How to test bonds » Wire Pull » failure modes

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12. Failure modes

MIL-STD-883 2011.9 lists 26 failure modes (which they call failure categories), depending on the type of sample. We list the most common failure modes for gold wire and aluminium wire below. We also refer to our grading library, where you can download result codes.

i. Gold wire

- Mid span break
  - Bond strength unknown
  - Acceptability depends on measured force
- Heat affected zone (HAZ) break
  - HAZ strength known
  - Acceptability depends on measured force
- Heel break
  - Heel strength known
  - Acceptability depends on measured force
- IMC/bond break
  - IMC/bond strength known
  - Acceptability depends on measured force
- Pad crater
  - Pad strength known
  - Acceptability depends on measured force
  - Possibly bonder process problem
- Wedge crater
  - Acceptability depends on measured force
  - Possibly bonder process problem
- Wedge bond break
  - Wedge bond strength known
  - Acceptability depends on measured force

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- Condor *Sigma W12*
- Condor *150HF*

Mid span
Bond strength unknown
Acceptability depends on strength

HAZ strength known
Acceptability depends on strength

Heel strength known
Acceptability depends on strength

IMC/Bond strength known
Acceptability depends on strength

Pad crater
Pad strength known
Acceptability depends on strength
Possibly bonder process problem

Wedge crater
Acceptability depends on strength
Possibly bonder process problem

Wedge bond
Wedge bond strength known
Acceptability depends on strength

Gold wire pull failure modes overview

ii. Aluminium wire

- Mid span break
  - Bond strength unknown
  - Acceptability depends on measured force
- Heel break
  - Heel strength known
  - Acceptability depends on measured force
- Wedge break
  - Wedge bond strength known
  - Acceptability depends on measured force
- Both wedge bonds break
  - Possibly weak bonds
- Wedge crater
  - Acceptability depends on measured force
  - Possibly bonder process problem
- Both wedge craters

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- Probably weak bonds
- Possibly bonder process problem

Mid span
Bond strength unknown
Acceptability depends on strength

Heel strength known
Acceptability depends on strength

Wedge bond
Wedge bond strength known
Acceptability depends on strength

Both wedge bonds
Possibly weak bonds

Wedge crater
Acceptability depends on strength
Possibly bonder process problem

Both wedge crater
Probably weak bonds
Possibly bonder process problem

Aluminium wire pull failure modes overview

13. Appendices

This how-to has four appendices, namely:

i. Force calculations
   a. Wire length l
   b. Position d1 from first bond angle θ
   c. Position d1 from second bond angle θ
   d. Angle at second bond Φ

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