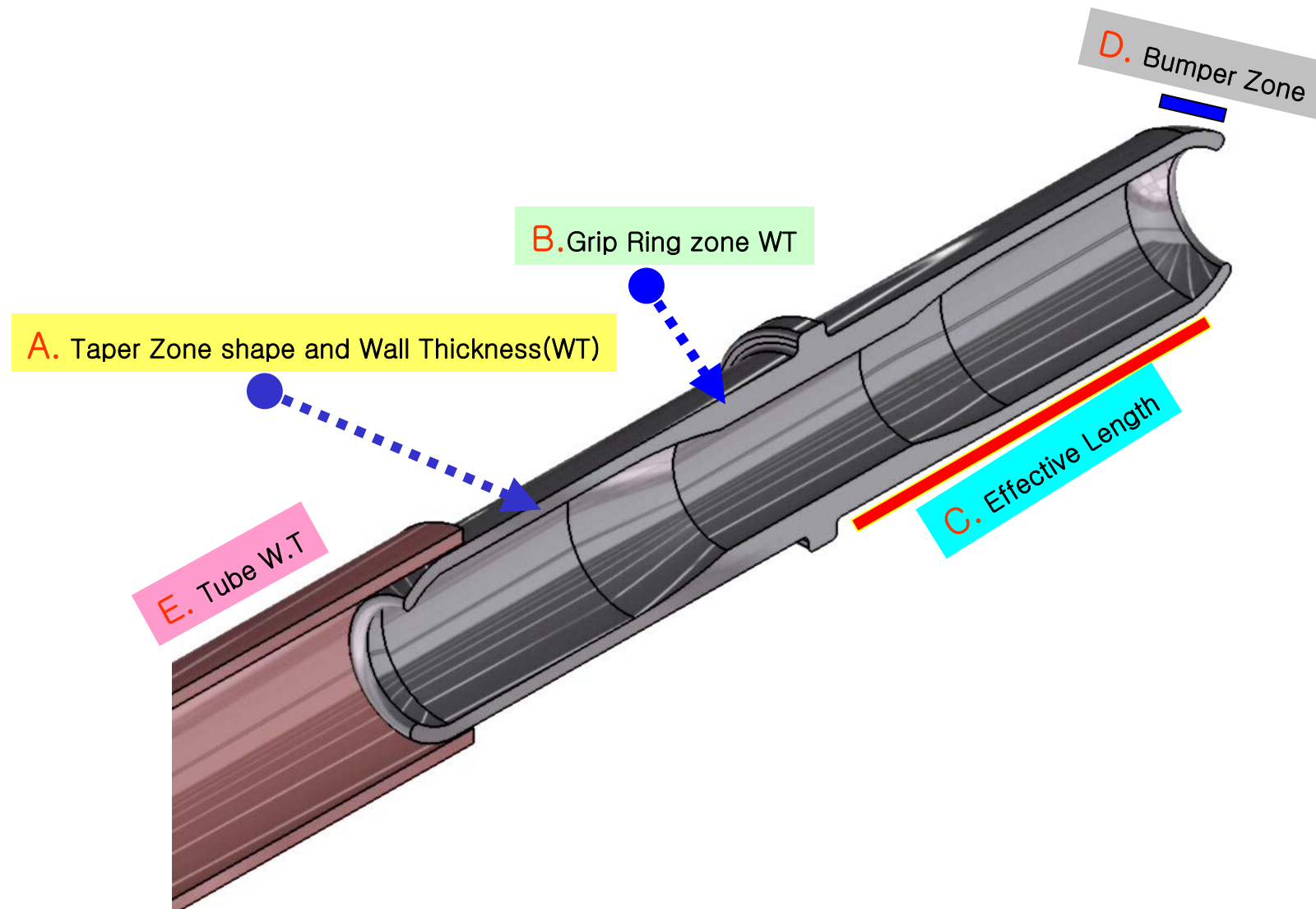


Advanced Floating Connector And Tube Analysis

July 22, 2005

Features to be analyzed for improving FC/tube performance

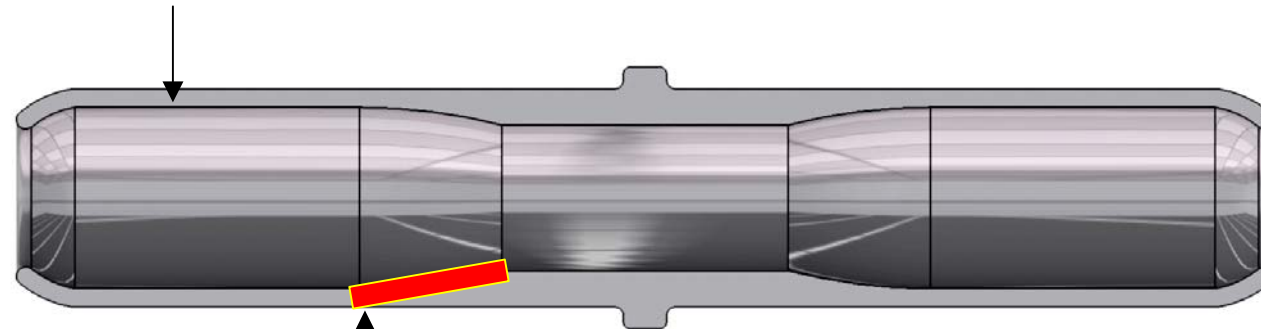




A. Taper Zone shape and WT

Variable 1 – WT (from 0.4mm to 0.75mm in $\sim 0.05\text{--}0.1\text{mm}$ Increments)

preparation



Variable 2 – taper length and angle
(from 5mm to 19mm in $\sim 2\text{--}5\text{mm}$ increments)
the longer the length, the slighter the angle

Test Result

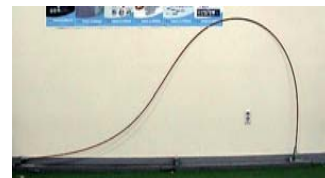
1. Longer Transition Length
2. Slighter taper angle
3. $\sim 0.5\text{--}0.55\text{mm}$ WT

