proposed strategic plan or design is evaluated and confirmed before approval. The goal of a feasibility analysis, also referred to as a feasibility study, is to fairly and logically consider the advantages and disadvantages of a current or proposed business, potential risks, the resources needed to carry out operations, and ultimately the chances that the venture will succeed. The feasibility analysis involves the following steps

- A preliminary survey always comes first in a feasibility study. It involves keeping track of remarks made about the project or considering the solutions and suggestions put forth by stakeholders and other business-related individuals.
- The proposed proposal or remedy is evaluated for merit by thoroughly examining the above preliminary statistics.
- Surveys and market research are conducted thereafter to evaluate consumer demand and the probability that the project will be successful.
- Finally, we decide firmly whether or not to carry out the strategy.

### 1.1.1 Market Feasibility

The main objective of a market feasibility study is to comprehend the market and analyze whether there is sufficient demand for the business to be successful. A market's depth condition and capacity to sustain a given development are all assessed through a market feasibility study. It is a great way for determining the likelihood that a new business initiative will succeed or fail.

## 1.2 Planning

It is an analytical and intellectual process that outlines the goals of an organization and offers many action plans to assist the company achieve their objectives and goals. Before beginning a project in construction, planning is essential to ensuring that it will be completed effectively and on schedule. In the construction industry, planning and managing various aspects in accordance with the plans are two crucial components.

It promotes the coordination of operations, gives direction for action, identifies future opportunities and threats, and

establishes criteria for managing. It assists managers in enhancing future performance.

### 1.3 Microsoft Project (MS Project)

Microsoft Project is a set of project management tools developed and delivered by Microsoft. It is software designed to help project managers in scheduling, allocating resources to projects, tracking progress, keeping costs under control and evaluating workloads.

The project creates budgets in accordance with assignment work and resource costs. When resources are allocated to tasks and assignment work is planned, the programmer estimates the cost, that is equal to the work multiplied by the rate, and rolls it up to the task level, then to any summary tasks, and finally to the project level. Every resource has access to a calendar that lists the days and shifts during which they are accessible.

## 2. METHODOLOGY

In this work a feasibility analysis for construction of new RMC plant is carried out. A case study on an existing RMC plant in Belagavi is conducted to examine all the prerequisites required to establish a new RMC plant. With reference to the case study a plan is for the proposal of new RMC plant is developed.

The following methodology is adopted in this work.

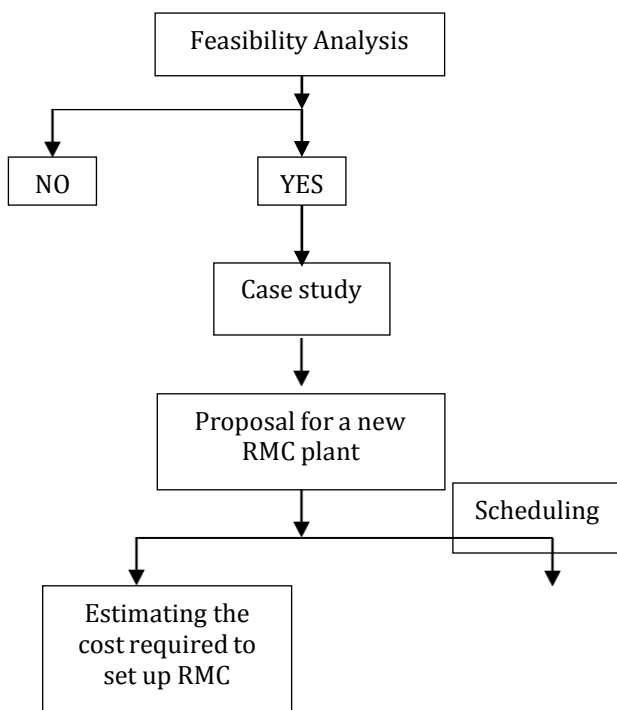


Fig No1-Flowchart for Methodology

### 2.1 Feasibility Analysis For Establishing A New RMC Plant In Belagavi

Belagavi, the fourth-largest city in Karnataka, is home to the country's first designated SEZ center for aerospace precision engineering and manufacturing. With 24 sugar factories, 8 MEUs (medium-sized enterprises), an aluminum factory owned by Hindalco, 5 ready-mix concrete plants, and 24 sugar factories are located in the area.

