Safety in Construction
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Lecture-07
A Case Study on Construction Safety

Greetings to the viewers, I am lieutenant level Arun Sekhar serving in military engineering services as a designer. Design is part of planning and many construction safety aspects are decided on the design table. Construction safety is closely related to constructability as the executives at site have to be well versed with the construction sequence. Many structural failures have happened in the past due to poor construction safety management.

I will be sharing a construction safety case study with you which will highlight the importance of following the correct construction sequence and strict supervision at site

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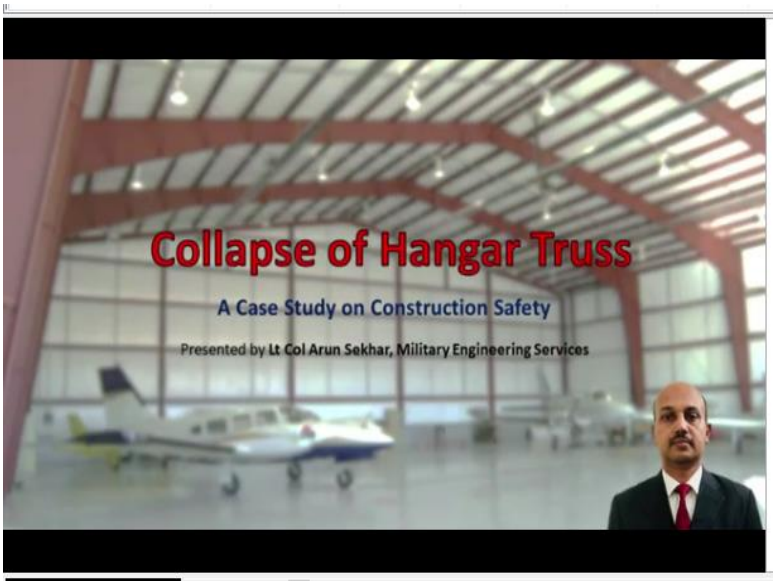

The structural failure led to 3 fatal casualties and the work got delayed for 3 years due to subsequent arbitration. The construction accident happened at Srinagar in the year 2011.

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The proposed facility was a hanger to be used for helicopters. The picture on the screen roughly indicates the size and shape of the proposed facility and may not be the actual one.

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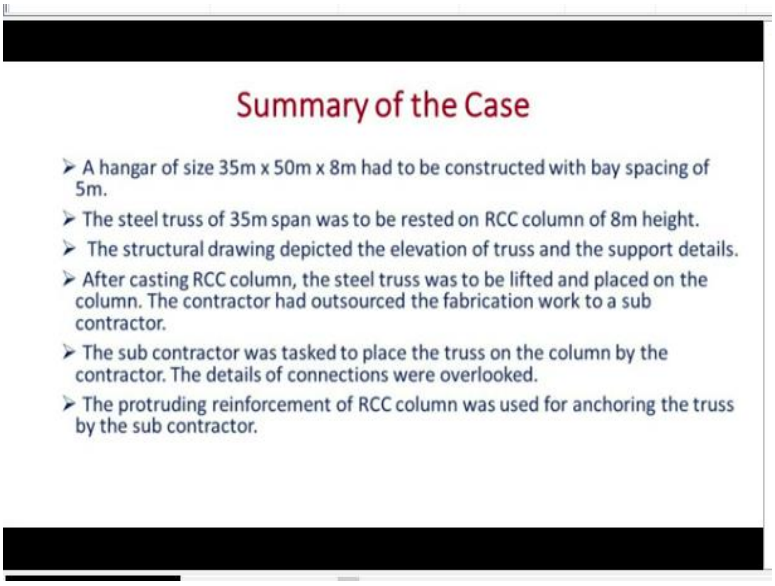

A hangar of size 35 meter by 50 meter by 8 meter high had to be constructed with a base spacing of 5 meter. The steel truss of 35 meter span was to be rested on RCC column of 8 meter height. The structural drawing depicted the elevation of the truss and the support details. After casting RCC column the steel truss was to be lifted and placed on the column. The contractor had outsourced the fabrication work to a subcontractor.

The subcontractor was tossed to place the truss on the column by the contractor. The details of the connections were overlooked. The protruding reinforcement of RCC column was used for anchoring the truss by the subcontractor.

