

CARBON FIBER LIFE EXTENSION SERVICES



TOTALGROUP
OF COMPANIES

TOTAL FIRE SOLUTIONS | TOTAL RESCUE | TOTAL MEDICAL

Ontario Approved Working at Heights Provider WAH-34962
Onsite Confined Space Entry and Technical Rope Rescue
Fire Extinguisher and Fire Systems Maintenance

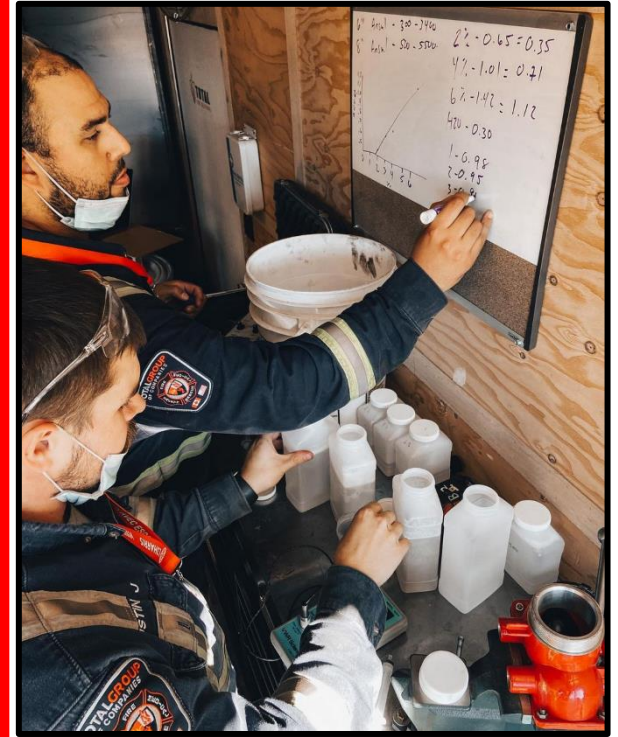
Carbon Fiber Life Extension – Canada *“Save Money, Never Compromise Safety”*