Under the Prime Minister Narendra Modi's flagship Smart Cities Mission Smart Belagavi, Belagavi is selected as a smart city in the first phase out of 20 cities. As Belagavi is the center for two main national highway there are many high cost projects being constructed in and around Belagavi which is a boost for ready mix concrete industry.

The need for ready-mix concrete is being fueled by the increasing number of infrastructure projects, such as bridges, highways, and airport development projects. There are many number of residential projects ongoing and numerous residential constructions are still in progress. Thus, it is anticipated that the ready-mix concrete industry would experience rapid expansion in the years to come.

#### 2.1.1 Opinion survey

To understand the feasibility for the requirement of RMC in Belagavi and to achieve the objective an opinion survey in the form of questionnaire survey was conducted among several engineers and data was collected on their preferences over ready mix concrete and site mix concrete. The survey study covered a variety of important facts such as the satisfactory factor, need, type of concrete mix preferred.

1. Name of the Contractor/Engineer/firm _____
2. Which type of concrete is feasible/preferred for use ? <ul style="list-style-type: none"> <li>• Site mix</li> <li>• RMC</li> </ul>
3. Which type of concrete is easy to handle ? <ul style="list-style-type: none"> <li>• Site mix</li> <li>• RMC</li> </ul>
4. In which type of concrete quality is achieved ? <ul style="list-style-type: none"> <li>• Site mix</li> <li>• RMC</li> </ul>
5. Is RMC service satisfactory in Belagavi ? <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
6. Is there a necessity for a new RMC plant in Belagavi ? <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>

Fig No.2- Sample of questionnaire survey form

## 2.2 Case Study

To gain knowledge about the ready mix concrete I visited one of the well-known RMC plant in Belagavi in order to learn and understand more about the plant. The study covered a number of significant information, such as the materials, production volume, manufacturing and storage, equipments used, operation and functioning etc.

### 2.2.1 Site visit details.

The details of the following were collected from the site visit:

#### 1. Existing area

The present area of the existing RMC plant is 2 acres, which was procured on a lease basis, with a monthly rent of 2 lakhs.

➤ The various units included in the total plant area are

- \* Plant setup area
- \* Material Storage area
- \* Transport movement area
- \* Plant office area

#### 2. Materials required

The materials required for the production of ready mix concrete are:

- \* Cement
- \* Aggregate
- \* Water
- \* Admixture

**Table No.1** Summary of materials used

Material	Role	Type
Cement	Binder	43 and 53 grade
Aggregate	Filler	VSI grade
Admixture	<ul style="list-style-type: none"> <li>• Increases workability</li> <li>• Increases strength</li> <li>• Reduces water</li> <li>• Slows the setting rate of concrete</li> </ul>	SNF Base(Sulphonate Naphthalene Formaldehyde)
		PCE Base (Polycarboxylate Ether)

#### Storage of Materials

- \* **Aggregate storage(Inline bins)**  
In ready mix concrete, aggregates are stored in bins that are separated for different sizes ,4-5 compartments are provided depending on the needs to store the different sized aggregates .
- \* **Aggregate hoppers**  
It consists of a hopper into which the fine and coarse aggregate is discharged using a loader in accordance with the design and the client's requirements. With the help of load cells and an indicator, the aggregate weighing hopper weighs the aggregates required for the mix.
- \* **Cement**  
Cement is stored in silos. Silos are airtight containers used to store cement and fly ash.
- \* **Admixture**  
Admixtures are stored in drums or in small tanks.