Results in

1. preventing permanent bending at taper
2. possibly less crazing
3. stress equalizing of $\sim 3\text{--}5\%$ under computer simulation



Crazing monitoring



Flexion Test



*Possibly less crazing
(difficult to determine)*

*Example of permanent bending
At taper under severe Flexion test*

B. Grip Ring zone WT

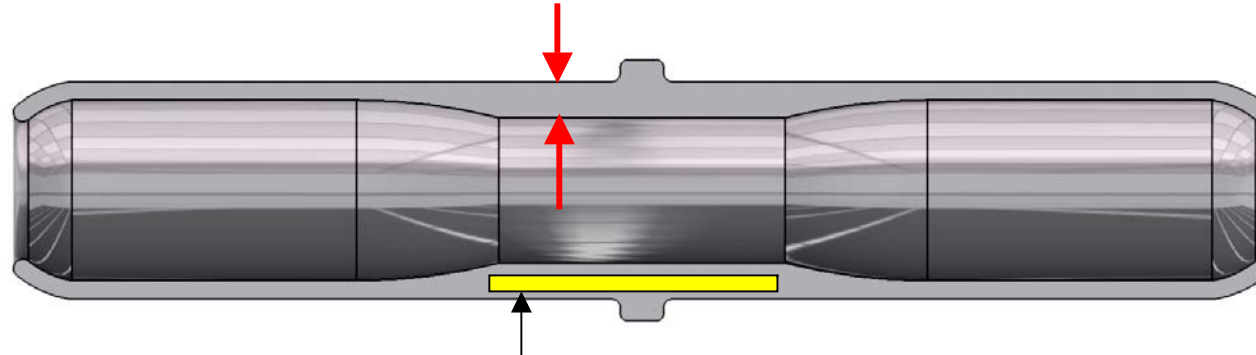


Variable 1 — Grip Ring zone WT
(from 0.85 to 1.20mm in ~0.05–0.1mm increments)

preparation



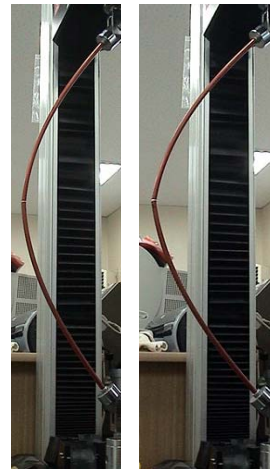
Test Result



Variable 2 — Grip Ring zone length
(from 6mm to 13mm in 2mm increments)



