

Design and Analysis of Large Rolling Shutter - A Review

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Abstract— In this paper we are going to discuss about the construction and analysis of large rolling shutter. The shutter is made up of plurality of slats inter-connected with each other. The shutter provides safety against weather conditions and burglary. The configuration of slat must be such that the rain water must not accumulate between two consecutive slats. The shutter curtain travels in the guide channels to open and close, provided at the either side of the shutter. The pulley system or direct mechanical mechanism can be installed for the opening and closing of shutter. If the size of the shutter is big then a motor can also be installed for the opening and closing of shutter. The wind load is to be considered for the designing of the shutter curtain since the load is mainly due to wind velocity. The curtain must with stand the high velocity wind. The nonlinear analysis of the shutter curtain is carried out because of the thin structure.

Key words: Rolling Shutter, slats, Wind Loads

I. INTRODUCTION

The roller shutter is made up number of slats inter-connected with each other. The shutter is raised to open and lowered to close. The shutter rolls over the pipe when opened and when lowered to close the shutter forms a protective curtain. The guide channels are provided on the either side of the curtain for the travel or movement of the shutter curtain during opening and closing. The shutter is pull-push type or electrically operated. The use of the mechanism for the function of the shutter depends upon the size of the shutter. On the bottom slat of the shutter a locking arrangement is provided. The place where the shutter are being used are also important as in malls the shutter curtain are provide with the grills where as in small shops and warehouses the curtain just consist of the slats with no grills.

Thus the Rolling Shutter we are investigating will be designed as per the requirement and then analysed. Once it is analysed it will be modified either to increase durability or to reduce weight and cost or both.

II. LITERATURE REVIEW

A. Shutter Type

One of the methods of classification of shutter is installation position of shutter. The clear height of the shutter is called as Soffit level. Fig. 1 shows the different types of shutter.[2]

- Type IA - Inside and above soffit level.
- Type IB - Inside and below soffit level.
- Type OA - Outside and above soffit level.
- Type OB - Outside and below soffit level.
- Type JPB - Jamb protected and below soffit level.
- Type JEB - Jamb embedded and below soffit level.

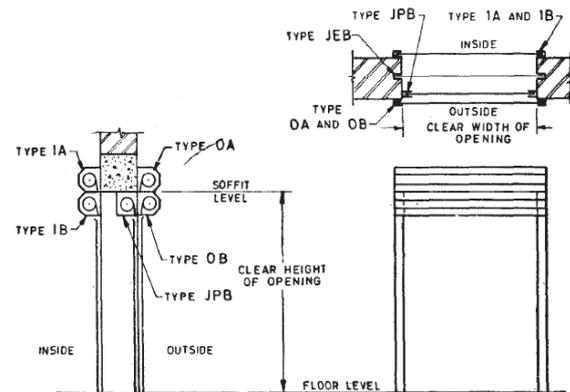


Fig. 1: Shutter Type

B. Components used in Shutter

- Slat - The basic component of Shutter is slat. The shutter curtain is formed by inter-locking of number of slats with each other.
- Pipe - The Shutter curtain rolls over the pipe while opening and closing of shutter. The pipe used in shutter assembly should be heavy duty pipe suitable for mechanical applications.
- Guide Channels - U shaped guide channels are used.
- Shaft - The shaft runs inside the overhanging pipe which connects the assembly to the brackets.
- Spring - The spring are used for the counter balancing the rolling shutter.
- Cast Iron Castings - The cast iron casting are used for roller pulleys, cleats, gears.

C. Shutter Drive Mechanism -

For the operation of the shutter different mechanism is used. For large rolling shutter the chain sprocket mechanism is used fitted with a electric-motor.[1]

D. Wind Loads

While designing the structure the wind loads are to be considered. The gust loading factor plays a important role in analysis [3]. Structures are design to bear the extreme wind load which requires a design wind load [4].

E. Analysis

The shutter curtain surface is analyzed for the high wind load based upon the location of installation of shutter. The wind load is converted into the force per unit area. The thin plates are analyzed with plane stress, Kirchhoff and Reissner theories while when the analysis of thick plates is to be carried out a three dimensional analysis is carried out [5]. When carrying out analysis of heavy structures a linear analysis approach is used while carrying out a analysis of a thin structure like here a shutter curtain a nonlinear analysis approach is used. The structure is designed for light weight to reduce weight [6].

F. Safety Measures

The safety measures in case of fire are to be maintained. The shutter must be designed to be rust protected. The safety breaks must be incorporated in motor, in case of power failure.

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