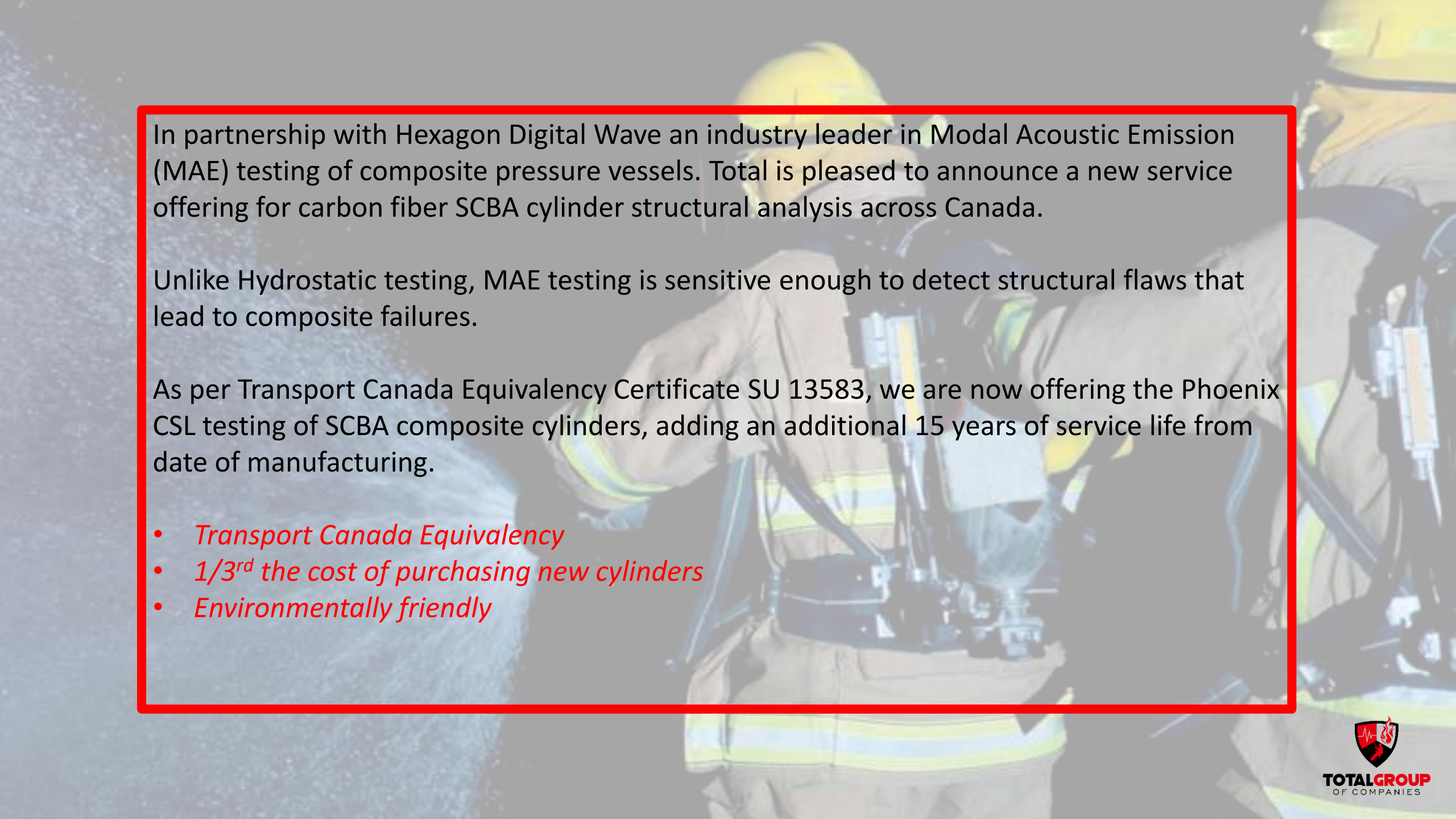


Total Group of Companies

Quality Fire, Rescue, Safety and Medical Services

- ✓ Carbon Fiber Life Extension (additional 15 years)
- ✓ Fire systems/foam supply, maintenance, testing, installs, and commissioning services
- ✓ Fire extinguisher, hydrotesting, hose testing and inspection services
- ✓ Rental and Emergency response fire equipment and personnel (5000 gpm. pumps, foam proportioning skids, hose and hardware)
- ✓ Rescue teams
- ✓ Safety personnel and equipment (plant turnarounds)
- ✓ Equipment inspections, custom software and reports, sales (rescueshop.ca)
- ✓ Safety training and advanced workshops





In partnership with Hexagon Digital Wave an industry leader in Modal Acoustic Emission (MAE) testing of composite pressure vessels. Total is pleased to announce a new service offering for carbon fiber SCBA cylinder structural analysis across Canada.

Unlike Hydrostatic testing, MAE testing is sensitive enough to detect structural flaws that lead to composite failures.

As per Transport Canada Equivalency Certificate SU 13583, we are now offering the Phoenix CSL testing of SCBA composite cylinders, adding an additional 15 years of service life from date of manufacturing.

- *Transport Canada Equivalency*
- *1/3rd the cost of purchasing new cylinders*
- *Environmentally friendly*



MODAL ACOUSTIC EMISSION VS. HYDROSTATIC

- Hydrostatic testing (old standard)
 - Volumetric expansion
 - Hydrotesting facilities not drying out properly in the U.S.
- MAE
 - Able to detect flaws that hydrostatic testing cannot (fiber fracture, delamination, etc.)
 - Re-autofrettage
 - Able to determine characteristics of physical variables through wideband wave modes (AE is narrowband wave modes that cannot be meaningfully quantified)

Test Method	False Positive (%)	False Negative (%)
Hydrostatic	1.3	3.8
MAE	3.8	1.3
AE	24.4	1.3



HISTORY OF LIFE EXTENSION

- U.S. Navy approached DOT wanting life extension of their SCBA fleet. HDW produced test plan showing cylinders could be safely life extended.
- Navy Special Permit issued in 2014. Civilian testing took place with FDNY cylinders and SP issued in 2017.
- Transport Canada Equivalency Certificate SU 13583 issued in 2022.
- Hexagon acquired Digital Wave in 2018 for CNG trailer requalification.