**Table No.2** Summary of capacity and number of material storage used

Capacity of 1 aggregate storagebin	200 Ton
Capacity of inline bins	2500kg
Skip bucket capacity	2000kg
Number of silos	2
Capacity of silos	150 Ton each

#### 3. Equipments used

- \* Concrete mixer
- \* Transit mixers
- \* Concrete pump
- \* Control Panel

**Table No.3** Capacity and number of equipments used

Mixer capacity	CP60(Concrete Production 60 Cum/hr)
Vol of mixer	1Cum
No. of Transit mixer(TM)	9
Capacity of TM	7 Cum
Time to fill 1 TM	12 min
No. of loaders	2
No. of tipper	6

4. Production cost analysis for 1m<sup>3</sup> of concrete.

- Cost analysis of the production cost for 1cum of M20 grade of concrete for the existing plant is as follows

**Table No .4** Total material cost of existing RMC plant

Particular	Content per Cum in Kgs	Rates in Rs per kg	Total cost perCum in Rs
Cement	310	5.15	2111.5
Sand	820	0.76	623.2
20mm aggregate	840	0.57	478.8
12.5mm aggregate	330	0.57	188.1
Water	155	0.1	15.5
Admixture	3.1	34.75	107.725
<b>Total</b>	<b>2458.1</b>		<b>3009</b>

**Table No 5** Total production cost of existing RMC plant

Total material cost	3009 Rs
Total of other cost (Remains fixed)	(35 to 37.5 %) i.e. 1130Rs
Total RMC cost for M20 grade	4139.825Rs
GST 18% of above	745.1685Rs
Total RMC cost for M20 grade concrete	4885Rs

❖ Cost reduction

Production cost can be reduced by managing the cost of materials and by proper vendor management. Cost-saving efforts in the supply chain may be made simpler by improving negotiating skills and developing trust with suppliers. We should look for suppliers who can provide the most value for money in terms of quality, delivery and lead time at the lowest price. It is effective to negotiate a lower price with the present supplier, or a new supplier is chosen who charges less for the identical item.

- Cost can be reduced by practicing the following:
  - \* Never assume that preferred or nearby seller will always be the best choice for purchasing raw materials.
  - \* Request at least three price quotations from material suppliers.
  - \* Review and compare three to four vendors to find the best deal including the quote numbers, lead times, expiration dates, and other pertinent information.
  - \* Don't be uncomfortable in discussing with vendors about the prices in reference to the other material quotations acquired.
- Benefits of vendor management.
  - \* Improved quality of goods and services
  - \* Reduced costs
  - \* Improved Efficiency
  - \* Maintains business continuity
  - \* Increased customer satisfaction

**2.3 Scheduling**

A detailed schedule using MSP is developed for execution of construction activities on the site. The construction of office ,labour room, staff room, batching plant platform, water tank ,aggregate storage ,QA/QC control lab, Wet lab, wash area is planned. The planning and scheduling includes Gantt chart, entry table and bar chart.

- Gantt chart

A Gantt chart is a sequential bar chart. It is a simple easy to understand timeline that converts the project's specifics into comprehensible visual representation.

- Entry table

It is the one that will list all of the tasks involved in the project and provide the estimated points of interest for each activity. Segments such the indicator field, task mode, task name, term, begin, and finish are included in the entry table.

- Bar charts

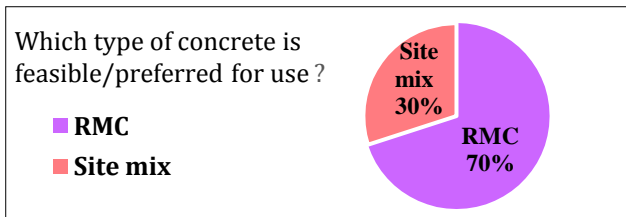
The time spans of each activity are shown by bars on this graph that are placed on a calendar time scale.

