

# A Critical Study and Analysis of the reasons of breakages of Ceramics Tiles During Transportation

Rajinder Singh Maan<sup>1</sup>, Dr. Poonam<sup>2</sup>,

<sup>1</sup>GM (SCM) RAK Ceramics India Pvt Ltd, Research Scholar.

<sup>2</sup>Dr. Poonam, Professor, Department of Management’  
OPJS University, Churu, Rajasthan, India

\*\*\*

**Abstract** - In Construction Industry, after Cement, Steel and Paint, Tiles and Sanitary ware plays an important role. Tiles are not a luxury now a days but it is a necessity. It not only adds protection to the floor and walls of houses, but also beautify them. Tiling is considered as the last product to be installed in a house construction after electrical installations. It is fragile in nature and need to be protected until it reaches the end user. The objective of this research paper is to study and highlight parameters required for the safety of the ceramic tiles from the manufacturing until it reaches the end consumer. It will also highlight the reasons of the breakages during transit and probable solutions to prevent these kinds of breakages. Primary data is collected from the various sources like logistics department, transporters, and customers. Secondary data is to be collected from the various Manufacturer’s sites, Magazine, Journals, and Books available on Supply Chain, Logistics, Distribution and Ceramics Industry. Various Statistics tools are used to do the analysis of the data and to provide the solution.

Raw Material are brought from the various mines spread across Gujrat, Rajasthan, AP and Tamil Nadu. The mode of transportation use are Road and Rails (where-ever possible). The major tiles manufacturing companies in India are – Kajaria Ceramics Ltd, Somany Ceramics Ltd., HR John Son (Prism Group), NITCO, RAK Ceramics India Pvt Ltd, HSIL, Cera, Orient Bell Limited, Simpulo Vitrified Pvt. Limited, Qutone Cermics, AGL Ltd., Varmora Ceramics and many more. In Gujrat, Morbi is the major hub of Tiles manufacturing companies in India. Kajaria Ceramics have their plants in Rajasthan, UP, Morbi and Andhra Pradesh. Somany Ceramics Ltd, have manufacturing facilities in Haryana, Gujrat and Andhra Pradesh. Orient Bell Ltd., has the plants in UP, Gujrat and Karnataka. HR Johnson have their plants in Maharashtra, Gujrat, Rak Ceramics have the manufacturing facilities in AP and Gujrat [4][5]. Morbi in Gujrat is the Ceramics hub of India and is the major competitor for China [5].

**Key Words:** Logistics, SCM, Transportation, Distribution, Ceramics Tiles, Construction

## 1. INTRODUCTION

In Supply Chain Management, Logistics plays an important role. Supply chain comprises of three types of flows, Flow of information, Flow of Funds and Flow of material. The third flow comes into existence after the first two flows [1][2]. With the receipt of information and data, any business process is initiated, processes, machineries and methodologies are institutionalized and them the production of the product is done [3]. Logistics, flow of material starts with this process. The SCM of tiles industry is as under –

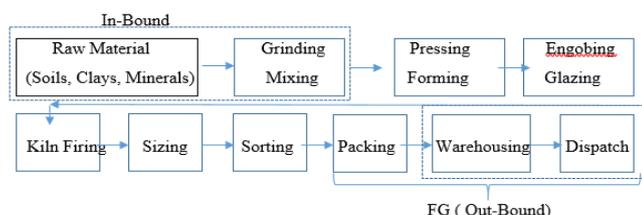


Fig -1: Manufacturing Flow Diagram

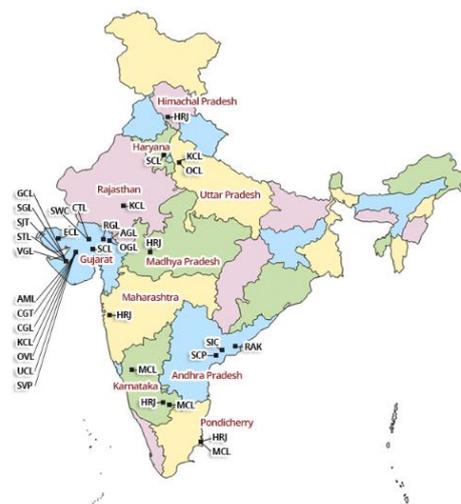


Fig-2. Tiles Industry (Source – ICCTAS)

More than 1500 manufacturing units are setup in this city of Gujrat. The major organized sector companies out-source FG and distribute across India and Exports to other countries. 60% of the total turnover of Indian ceramics industry is contributed by Gujrat industry and 40% is the contributions of all other organized sector companies [4]. From Morbi the material is distributed to PAN India and abroad. Gujrat is well connected to the other states by Road, Rail and Sea.

