

PRACTICAL APPROACH FOR THE SAFETY IN I - GIRDER CASTING AND STRESSING IN CASTING YARD

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Abstract - Infrastructure development is the very important for any Country. Highway's infrastructure comprises two part say Roads and Bridges, supplementary to each other. In modern projects the part of structures is increased about 40% to 50% which have very big influence to complete the project within targeted span of period. As per site condition and aesthetic requirement, there are several types of bridges. Bridges comprises different type of superstructure. I-girder is one of the simplest and popular forms of super structure adopted for bridges. The casting of I Girders is may be easy the job because you are casting them on the ground platform. This is the first part and second part are launching/erection of I-Girders after stressing. This paper is mainly written to share the knowledge and how to reduce the consequences, mainly to boost the site staff moral for the construction process. The erection activity is highly critical and to be done in very safe manner. Each step of erection must be followed by the all concerns. Now a days the clients are also very strict and specific with extra vigilant in girder erection process. This document is just a guideline and to spread awareness to all concerns. The burning issue of incidences in civil constructions and the requisite precautionary measures to avoid the same and consequential loss of properties and life.

INTRODUCTION - I-girder is the most popular and common type of superstructure due to easy and quick construction. Casting of I-girders rather can be achieved in a faster manner by deployment of multiple set of forms. I-girder can be used for both pre-cast and cast-in- situ construction. It is also good for both single unit and Segmental construction and for pre-tension and post-tension construction both. Single unit I-girder is however more common. Construction of I-girder is generally better option for span range of 15 m to 30 m. I-girder is simple and very fast in construction at the same time it is very unstable during construction, especially after stressing till the proper supporting arrangement to be provided. If a single girder rests on POT & POT cum PTFE Bearings, its stability rating is like Bike which needs proper support to remain in position. Once diaphragm between girders is cast, it becomes stable like four-wheeler. To avoid such incidences all concerned must take all necessary precautionary measures. Mentality of negligence and over confidence is the main causes of incidence. Engineers working at site must remove the term "चलता है, होता है, चलेगा, हमने तो ऐसे ही किया है" from their dictionary because every new location has new

challenges. Simple precautions, arrangements and careful attention can avoid this type of incidences. In this paper, pre-casts prestressed I-girder is being considered. Based on previous experience, few guidelines are suggested. If the same is followed properly, incidence of failure of launching/erection and toppling of girder can be avoided. In case of pre-cast prestressed girder, toppling is the main problem during transportation and erection.

Safety Precautions for Stability

Stability of I-Girder can be ensured by providing proper support to bottom of girder to transfer the load on ground in casting yard, on the proper location of traveler trailer and over the pier cap.

A. Anticipated Causes of Failure:

- i. Inspection of ground surface/soil strata on top surface.
- ii. Cracks in bottom bed PCC due to not desired compaction of ground.
- ii. Calculations of girder's load over PCC bed not considered as per requirements.
- iii. Settlement of rest foundations after stressing in casting yard due to point load transfer on girder's ends.
- iv. Failure of End Blocks concrete during stressing due to not clearing the end portions beyond bearing locations before stressing.
- vi. Premature removal of support, bracing, packing etc.

A1. Precautionary Measures

- i. Design of entire support system should be proper and with accepted factor of safety. In case of prestressed girder, the special care shall be taken for the end supports under bearings locations. Because after stressing hogging in girder may occur and the middle portion of bottom bed will free. Due to stressing effect the load shall be transferred on both ends due to the bottom supports near bearings.
- ii. Base of Girder shall be on firm and well compacted ground to avoid any settlement causes failure. In no case, girder bottom shall rest directly on soil. PCC under the girder is the best option with thin aluminum sheet or another releasing material for good quality work.
- iii. if there is any drain, manhole, covered pipeline or any utility passing underneath in the casting yard then special care shall be taken.
- iv. A thin layer of PCC or Granular material shall be laid on the compacted ground to avoid any mud formation during curing period resulting in settlement.

v. The prestressing shall be done as per design, drawings and preapproved method statement with involvement of Engineer.

vi. A system for removal of supports to avoid any unauthorized removal of support/packing etc. should be prepared internally. Most of the incidences occur due to unauthorized removal of support/packing etc.

vii. Lifting hooks/loops shall be provided in the girders as per mentioned locations in the approved drawings.

viii. It is highly recommended that not try shortcuts, just follow the process as mentioned in method statements and in the approved drawings.

Photo 1 Good example for how to keep the end portion free before stressing activity.