SCBA Cylinders	8790
Navy Cylinders	3768
PCI	1890
Titan Trailer	1600
Total	14448

FIREFIGHTER AND CLIENT BENEFITS

Cost Savings

- ~\$1,700+ for new cylinders
- ~\$10,000+ for new pack

Environmental

- Double the life
- Less waste in landfills
- Carbon fiber shortage

Safety

- Proven safety testing technology available
- DOT and TC approved

REGULATORY



**Alberta Fire Chiefs
Association**
Professionals Serving Professionals



September 12, 2022

Alberta Fire Chiefs Association in Conjunction with Hexagon Digital Wave shares this announcement of revolutionary technology to create the potential to double the life span of carbon composite cylinders.

Transport Canada has recently issued an Equivalency Certificate (basically an exemption to the TDG Regulations) that allows certain carbon composite cylinders with a seamless aluminum liner to be used past their 15-year service life provided that the cylinders pass a specific testing protocol. Hexagon Digital Wave, LLC has received this certification authorizing the use of its Modal Acoustic Emission (MAE) technology to conduct this specific testing.

The Alberta Fire Chiefs Association along with the Canadian Association of Fire Chiefs – National Advisory Council, played a large part in advocating Transport Canada in this tremendous news for all fire services in this country. The potential to double the life span of carbon composite cylinders through this process will have meaningful budgetary and positive environmental impacts.

[Hexagon Digital Wave's proprietary Modal Acoustic Emission technology approved for use in Canada](#)

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Transport
Canada

Transports
Canada



Transportation of Dangerous
Goods Directorate
L'Esplanade Laurier
300 Laurier Avenue West
Ottawa, Ontario
K1A 0N5

Direction générale du transport
des marchandises dangereuses
L'Esplanade Laurier
300, avenue Laurier Ouest
Ottawa (Ontario)
K1A 0N5



Equivalency Certificate

(Approval issued by the competent authority of Canada)

Certificate Number: SU 13583
Template Number: N/A
Certificate Holder: Hexagon Digital Wave, LLC
Mode of Transport: Road, Rail, Marine, Air
Effective Date: June 13, 2022
Expiry Date: June 30, 2027

LEGEND

For the purposes of this equivalency certificate, documents referred to by an abbreviation have the following meaning:

TDG Act: *Transportation of Dangerous Goods Act, 1992*

TDG Regulations: *Transportation of Dangerous Goods Regulations*

CGA C-6.2-2019: CGA C-6.2-2019, "Standard for Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders", eighth edition, published by the Compressed Gas Association Inc. (CGA)

CSA B339-18: CSA Standard B339-18, "Cylinders, spheres, and tubes for the transportation of dangerous goods", published by the Canadian Standards Association (CSA), June 2018

CSA B340-18: CSA Standard B340-18, "Selection and use of cylinders, spheres, tubes, and other containers for the transportation of dangerous goods, Class 2", published by the Canadian Standards Association (CSA), June 2018

ISO 11119-2:2020: 11119-2:2020, "Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 2: Fully wrapped fibre reinforced



TOTALGROUP
OF COMPANIES

LOGISTICS AND PRICING

Ship to Total's Red Deer Facility

- Central location
- No TDG for empty cylinders

Total Onsite Pickup and Delivery

- Potential savings if onsite for other services
- Convenient

Lead Time

- 15 business days - rush orders available depending on client requirements

Pricing

- \$500.00/cylinder +shipping

The background of the slide is a close-up photograph of a fire engine's dashboard and engine compartment. The dashboard on the right features several gauges, including a large RPM gauge labeled 'RPM X1000' and a smaller voltage gauge labeled 'VOLT'. Below these are two red indicator lights labeled 'LOW OIL' and 'HI TEMP', and a black ignition switch with a key. The engine block on the left is dark and metallic, with various bolts and components visible. The overall scene is brightly lit, suggesting an outdoor setting.

Questions?

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