**3. RESULTS AND DISCUSSION**

In this work a case study was undertaken in which detailed study of an existing RMC plant was done in order to develop a new RMC plant. A detailed planning, costing and analyzes was carried out for proposing a new RMC plant in Belagavi .

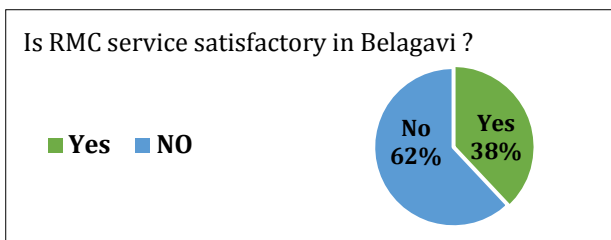
### 3.1 Results Of Feasibility Analysis

- The results of the survey are graphed as follows in the form a pie chart.
- i. The responses for the second question are shown below; 30% of respondents chose site mix concrete, while 70% of them choose ready mix concrete .



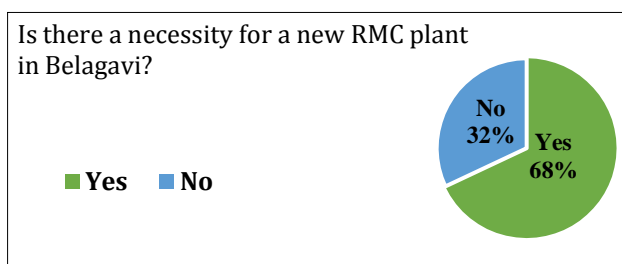
**Fig No.3-** Pie chart showing RMC is preferred than site mix concrete

- ii. The answer for the 5th question is displayed below. The current ready mix concrete facilities in Belagavi provides a service that leaves only 38% of respondents pleased, while 62% of them are not satisfied with the service provided.



**Fig No 4-** Pie chart showing the present service of RMC plant in Belagavi is not satisfactory

- iii. To analyze the demand for a new RMC plant in Belagavi 6th question was posed. According to the findings, 68 percent of the respondents believe that Belagavi needs a new RMC plant facility



**Fig No 5-** Pie chart showing that there is necessity for a new RMC plant in Belagavi.

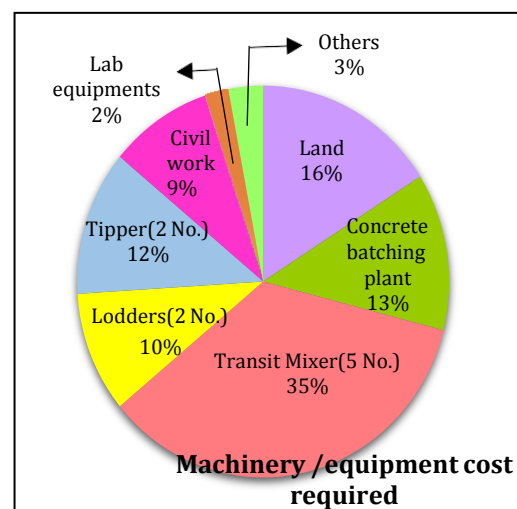
### 3.2 Results of cost required for setting up of a new RMC plant

The various costs required for setting up a new RMC plant include the following :

- Area required :2 acres approx.  
As the preferred location of the client is Ambewadi ,the cost of 2 acre of land is amounted to 90 lakhs.
- Cost of Machinery

Particular	Cost per unit in Rs	Number of units required	Total cost (approx.) in Rs
Batching plant (CP60)	1 crore	1	70 Lakh to 75 Lakh
Transit mixer	35 to 40 Lakh	4 to 5	1.75 Cr to 2.Cr
Loaders	25 to 30 Lakh	2 to 3	50 Lakh to 60 Lakh
Tipppers	30 to 35 Lakh	2 to 3	60Lakh to 70 Lakh
Diesel generator	2 to 5 Lakhs	1	2 Lakh to 5Lakh
Lab equipments	10Lakh		10Lakh
Building infrastructure	50 Lakh		50Lakh
Total			4.5Cr to 5Cr