Photo 2 Casting Yard ground is well compacted and covered with thin concrete layer



Photo 3 Casting Yard ground is not provided any ground cover/protection and which resulting cavity under the bottom PCC of Girder. The girder is in position to pour the concrete. At the first occurrence of an acronym, spell it out followed by the acronym in parentheses, e.g., charge-coupled diode (CCD).



B. Safety Precautions for Prestressing Activity

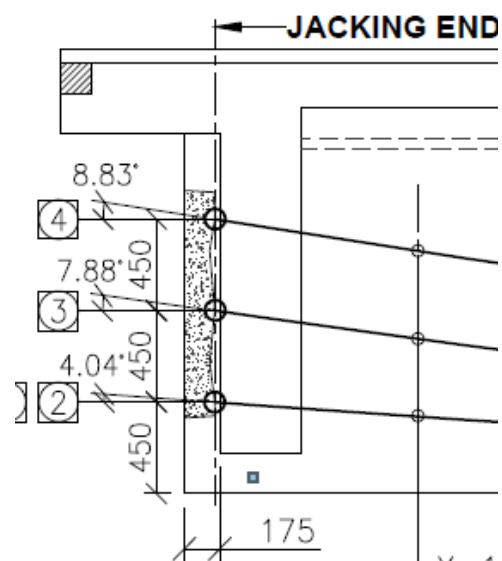
a. Anticipated causes of failure:

- Fixing of Anchors not in true line and angle.
- Not providing spiral steel as per drawings.
- The space is hollow behind the Anchor
- Honeycombing occurred due to more steel in place or steel not fixed as per drawing
- Prestressing activity take place without proper checking the Anchors or sometime the repair not done as seeing the load pressure on the ends of girders.
- Length of HT strands not provided in the ducts, which may cause slip of wedges during stressing or ply of HT strands may separate from the coil.
- During stressing no shield protection provision behind the stressing jacks. Sometime the worker stands in front of stressing jack during stressing activity which cause a fatal accident.
- After stressing the placement of girder bottom support not provided on proper location. By not providing a proper location bottom support the eccentricity of load shifted which causes the damage of girder.

Precautionary Measures

- The Anchor fixing should be fixed in true line and level with great care of angle fixing as mentioned in the drawing.

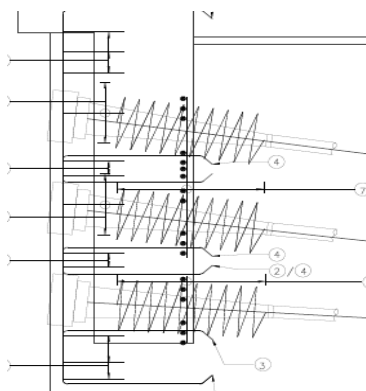
Figure - 1



- Sometime the engineer may not able to understand the importance of spirial

reinforcement, which may cause failure of end blocks during or after stressing.

Fig. 2



- iii. Before commencing the stressing activity, there must be close inspection to be done for checking of any crack, hollowness or honeycombing specially near the end blocks and the Anchor cone should be checked by tapping a small hammer softly over it and check the sound. An experienced worker can easily identify the hollowness behind the Anchor cone. If any hollowness encountered then a proper methodology may prepare to repair the honeycombing/hollowness. A curing and setting time should be given to the repaired girder. After ensuring the required strength, stressing may be carried out.

Photo- 4 Placement of PSC girder at erection site after stressing in safe manner as the wooden block provided adjacent to the bearing location.



Photo 5 Protection of HT strands by covering with PVC sheet to protect from rust/corrosion. If a small amount of rust

encountered, which may lead to slip during stressing and cause accident.



Photo 6 Unsafe act because the workers are standing in front of stressing jack.



CONCLUSION

Production of I-girder is a good combined effort of manpower, material, machinery and money. This type of production completes the project well in time or earlier. The involvement of skilled manpower makes such type of construction may very easy task in terms of speed and quality. Life of people and properties of nation both are very precious. Due to negligence of someone, if incidence occurs, the efforts of direct or indirect involved concerns got wasted. This type of incidents gives big impact on name and fame of firms as well as for professionals. All concerns must remember, any incidence causes are a national loss. Therefore, we have to be more careful while casting and stressing of I-girders.

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REFERENCES

1. collection of data from various site project.
2. Review of procedure and process during site visit and supervision.

BIOGRAPHIES



Ravinder Kumar working having 29 years working experience in various projects on national and International basis specially for structures.