Material to PAN India is sent through road transportation. Both Sea and Road transportation caters Kerala, some part of Karnataka and Tamil Nadu. Northern, Western, Eastern states are majorly serviced through road only. Concor (Indian Railways) and other private service providers cater Kolkotta (WB) and surrounding cities through railways.

Tiles are fragile in Nature and probability of breakage due to shocks and jerks during movement. There are many reasons of this, which are subject for this research paper.

**2. LITERATURE REVIEW**

In Supply Chain Management, logistics plays importation roles. And in logistics, transportation plays an important role of moving the products from producers to the end consumer safely, securely, in time and at the right place [1]. It is not only the vehicle’s body and road conditions which effects the safely delivery of the material but also the type of product which are to be transported also matters the most. Product range and the characteristics also affects the performance of the logistics [6]. Role of packaging plays an important role in protection of the product in-transit. The packaging designing should be such that the product is not open to any external impacts and should bear the jerks in the movement [1].

In some cases, it is found that the packaging done by the manufacturers are not adequate to transport it safely [12]. The material get damaged. In that case, normally transporter take extra precautions while loading and transporting the material [12]. Sometime the size of the material is also not suitable for the pallet. It may be small or big, which makes it vulnerable to deliver safely. Overloading of the vehicle is also a very serious issue of breakages. Even Insurance companies are not accepting any claim if the vehicle is overloaded[12].

As per the study done by the Supply Chain specialists [1][2][3][12], there is more probability of damage of goods if send via road, instead of by rail and sea.

There is almost nil research on the breakage happen during the transportation of the tiles. Therefore, it is very interesting topic to study. Top 10 companies web sites, ICCTAS (Indian Council of Ceramics Tiles and Sanitary) are studies for collecting the data pertaining the product categories, characteristics and dimensions.

From the various web sites of the major manufacturers in India, following common sizes of the tiles are manufactures [7][8][9][10]-

- a) Type of Products
  - Ceramics Products (Wall and Floor tiles)
  - Vitrified Products (Floor Tiles)
  - Double Charges (Floor Tiles)
- b) Dimensions of the Product
  - Small Size - 200mmx200mm, 200mmx300mm, 300mmx300mm, 250mmx375mm

- Medium - 395mmx395mm, 400mmx400mm, 300mmx450mm, 300mmx600mm, 600mmx600mm, 600mmx1200mm
- Big Size - 800mmx800mm, 800mmx1200mm, 1000mmx1000mm, 1200mmx1200mm, 800mmx2400mm, 1200mmx2400mm

Earlier wall tiles were only rectangle in sizes like 200x300mm, 300x450mm, 300x600mm, but now even square size are also used. Normally floor tiles are square in size. The big slabs are now coming in rectangular sizes also. 60-70% of the tiles are uses in floor applications and 30% to 40% of the sizes are used on walls. There are some other sizes available in market for the other purpose like swimming pool tiles, pavers, exterior tiles (Façade Tiles). There are 3<sup>rd</sup> fired value added tiles also available on a higher cost.

Tiles are classified majorly into four categories and whose breaking strength are mention as under [11] -

Category	Breaking Strength(in N)
Ceramics Wall Tiles	Min 600 N
Ceramics Floor Tiles	Min 1000 N
Vitrified Body	➤ 1300 N

**Table 1 - Type of Tiles and Breaking Strength**

More the Breaking strength, more the tile will sustain the jerks and less will be breakages, whereas in lower breaking strengths tiles are bound to break on lower impact of external force on it during the transit. Therefore, more care is required in the case of tiles having lower breaking strength.

There is limitation of availability data or literature on breakage of tiles happened during transit.

**3. Research Methodology**

Very less publication has been found on the breakage issues of tiles in transit. Therefore, this research is more relying on the primary data. In tiles transportation / movement, mainly four respondents are involves, Logistics/Warehouse Team, Transporter/Driver, Customers and the Technical services team/Customer Care Team.