**Table No .6** Cost of Machineries



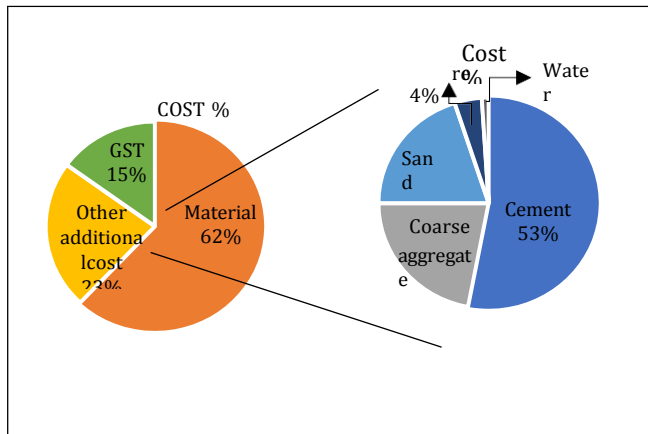
**Fig No 6-** Pie chart illustrating the costs required for setting up a RMC plant

A pie chart illustrating the cost required for setting up an RMC plant shows the proportional contribution of each component to the overall cost required. The average cost to establish a new RMC including the land cost is in the range 5Cr to 5.5 Cr, of which the two components that require the biggest sum of money are land cost which accounts for 16 % of the total cost and transit mixers which accounts for 35 % of the overall cost.

**3.2.1 Cost for production of concrete**

The production cost of ready mix concrete is given in terms of 1 m3. The production price of ready mix concrete includes various cost :

- Material cost
- Additional cost
  - Around 35-37 % of other additional cost are included in the total production cost of concrete.
  - \* The other additional cost included in the production cost of RMC are operational cost, Diesel cost, labour cost, miscellaneous cost
- Taxation - 18% of Goods and service tax (GST) charges are applied.



**Fig No 7-** Pie chart showing the distribution of different cost included in the total production cost of concrete

The material cost that is 62 % dominates the total production cost. Therefore production cost can be reduced by reducing the cost of materials and this can be reduced with proper vendor management.

As a result, we used vendor management for the material inventories for the new plant setup. The existing firm procured the material from two to three suppliers for the same product, which led to a lack of long-term relationships and trust. As a result, it was challenging to negotiate lower costs and shorter lead times. After taking this information into consideration, we started the vendor selection process, which included finding and contacting relevant suppliers, requesting bids, shortlisting and choosing vendors. The vendor offering the most value for the money, the lowest price, and the quickest lead time was chosen out of the three received quotes, and they were guaranteed of developing a

long-term partnership. Therefore the new rates of the materials were adopted and the production cost was calculated.

- Cost analysis for the production for 1cum of M20 grade of concrete of new RMC plant is as follows:

**Table No 7** Total material cost of new RMC plant.

Particular	Content per Cum in Kgs	Rates in Rs per Kg	Total cost per Cum in Rs
Cement	310	5	1550
Sand	820	0.76	623.2
20mm	840	0.55	462
12.5mm	330	0.55	181.5
Water	155	0.1	15.5
Admixture	3.1	33.89	105.059
<b>Total</b>	<b>2458.1</b>		<b>2937.259</b>

**Table No 8** Total production cost

Total material cost	2937 Rs
Total of other cost(Remains fixed)	(35 to 37.5 %) i.e. 1130 Rs
Total RMC cost for M20 grade	4067.259 Rs
GST 18% of above	732.10662 Rs
Total RMC cost for M20 grade concrete	4800 Rs

**Table No 9** Cost comparison between the existing and new RMC plant for 1cum of concrete.

	Existing plant	New proposed plant	Difference
Units	1cum	1cum	1cum
Material cost in Rs	3010	2940	70
Total production cost in Rs	4885	4800	85

➤ The following graph shows that as the material cost reduces there is reduction in the total production cost.