Acceptable tube breakage



*Unacceptable tube breakage
(tube and FC split)*

Sufficient Grip Ring zone WT and length with steady taper leads to safer pole structure



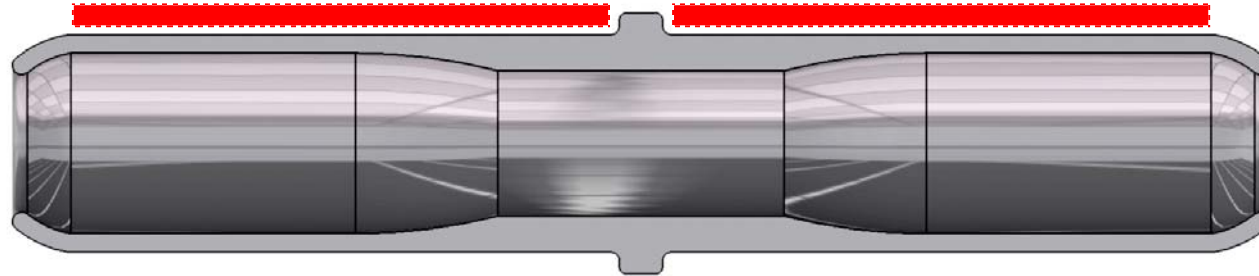
Optimal Grip Ring zone WT and length determined by pressure test and simulation



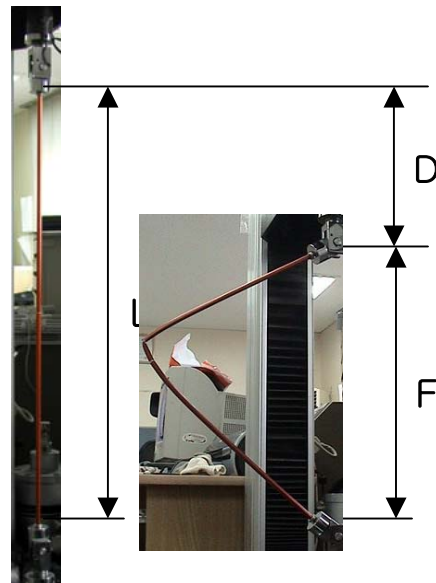
C. Effective Length

Variable 1 – Effective length
(from 19mm to 32mm)

preparation



Test Result



L = initial pole length
D = arching length
F = final pole length

Increasing the effective length:

- Case 1. — Increasing 26% results in ~7–8% more arching
(“D”increases as “F”decreases)
- Case 2. — Increasing 27% results in 9% more arching
(“D”increases as “F”decreases)

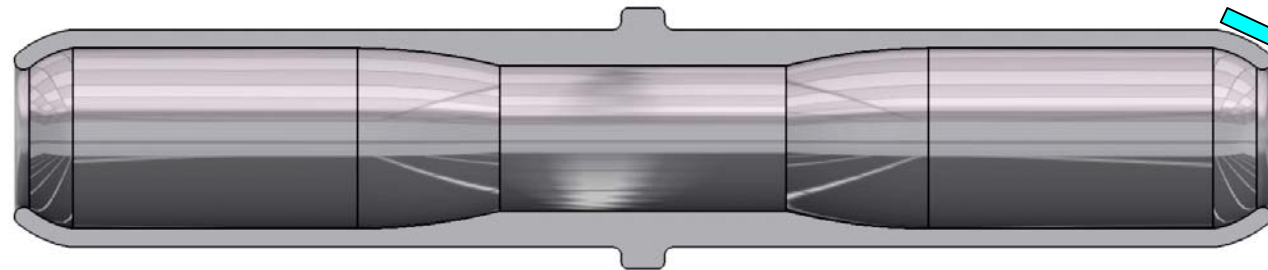
Longer effective length results in safer poles