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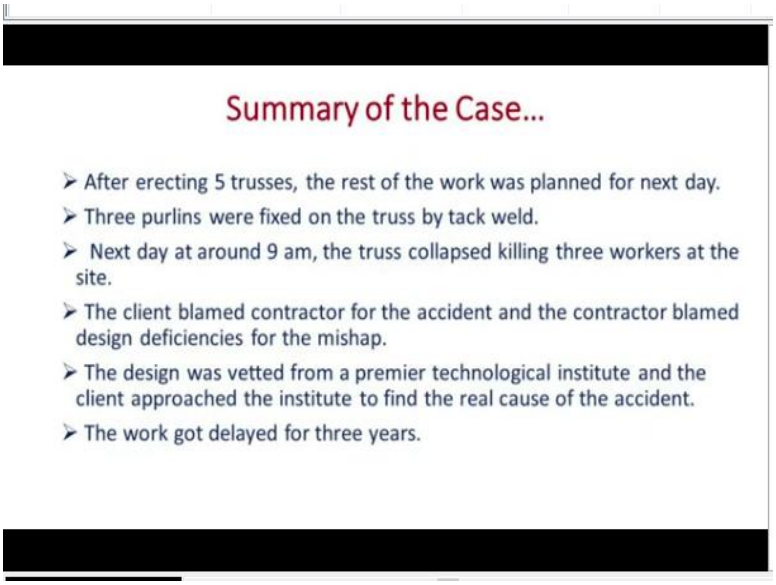

After erecting 5 trusses, the rest of the work was planned for the next day. Three purlins were fixed on the truss by tack weld. Next day at around 9 am the truss collapsed killing 3 workers at the site the site. The client blamed contractor for the accident and the contractor blamed design deficiencies for the mishap. The design was vetted from a premier technology institute and the client approached the institute to find the real cause of the accident. The work got delayed for 3 years due to the accident.

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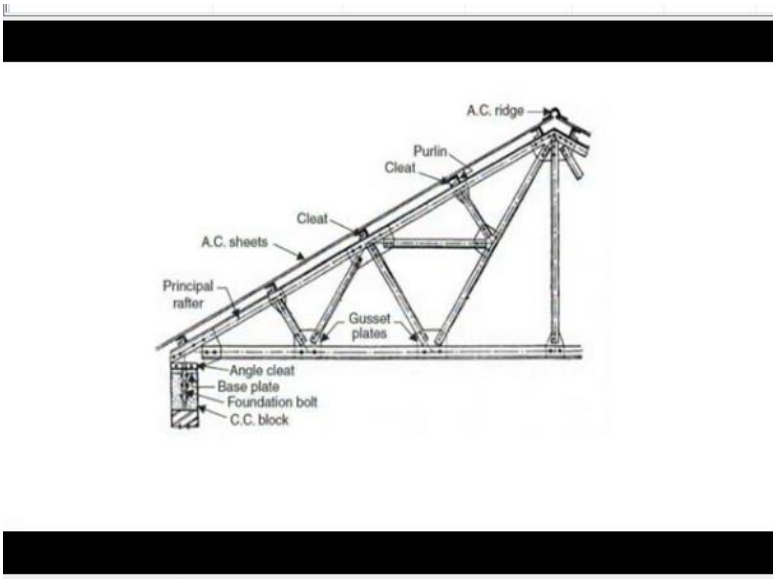

Having understood the background now we will look into the scientific reasons behind this accident and what our lab says led to this mishap. The figure shows the typical cross section of etrus with connection details. The support details include the foundation boards embedded in reinforced cement concrete and the base plate at the top of RCC column.

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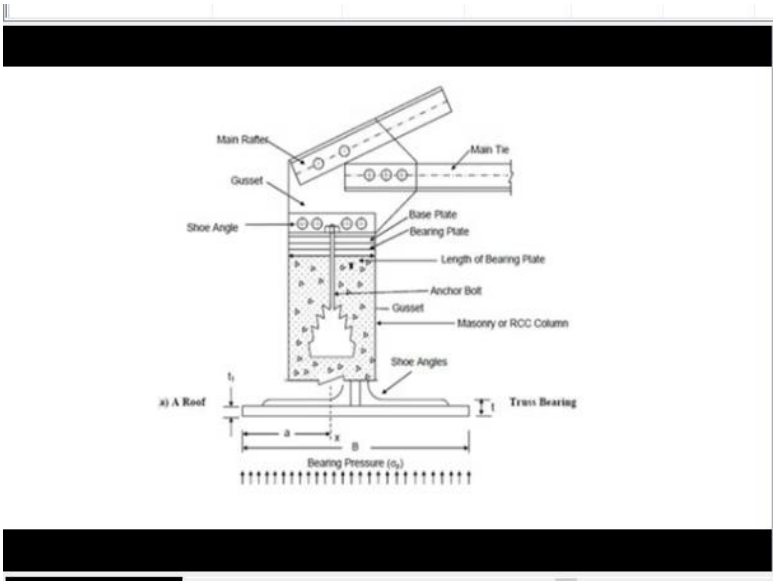

The axial forces are supposed to be transferred through the base plate to the support of the truss and that is achieved by high strength friction grip bolts.

