"SQUIRTER" TENSION INDICATOR TRIAL PROJECT

by

FLORIDA DOT

Presentation to

FLORIDA TRANSPORTATION BUILDERS ASSN. INC. 1933

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THE LAWYER'S MINUTE (DISCLAIMER)

Squirter DTIs Were Provided To Project Contractor at No Cost By Applied Bolting Technology For Trial Project.

The Information Contained In This Document Shall Not Be Taken As An Endorsement By The Florida Department of Transportation, Keith and Schnars, P.A., Florida Transportation Builders Association, Or Wood Hopkins Contracting Company For This Fastening System Or Manufacturer.

DTI's Are Under Consideration As An Alternate To Present FDOT Bolting Requirements, And Not As A Replacement Method.

Cost of DTI's Are Estimated, And Actual Cost Will Be Established By Supplier.

Labor Costs Are Based On Local Rates, And Estimated Overhead Costs.

Installation Was Not Timed For All Bolting Operations. Extrapolations Were Made Based On Completion Of Several Connections. Net Project Savings Were Estimated Based On All Project Bolting.

WHAT ARE DIRECT TENSION INDICATORS ?

Direct Tension Indicators are part of a compressible washer fastening system which indicates proper bolt tension independent of torque.

Available systems and techniques include:

Turn of Nut Method.

Calibrated Torque Wrench.

Tension Control bolts with shear tips.

DTI's - Load Indicating Washers

DTI's with silicone indicating agent.

STANDARD BOLTING PRACTICE

Present FDOT Specification Requirements

1. Calibrate torque wrench and air/electric wrenches with Skidmore for proper bolt tension. Repeated for each new lot, length and day of bolting.

2. Tighten bolts to “snug tight” tension.

3. Inspectors confirm “snug tight” with torque wrench by testing 10% of bolts.

4. Inspector match marks bolt and nut for final tightening.

5. Perform final turn of nut tightening.

6. Inspector witnesses turn of nut to match mark.

DTI BOLTING PRACTICE

Proposed Alternate FDOT Specification to Turn of Nut Method

1. **Perform DTI installation verification with Skidmore for proper bolt tension.**
2. **Tighten bolts to “snug tight” tension.**
3. **Final tightening until DTI flattens and orange silicone squirts out.**
4. **Inspector checks proper flattening (gap) with feeler gage.**
5. **Remove orange silicone squirt with compressed air prior to painting.**

DTI INSTALLATION

Trial Project Observations

1. Perform DTI verification procedure with Skidmore on first day. Only repeat for new lots.

2. Eliminates need for torque wrench and cheater bar.

3. Eliminates need to confirm “snug tight” condition on 10% of bolts.

4. Less fatigue for installers.

5. Safer working conditions for erection bolting.

6. Immediate verification of bolt tension.

7. Additional tightening required after feeler gage inspection was 4 bolts out of 1,134 installed (0.35%).

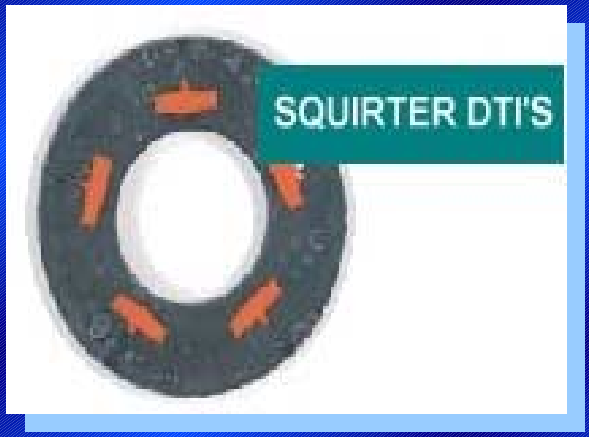
DTI COST COMPARISON (SQUIRTERS)

1. Washer cost is in addition to fasteners, and does not replace any components.

2. Standard DTI washers with indicating agent cost $0.50-$0.60 each. Washers without indicating agent cost about 25% less.