D. Bumper Zone

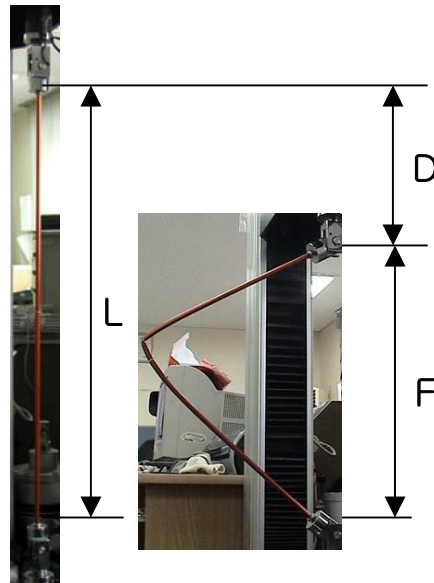


Variable 1 – Bumper Zone length
(from 0mm to 2mm)

preparation



Test Result



L = initial pole length
D = arching length
F = final pole length

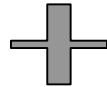
Results of changing Bumper Zone length

From 2mm to 1mm

1. Difference in crazing difficult to determine visually
2. In pressure test at left , no discernible difference between 2mm and 1mm lengths as “D” amount increases
3. Wear to Shokcord due to Bumper Zone reduced under visual inspection

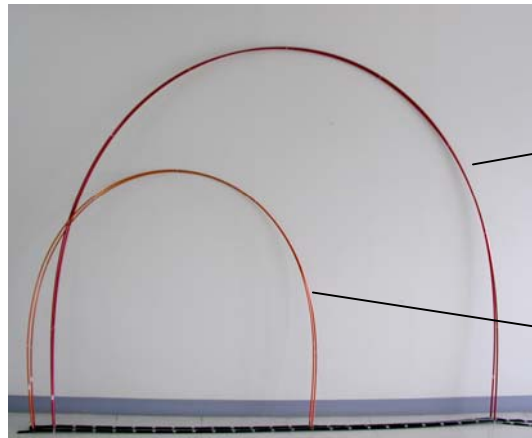


Advanced FC
(Optimal construction)



Current
Specification

Material	Current O.D	W.T
Scandium	8.88mm,	.60mm
Scandium	9.76mm,	.61mm
Scandium	10.76mm,	.62mm
A7001T6	8.91mm,	.62mm
A7001T6	9.80mm,	.63mm
A7001T6	10.80mm,	.64mm



Smoother arching and
safer pole structure
During Flexion test



Current_FC



Advanced_FC

Advanced_FC

Current_FC

Ensures less crazing and a more secure pole structure

E. Tube WT modified to create a safer pole system



Current
Specification

<i>Material</i>	<i>Current O.D</i>	<i>W.T</i>
<i>Scandium</i>	<i>8.88mm,</i>	<i>.60mm</i>
<i>Scandium</i>	<i>9.76mm,</i>	<i>.61mm</i>
<i>Scandium</i>	<i>10.76mm,</i>	<i>.62mm</i>
<i>A7001T6</i>	<i>8.91mm,</i>	<i>.62mm</i>
<i>A7001T6</i>	<i>9.80mm,</i>	<i>.63mm</i>
<i>A7001T6</i>	<i>10.80mm,</i>	<i>.64mm</i>

Modified
Specification

<i>Material</i>	<i>Modified O.D</i>	<i>W.T</i>
<i>Scandium</i>	<i>8.90mm,</i>	<i>.61mm</i>
<i>Scandium</i>	<i>9.78mm,</i>	<i>.62mm</i>
<i>Scandium</i>	<i>10.78mm,</i>	<i>.63mm</i>
<i>A7001T6</i>	<i>8.93mm,</i>	<i>.63mm</i>
<i>A7001T6</i>	<i>9.82mm,</i>	<i>.64mm</i>
<i>A7001T6</i>	<i>10.82mm,</i>	<i>.65mm</i>