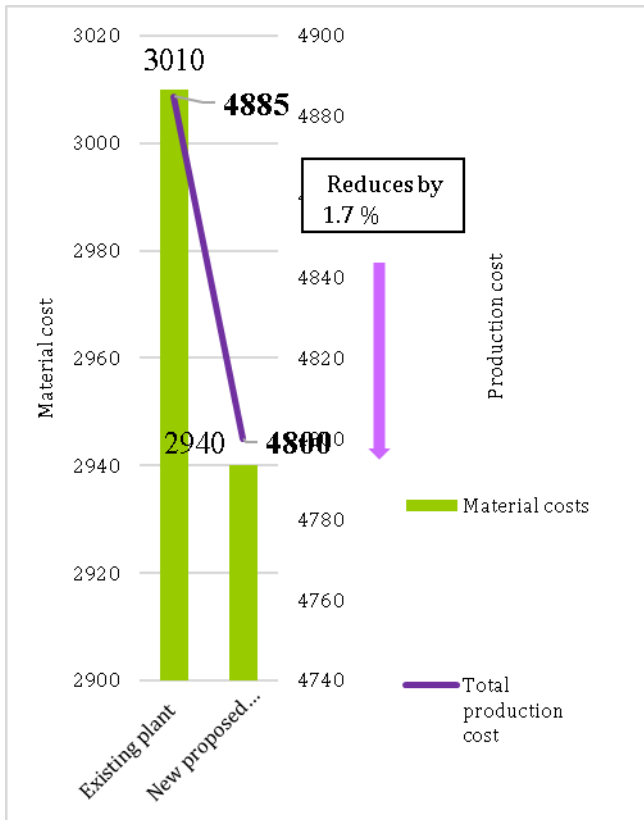


Fig No 8- Cost comparison between the material and total production cost of concrete

### 3.3 Scheduling

The construction of civil work required for setting up a new RMC plant is scheduled in MS Project software. The project involves the construction of foundation for installation of batching plant, construction of labour rooms, office, water tank, staff room, QA/QC lab, wet lab, wash area, aggregate storage.

Table No.11 Total duration of the project

Start date	2/05/2022
End date	6/08/2022
Total duration	84 days

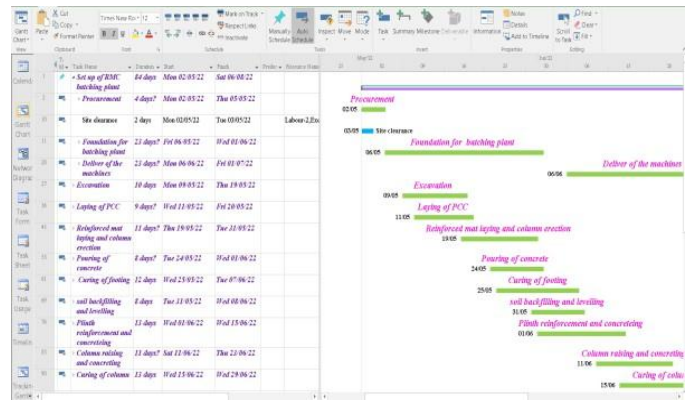


Fig No.9 -Summary of scheduling from procurement of batching plant till plinth beam reinforcement

### 4.CONCLUSION

1. It is concluded by feasibility analysis that it is feasible to set up a new RMC plant near Belagavi.
2. The total cost required for the setup of a new RMC plant is about Rs 5 Crore.
3. The production cost of 1m3 of M20 grade of concrete of existing plant is 4885Rs whereas that for the new proposed plant is 4800 Rs .A cost reduction of 85 Rs per m3 of concrete can be achieved in the new proposed plant.
4. The total time required for setting up of a new RMC plant as obtained by using MS Project is 84 days

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