3. Trial project indicated 50% time savings for ground level bolting, and 75% time savings for aerial bolting.

4. DTI use reduced bolting crew from three workers to two.



TRIAL PROJECT RESULTS (DTI SPLICE)

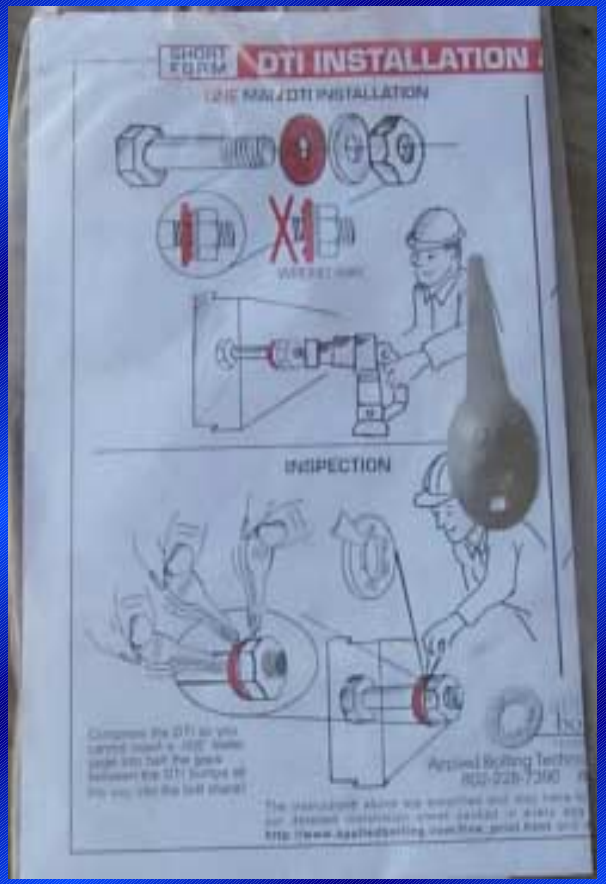
1. Bolted six splices with 1134 bolts. (189 bolts per splice)

2. Final tightening with DTI's required 1.25 hours per splice.

3. Labor cost for 2 men approximately $85.00 per splice.

4. DTI cost approximately $117.18 (at $0.62 per DTI)

5. Total splice cost using DTI's approximately $202.08.

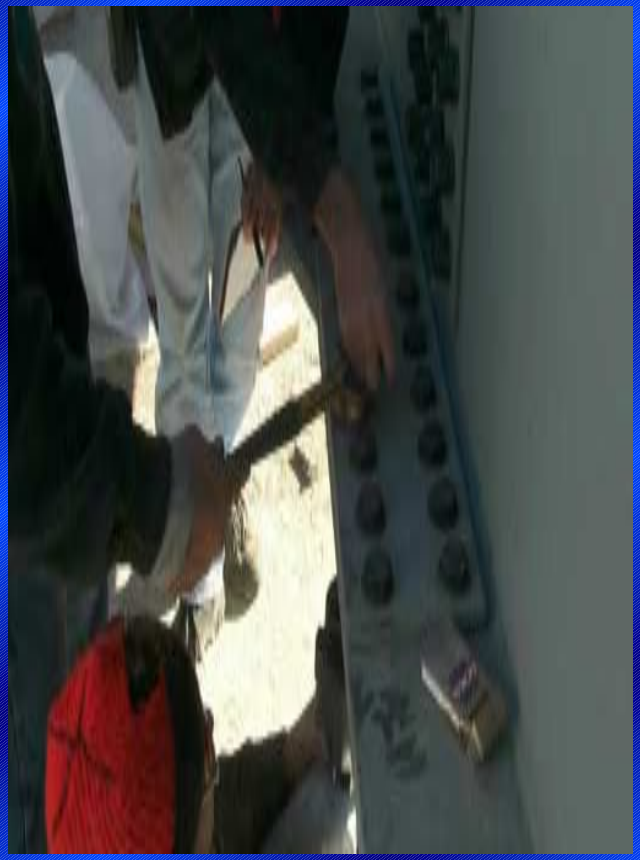


TRIAL PROJECT RESULTS (TURN OF NUT SPLICE)

1. Final tightening with turn of nut tightening required 2.5 hours per splice.

2. Turn of nut method required 3 man crew. One man to hold fixed end, and two men to turn wrench.

3. Labor cost for turn of nut method approximately $255.00.



SUMMARY OF TRIAL PROJECT

1. Time savings of 7.5 hours for six splices done on ground.

2. Estimated time savings of 9 hours for aerial splices.

3. Estimated time savings of 10 hours for aerial cross frame bolting.

3. Total time savings for all bolting 26.5 hours.

4. Estimated net cost savings **$1,150.**

5. Additional tightening required after feeler gage inspection was 4 bolts out of 1,134 splice bolts (0.35%).