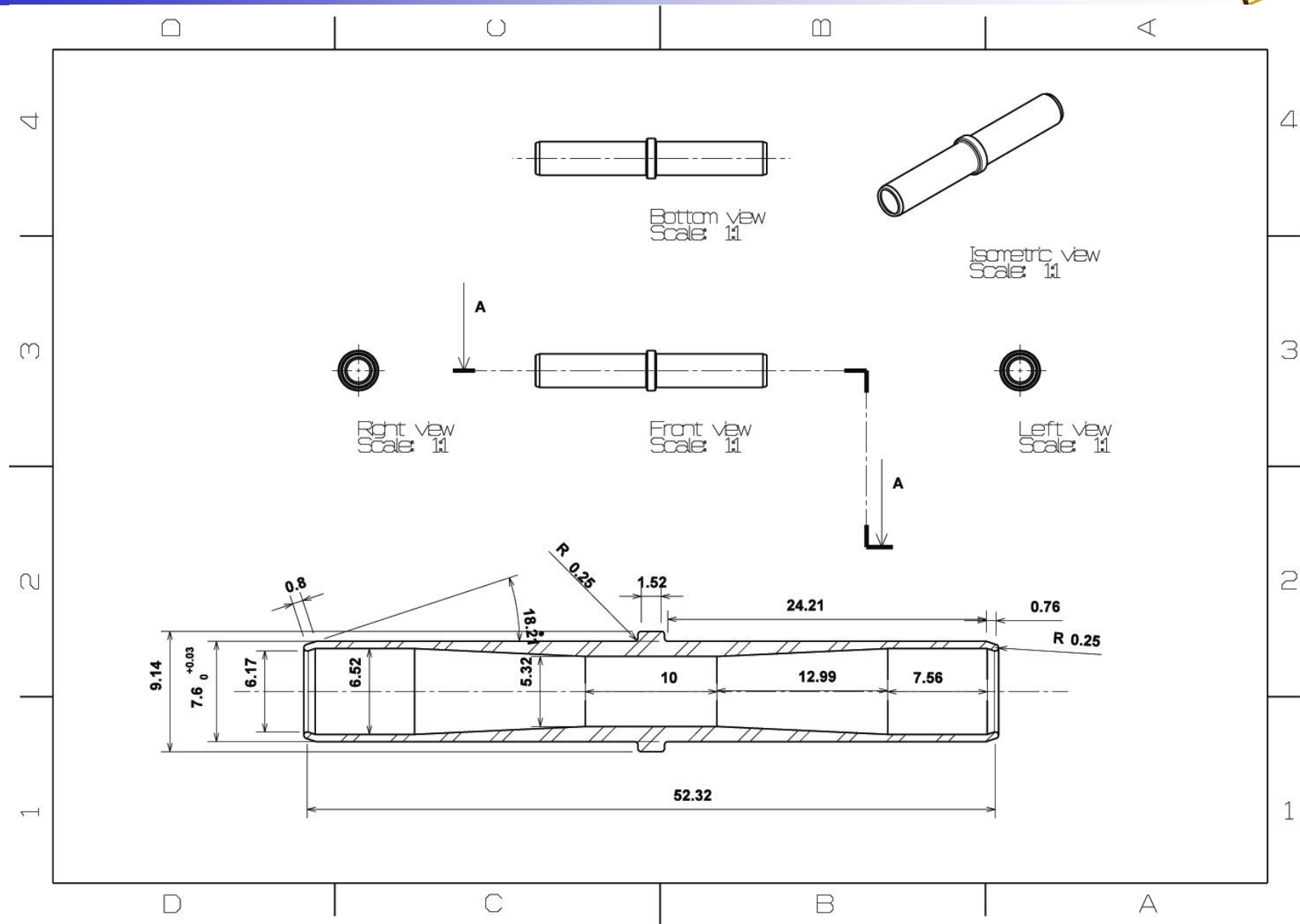
Increase tube outer diameter by 0.02mm

Decision based on following considerations :

