Customer Driven Designs

- Connectorization
- Component Separation
- Positive Compensation
- Field Installable
- Field Testable
- Emergency Breakaway
- Bend Restrictor
- Dual Barrier Sealing
- Flooded Operation
- Leak Detection
- Component Integration
Component Separation

ARMOR TERMINATION
ASSEMBLY

FITA

BREAKAWAY UNIT

BULKHEAD CONNECTOR
Armor Termination Assembly

- Field Installable
- No Compounds
- Full Ocean Depth Rated
- Adaptable to Most Cables
Field Installable Testable Assembly

- Field Installable
- No Compounds
- 700 lb. Pull-Out
- 10,000 ft. Rated
- O-Ring Test Ports
Positive Pressure Compensation Technology

- Low Differential Pressure
- 30 psi Positive Internal Pressure
Leak Detection

• RUFFNECK™ and FITA designed to continue operating in the event of water ingress.
• FITA equipped with ‘Meggar Pin’ that allows quick water detection test.
Component Integration

- RUFFNECK™ Connector
- Positive Compensation
- Electric / Fiber Optic
- Integrated Armor Termination with Connector
- 10,000 psi Rated
Field Installation and Testing

• All Equipment Field Installable
• Training Available for Rig Personnel
• Why is Connector Testable?
  – Conventional pressure testing not possible.
• How is Connector Testable?
  – Recommended to use O-ring test ports
  – Design allows connector to be filled with water in field and assured operational when flooded
Dual Barrier Sealing

- Dual O-ring sealing on all water paths
- Where possible, dual seals are not on same diameter
Breakaway Unit

- Field Installable
- No Compounds
- Shear Pin
Right Angle Bulkhead

- Field Installable
- No Compounds
- Rated 5,000 psi
- open-face forward & backward
Bend Restrictor

- 2.5 “ Diameter
- 60,000 lb. Operating Tensile Load
- 11,000 lb. Dynamic Cyclic Bend Load
Electrical/Optical Characteristics

• FITA
  – 12#16 AWG Configuration fully developed, tested, and field proven.
  – Additional configurations, including fiber optic, under development.
  – 600 Volt / 15 Amp electrical contacts.
  – IR > 500 MΩ@500 VDC.

• RUFFNECK™
  – 4#10 AWG with 8 Fiber Optic Contacts.
  – Same electrical characteristics as FITA.
  – Optical Attenuation < 0.5 dB per contact.
Test Results

• Electrical connectors pressure tested in flooded condition, 7,500 psi.
  – 75 GΩ lowest IR flooded.
  – Three 10 minute cycles, one 1 hour cycle.
• FITA cable pull-out tested ~700 lb.
• Armor Termination Assembly pull-tested with customer cable, failure mode was armor breakage.
• Breakaway Unit tests within 5% of target load.
• Universal Bend Restrictor dynamically cycled under tension over 36” sheave.
Field Results

• RUFFNECK™ in Brazilian waters for over two years with no failures.
• ATA / FITA in operation on the Transocean Offshore Deepwater Drilling Inc. Deepwater Nautilus in 9000+ ft record depth for a moored rig.
Conclusions

• Reliability
  – 20 year design life
  – Positive pressure compensation major factor

• Robustness
  – Significant design input from offshore personnel to ensure practicality
  – Added size / strength to accommodate larger MUX cables in future

• Suitability
  – Modularized design allows flexibility

• Costs
  – Competitive with conventional MUX connectors
Acknowledgements

• Seacon Worldwide Teams
  – Over 40 years continuous experience

• Transocean Offshore Deepwater Drilling Inc.
  – Partnership in development of ATA / FITA.