A general questionnaire was prepared and circulated to Logistics, Customer, Technical Services and the transporters. Questionnaire is consisting 35 questions and provision for open-end response was provided for additional reasons. Wherever the respondent has resistance to respond on the questionnaire, telephonic calls were done and the data was collected. It took approximately 6 months to collect and analyse the data for this research paper.

The companies considered for this research were the top 10 companies in India involved in manufacturing and marketing

of tiles in India and abroad. More than 50 Customers were contacted and more than 25 transporters, 100 drivers were interviewed.

Data is collected and recorded in different categories – Logistics Team, Transporter/Drivers, Customers, and Company’s Technical Services Team. Tools used for analyzing the data, Tabulation of the data, Mean, Average, Graphical representation like Bar Chart, Pie Chart, Line diagram, Venn diagram, Etc.,

#### 4. Data Collection, Interpretations, Findings and Results

35 type of reasons were identified by all the stake holders contributing to the breakages happening during movement of Material from the manufacturer to the end consumer.

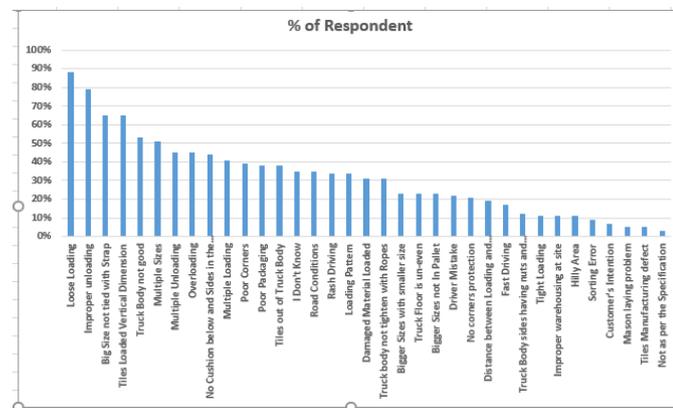


Fig-3 Reason of Breakages

The main reasons of breakages which are identifies are – Loose Loading, Improper Loading, Big Size Tiles Packing and Strapping issue, Loading in wrong dimension, Vehicle body issue, Multiple Sizes, Multiple Loading and Unloading, Overloading, Cushion below and side of the vehicle floor, Packaging, Corners, Out of body loading, Road Conditions, Rash Driving, Damaged Material Loaded, Material not properly tighten, Un-palletized tiles, Fast Driving, Improper stacking in warehouse, Customers Intention, etc.,

All the four category of respondents gave their views independently unbiased and without any prejudice.

#### Packing Matrix

From the data collected from the Logistics team of the top 10 companies in tiles industry, following packages are recommended to protect the tiles from damage. The Small size tiles are packed in closed box from all the sizes and can be loaded in any fashion. Bigger sizes tiles need more protection as far as the strength of the cartons and the corners are required. In the Slabs, the Cartons need to be dispatched on the pallets, specially designed for them. In case of some bigger sized tiles which are to be transported in

small quantity, ply wood or boards are also used for protection.

Following is table depicting various packaging -

Size	Bottom/Side Cushion	Cartons	Corners	Ply/Board	Pallets
200x300mm	Y	Y			
300x300mm	Y	Y			
300x450mm	Y	Y			
400x400mm	Y	Y			
600x600mm	Y	Y	Y		
600x1200mm	Y	Y	Y		
800x800mm	Y	Y	Y		
800x1600mm	Y	Y	Y	Y	
800x1200mm	Y	Y	Y	Y	
800x2400mm	Y	Y	Y	Y	Y
800x3000mm	Y	Y	Y	Y	Y
1000x1000mm	Y	Y	Y	Y	Y
1200x1200mm	Y	Y	Y	Y	Y
1200x2400mm	Y	Y	Y	Y	Y
1200x3600mm	Y	Y	Y	Y	Y

Table 2 – Packing Matrix

#### Mode of Transportation

The data shows, 89% of consignments are dispatched through Road, 8% are through Sea and 3% are through Rail. The % breakages case in case of Road is 75%, Sea – 15% and 10% in Rail.

