أرامكو السعودية
saudi aramco

Innovative Method to Protect Pipelines Made of Composites When Excavating to Build a Crossing Pipeline

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Presentation outline

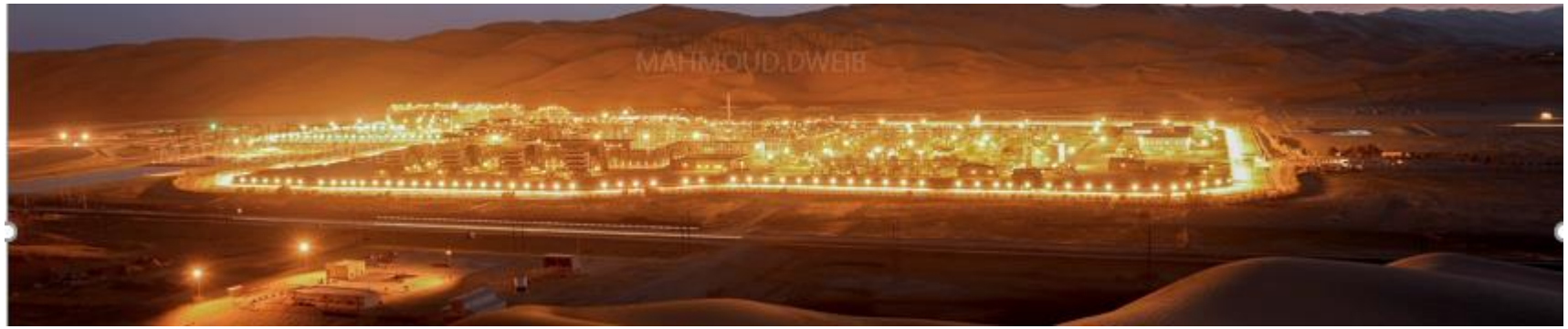
- Background
- Current Situation
- Protection Method Design
- Prototype
- Aboveground Assembly
- Underground Assembly
- Advantages and Benefits
- Conclusions

Background

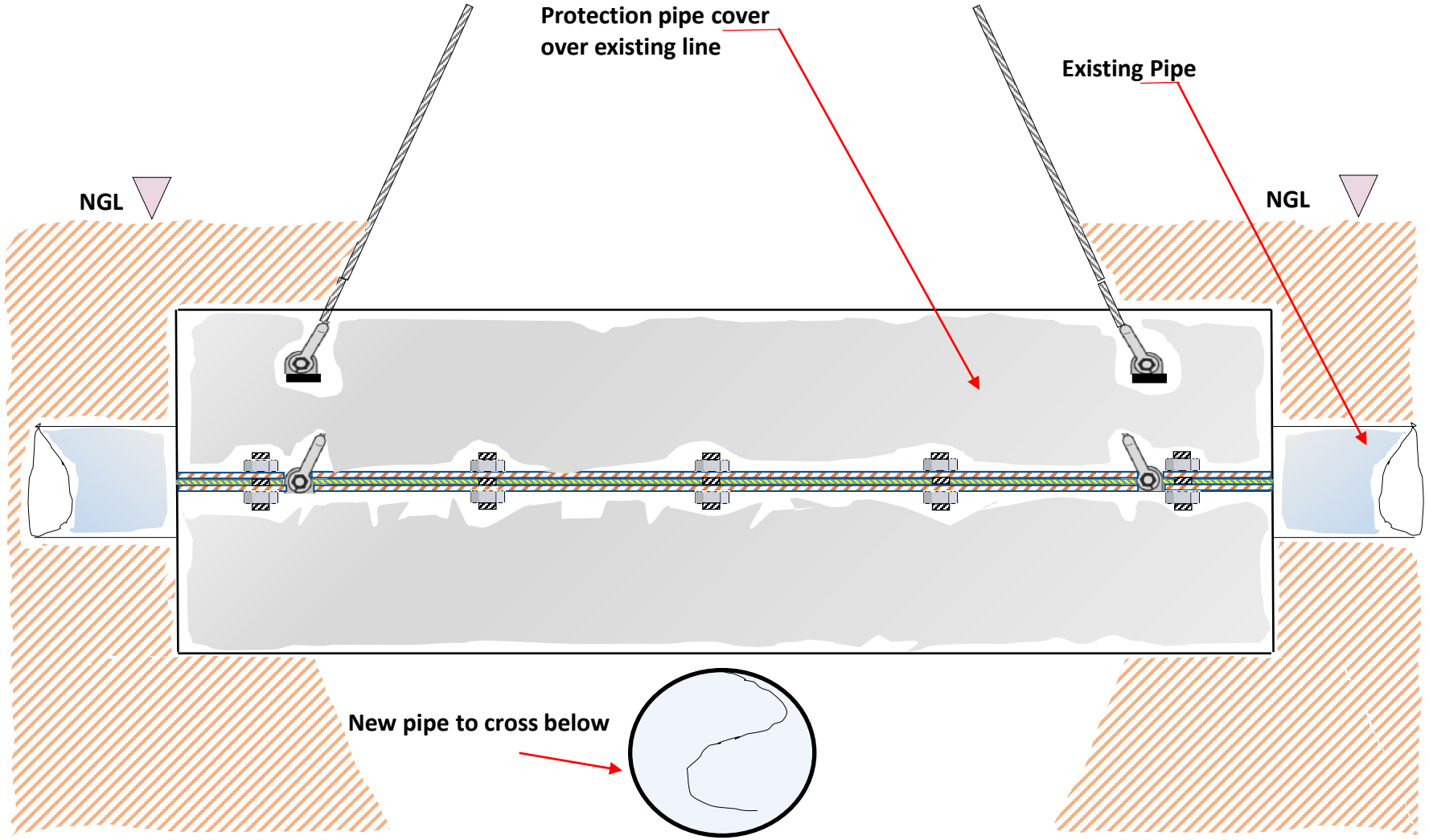
- All live steel pipelines and composite pipelines need to be protected during excavation
- Composite pipes also need protection during shut down and manual excavation!

