

Frame update

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Collaboration meeting - Bristol

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Manufactured stainless steel – Previous problems

Problems:

- Cross corner radius too large
- Cross section measurement too large
- Important bow (max 3.5mm for 4.5mm tolerance)
- Important twist (max 2mm for 3mm tolerance)

Consequences:

- Longer frame production time
- Frames out of tolerance (bow/twist)

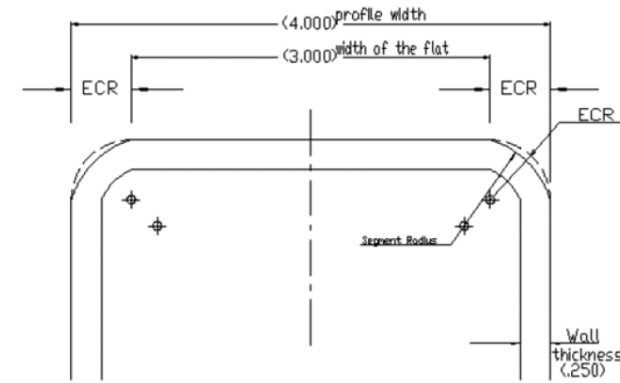
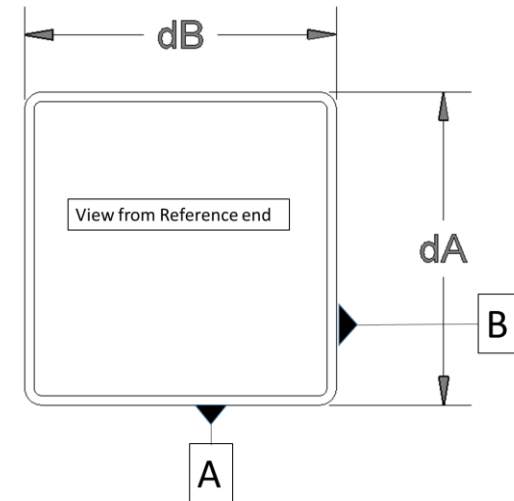


FIGURE 1



Manufactured stainless steel – Solution

- Discussion with Stala Tube (frame manufacturer in Finland)
- Visit of Stala tube (4x4 beam verification)



Manufactured stainless steel – New results

- Effective corner radius within tolerance
- Cross section measurement within tolerance
- Bow much better: max 2.5mm (was 3.5mm)
- Twist near zero: max 0.55mm (was 2mm)



Frame status – Frames at Daresbury

20 frames produced, inspected and shipped to Daresbury:

- 3 ProtoDUNE APAs
- APAs 4, 5, 7, 8 finished (or nearly)
- APA 6, 9 ready for winder
- 11 frames in waiting
- Some of those frames were made several times

Concessions

- Frame 3: partial drill hole on the head beam
- Frame 12: partial drill hole on the middle beam
- Frame 14: 1.09 mm/m twist (tolerance: 1 mm/m)
- Frame 17: 1.22 mm fold (tolerance: 1.2 mm)
- Frame 19: 1.02 mm/m twist (tolerance: 1 mm/m)



Frame status – Frames at DSM

Frame	Manual inspection	Horizontal inspection	Vertical inspection
Frame 21	OK	Results not available	Twist, zone 3: 1.07 mm/m Twist, zone 4: 1.22 mm/m
Frame 22	Modif in progress: Rivnut addition	Results not available	Twist, zone 2: 1.03 mm/m
Frame 23	OK	Results not available	Twist, zone 2: 1.26 mm/m Twist, zone 3: 1.25 mm/m
Frame 24	Modif in progress: Frame serialization Rivnut addition	Results not available	Twist, zone 2: 1.02 mm/m Twist, zone 4: 1.29 mm/m

Upcoming program

- New steel from frame 28 -> Reduce assembly time
- 4 or 5 frames produced per month
- Regular night shifts at machining company
- Rare night shifts at DSM
- 6 frame inspection days per month (made by DUNE)
 - 2/3 days (2 person): laser inspection with Liverpool University or Manchester metrology
 - 3/4 days (2 person): manual inspection with Lancaster technicians
- Shipments of 3 to 5 frames at a time
- On track to recover our initial schedule