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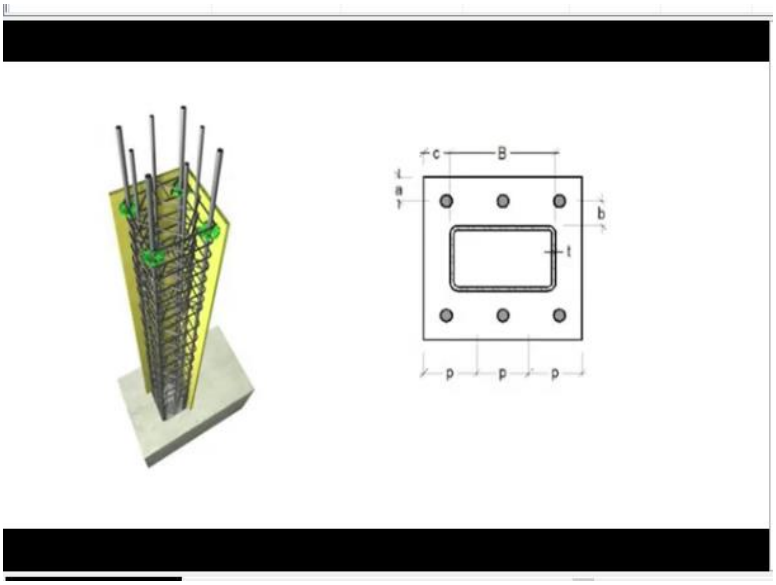

In our case the contractor did not purchase the j-hooks or anger boards which was supposed to be embedded in column or he forgot to do it before casting the tip of the column. When it was time to lift the truss using crane it was too late and the fabricator found a quick solution by welding the base plate with the reinforcement of the column after inserting it through the holes provided in the base plate.

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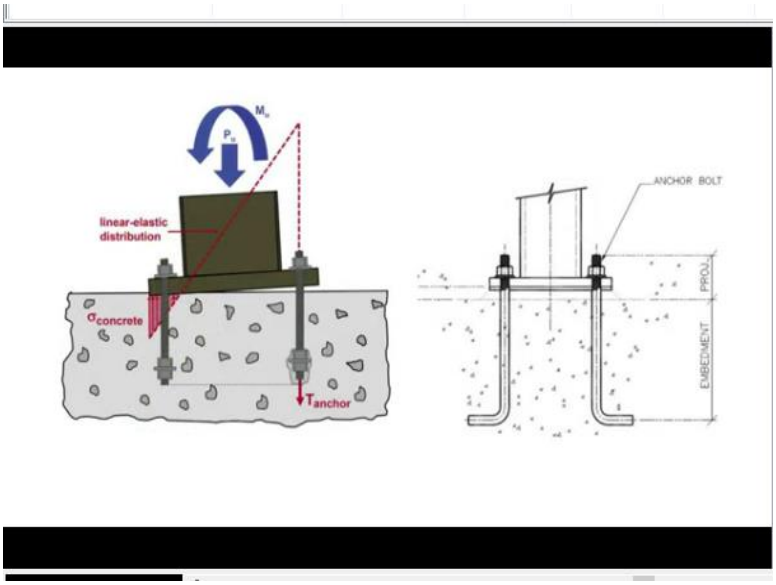

During high wind the truss sway and exert axial forces as well as movement on the base plates. The very purpose of anger bolt is to resist these forces by bond in concrete and prevent any uprooting of base plate. The weld on reinforcement neither provided enough bone strength nor any axial force resisting capability. Srinagar is an area where the wind velocity is considerable and in an open area the effect was even severe.

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The shown picture depicts the ideal arrangement of an anger bolt and base plate. This should have been prepared fabricated and embedded before casting the tip of the column.

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As construction professionals there are important takeaways for all of us. Safety in construction is closely related to construction sequence. Erection loads are significant in steel structures as wind plays an important role during construction. Construction sequencing has to be designed on the design table. Close supervision during critical activities is essential and access to supervision has to be designed during planning.

Enough lateral stability has to be ensured by purlins and wind brazing. In our case only 4 purlins were tack welded which was insufficient to resist the lateral forces in total. The cumulative lapses invited the disaster. There is no shortcut to safety, it has to be well designed. I know that the real pictures of the accident side would have helped to better understand the case, but unfortunately, I cannot share them as of now due to protocol issues. Thank you so much.