Current Situation

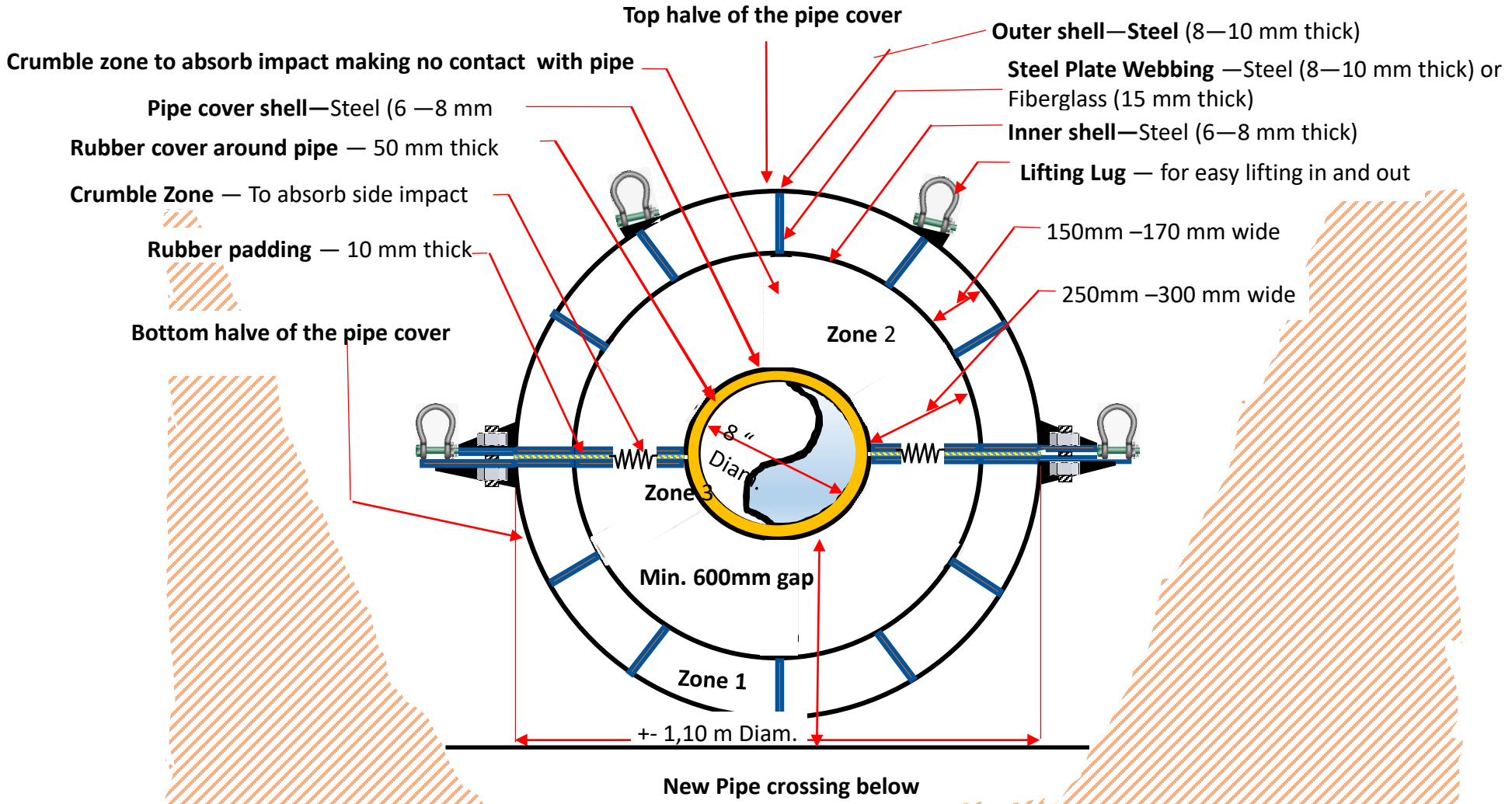
- Live pipes are vulnerable and heavy machines could cause damage and spill
- Machine Excavations is not allowed within three meters of existing pipeline
- More than 1000 pipeline crossings take place at SA every year
- Excavation using handheld tools is time and money consuming
- Nonmetallic pipes may still get damaged by handheld tools and falling small rocks