Mode	% Consignment	Breakage Case
Road	89%	75%
Sea	8%	15%
Rail	3%	10%
Total	100%	100%

Table 3 – Mode of Transportation

#### Loading Pattern

As per the study done, loading pattern for the selected sizes are as under. The Small Sizes can be load horizontally one above other, but the bigger size can't be store in that fashion, as big tiles are more elastic in nature and can break during movement, due to jerks. Bigger the tile, more is the probability of damage. To prevent breakage, bigger tiles are recommended to be loaded or moved on the pallets only.

The bigger tiles are either packed or loaded on the wooden pallets or on Iron Pallet so that the tiles are protected and does not break during transit. If the material is not of full pallet, then the tiles are packed with both sides Plywood or Hardboard, strapped and loaded. Different sizes needs to be

treated differently, packed, and loading into the vehicle with all the safety to avoid damage. Matrix of loading pattern of different sizes are defined as under.

Size	200x300mm	300x300mm	300x450mm	400x400mm	600x600mm	600x1200mm	800x800mm	800x1600mm	800x1200mm	800x2400mm	800x3000mm	1000x1000mm	1200x1200mm	1200x2400mm	1200x3600mm
200x300mm	■														
300x300mm	■	■													
300x450mm	■	■	■												
400x400mm	■	■	■	■											
600x600mm					■	■									
600x1200mm					■	■									
800x800mm							■	■							
800x1600mm							■	■							
800x1200mm									■	■					
800x2400mm											■	■			
800x3000mm												■	■		
1000x1000mm													■	■	
1200x1200mm														■	■
1200x2400mm															■
1200x3600mm															■

Table 3 – Size-wise Loading pattern

The other factors which are contributing to the breakages in transit are – multiple loading point, mainly in Morbi it is done, multiple unloading points, more distance between the unloading points, in rainy seasons road conditions also deteriorate paving to pits on the roads, plastic corners on the corners of the tiles, strength of the cartons are other points of concerns. With the production of the new tiles, packaging and movement of the material are done as per the requirement. Innovation in this field is must, being a fragile material.

Some of the Packing -



Fig – 4 Packing of 800x2600mm



Fig – 5 - Tighten the rows to avoid Breakage

5. CONCLUSIONS

Transportation of Ceramic Tiles is a very tricky and technical task. It can't be done by un-training manpower both at the Loading and Unloading points. Handling of the tiles till it is laying plays and important role. Now a days companies are making big slabs which can't be moved without palletization, that too of different structure. Some of the dimensions can be loaded directly, some without pallet in horizontal, some in vertical directions, some on wooden pallets and some of Iron pallets.

“Product design includes quality function deployment (QFD), ease of manufacturing, design for the environment (DFE), and ease of distribution throughout the supply chain.” [9]

REFERENCES

[1] Honkey Min, The Essentials of Supply Chain Management, 1st Edition, 2015, Pearson Education LTD.

[2] Sunil Chopra, Peter Meindl, Supply Chain Management, 4th Edition, 2015, Pearson

[3] Alan Rushton, Phil Croucher, Peter Baker, The Handbook of Logistics and Distribution, 5th Edition, 2014, Kogan Page Limited

[4] <https://surfacesreporter.com/articles/134110/tiles-in-india-market-share-growth-strategies-new-launches-and-more>

[5] <https://ceramicworldweb.com/en/tag/ceramic-world-review>

[6] R Dan Reid, Nada R Sanders, Operation Management, 4th Edition, 2011, John Wiley and Sons.

[7] <https://www.icctas.com> – Indian Council of Ceramics Tiles and Sanitary

[8] <https://www.kajariaceramics.com> – Kajaria Ceramics Limited

[9] <https://www.somanyceramics.com> – Somany Ceramics Limited

[10] <https://www.hrjohnsonindia.com> – H&R Johnson India Limited

[11] Giovanni Biffi, Rolando Giovannini, Book for the Production of Ceramic tiles, Gruppo Editoriale, Faenza (RA)

[12] Mohamed Achahchah, Lean Transportation Management, Using Logistics as a Strategic Differentiator, 2019, Routledge, UK

## BIOGRAPHIES



Rajinder Singh Maan, GM (Supply Chain) In RAK Ceramics India Pvt., Is a research



Dr. Poonam, is a Professor, in Department Management, OPJS University, Churu, Rajasthan, India.