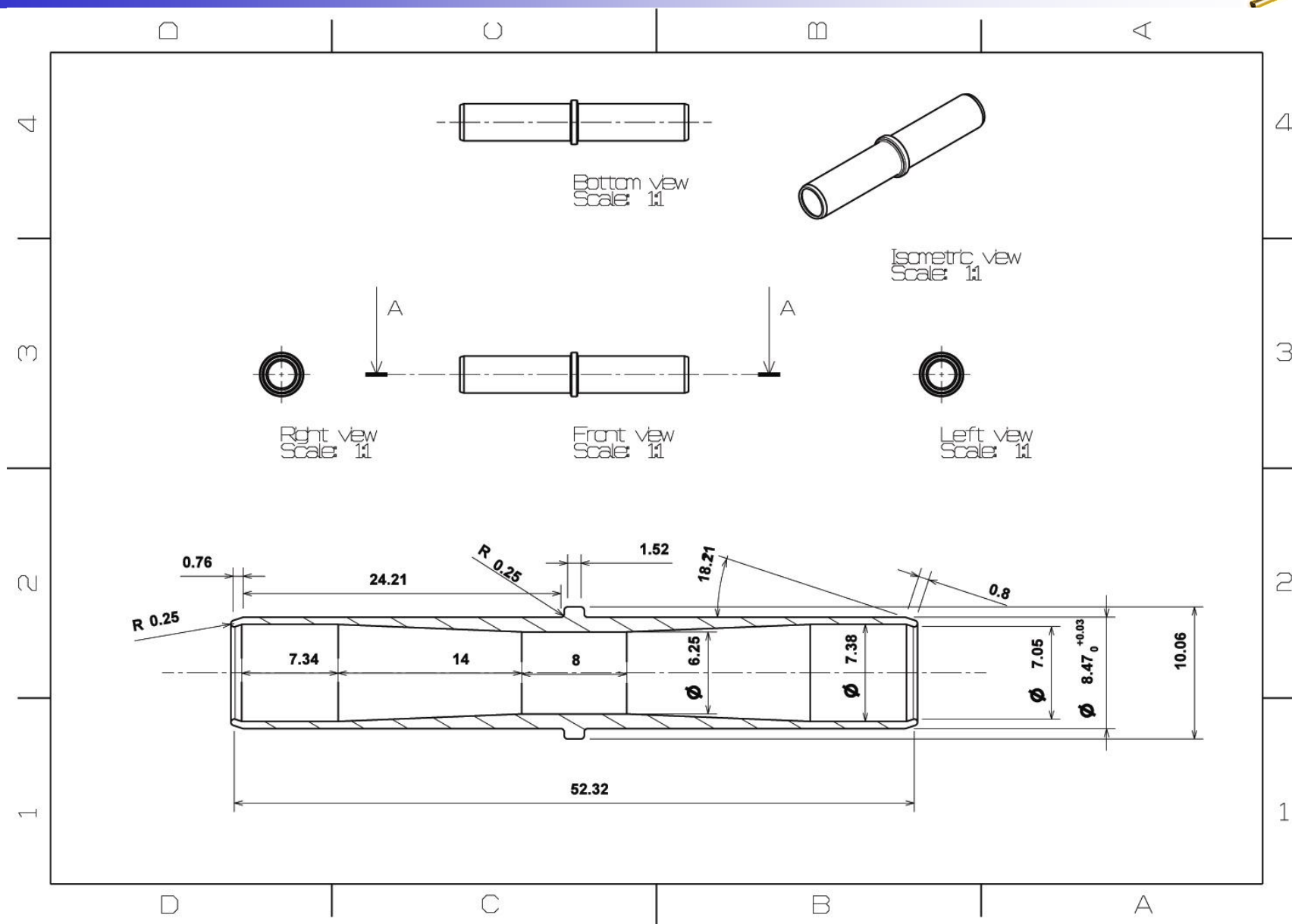
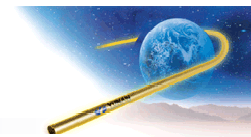
1. Material (Scandium and A7001T6)
2. Maintaining stress balance between FC and tubes limits amount of tube OD increase
3. Advanced FC's longer effective length already results in stringer poles
4. Nominal weight increase maintains lightness of poles

**Less Crazing
safer pole system**

8.9mm/8.93mm FC_AD Drawing



9.78mm/9.82mm FC_AD Drawing



10.78mm/10.82mm FC_AD Drawing

