EXPERIMENTAL INVESTIGATION OF BUCKLING AND LATERAL TORSION BARRE INFORCED BY DELTA UNDER PURE BENDING LOAD

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ABSTRACT

Lateral torsional buckling is one of the main structural instability of lightweight thin members under bending. In this type of structural members instability suddenly dropped considerable lateral and twisting off the page is loaded. The conventional method for preventing the occurrence of this type of buckling and lateral bracing member is using of concrete slab in the upper section. Using torsional and lateral stiffness hardening delta beams and rafters sheet resistance can be raised and thus prevent buckling of this section. In this paper, finite element program to help with difficult sections of Abaqus 6.13 Delta modeled and section capacity Delta lateral torsional buckling in front of side-reviewed studies show that optimal reinforcement to strengthen Delta is 1/4 bar height.

Keywords: *experimental investigation, torsion barre, delta*

INTRODUCTION

Lateral torsional buckling instability is one of the main structural members under bending the thin separate entrance. In this type of structural member for instability suddenly dropped considerable lateral and twisting off the page is loaded. In the design of Steel Moment including beam and plate girder that of course, most of them do extensive research to improve the behavior and bending strength of these members is done. But as it stands these are lateral stability and thus the torsional and lateral buckling of them should also be considered. The conventional method for preventing the occurrence of this type of buckling and lateral bracing member or the use of concrete slab is in the upper section. AISC international conference in 1959 was expressed in the way in which they use the torsional and lateral stiffness of the Delta can be plate girder increase resistance and therefore prevent the onset of buckling point [1].

this harder connect to the flange of compressive plate girder I-shaped beams and stabilize the beam components plate girder against lateral torsional buckling loads arrived at the conclusion of the event they prevent [2,3]. Proposed cross geometry used to be called the delta period. [1]. The experimental research and computer modeling conducted on this point that the behavior of these sections are examined under different loads [4,5,6]. In this research to experimentally loading pure bending and torsional buckling resistance to the effect of reinforcing the delta on the side.

THE SPECIFICATIONS OF THE MATERIALS USED

Profiles want to test beam score 14 (IPE14) production of steel is of the type st37. (Figure 1)

Figure 1. The 14 steel profile listed on profiles

LABORATORY SAMPLE INTRODUCTION:

Sample length is 4.5m .75m from each side as the arm anchor is intended to create momentum so that the distance between supports 3m will Shdazs·h simple example is used for testing. (Figure 2)

Figure 2. An example overview

SAMPLES:

All three of 4.5m length and distance of load applied to the base of each side are .75m.

Example 1: Example of a delta without amplification. Figure 3

Figure 3. sampleno.1

Example 2: An example of the strengthening of the delta and delta wings to half the height of John's location. Figure 4

Figure 4. sampleno.2

Example 3: A typical three also by strengthening the delta and delta position of the wings up to a quarter of life is high. Figure 5

Figure 5. sampleno. 3

THE THICKNESS AND THE SIZE OF PLATES USED TO DELTA:

In the case of strip width of 6 cm and a thickness of 5mm number two and number three of the strip width of 4.5cm and a thickness of 5mm is used to build the delta.

The results of tests on samples:

sample 1: Figure 6 shows the scheme of a pre-test. Jack compressive load applied by the system load by jack with lever arms to the ends of the beams inserted between two support beams under pure bending and the result is.

Figure 6. Example of a ride on the device before starting the test.

Figure 7 shows sample 1 after loading.

Figure 7 : sample 1 after loading

In this case, the Delta is not strengthened after loading section in the middle of the bar began to twist. The amount of time is significant. Figure 1 shows the increase during the period of increased load.

Diagram 1. Sample 1 turning point Overload

Sample 2:

Figure 8 shows the schema of two before the test.

Figure 8. The sample 2 before loading

Figure 9 shows the sample two after loading.

Figure 9. Typical dimensions of load (bending without buckling evident side)

In this case, which has strengthened in the middle Delta level is high at a low level compared to the amount of lateral buckling and Figure 2 shows a middle school during the shooting to the increase in times.

Diagram 2 during the cross-section two Overload

As can be seen from Figure 2 is negligible amounts of time compared to Figure 1 shows the boost function Delta. In example 1, the maximum period is 0.16rad while sample 2 to 0.014rad this maximum value is limited.

sample 3:

Figure 10 shows the sample 3 before testing.

Figure 10: A typical three pre-loading

Figure 11 shows the typical three after loading.

Figure 11 - sample 3 after loading

Diagram 3 shows the cross-section 3 times the applied load.

Diagram 3. The period of three in the cross section Overload

In diagram 4 the time period in all three cases have been brought together for comparison.

Unlike results anticipated period of 3 days less than the 2 shows.

Diagram 4. During the period of total Overload

Using Abaqus analytical results are shown in Figure 5. The horizontal axis and vertical axis of rotation is the point in the middle of July the total amount of force is the anchor for comparison with experimental results.

Diagram 5. The results of Abaqus

The results of Abaqus also observed that the use of the Delta makes it more difficult and the side beams can be seen that the delta in fourth grade only cause a slight difference compared to the height

of the beam height is $1/2 \Delta$. So economically be concluded that Delta state at $1/4$ height is affordable.

In the form of 12 to 14 also has a buckling of the Abacus program is shown.

Figure 12. Deflection the beam without data

Figure 13. Delta deformed bars in $1/2$ beam height

Figure 14. Delta deformed bars in 1/4 beam height

Moreover, the results derived from the output parameters examined samples brought.

sample 1: No data

sample2: delta sample at half height

sample 3: Delta in the quarter-height

CONCLUSION

Of tests on the three samples, it was concluded that the use of lateral torsional buckling point, Delta strengthens the profile and prevent. And the result will be that much lower level, strengthening Delta in the quarter compared to the height of the life at half the delta boost is not life, it can be said that the state boost cross-section of the Delta in the quarter-height will be optimal.

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