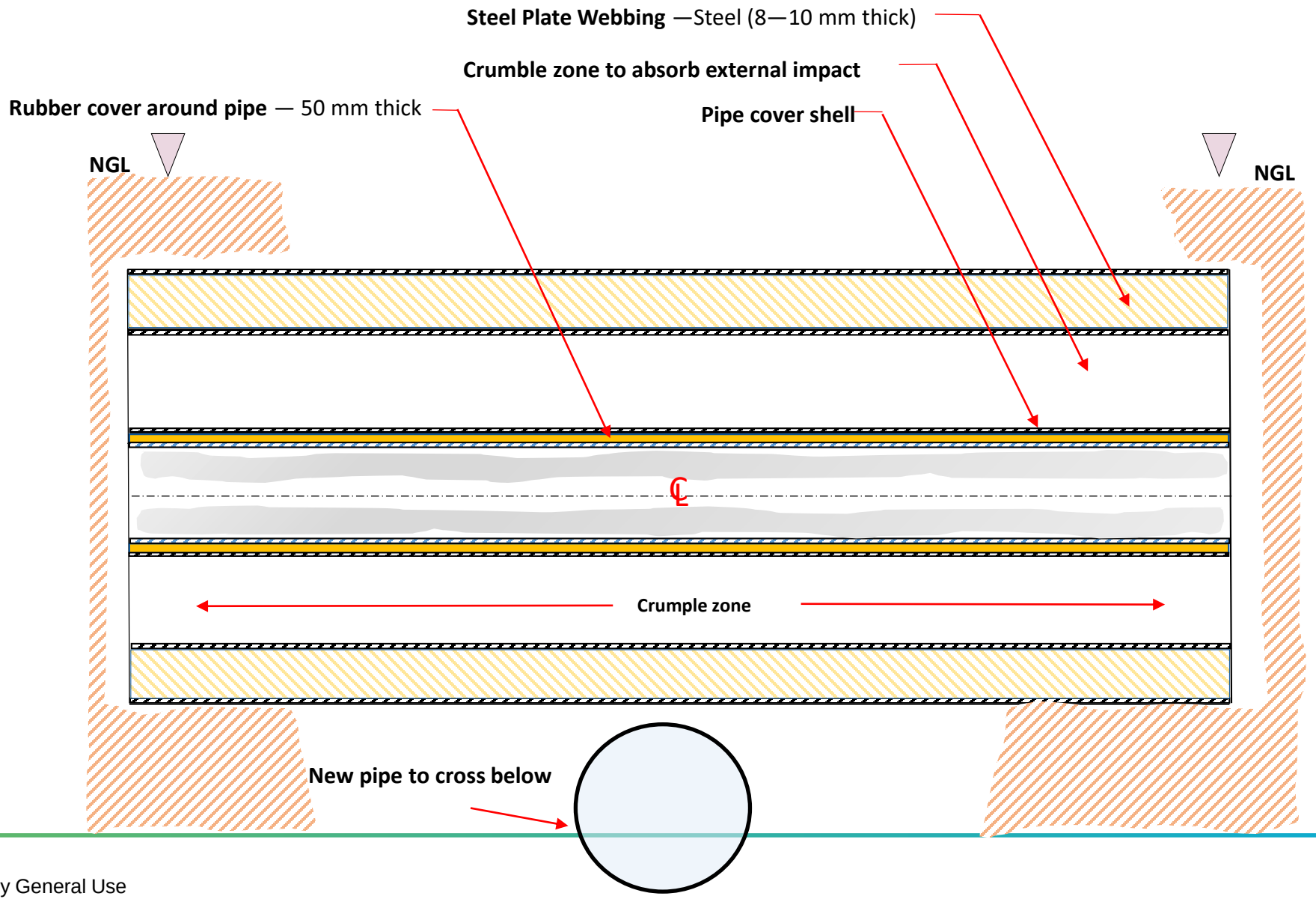
Protection Method Concept



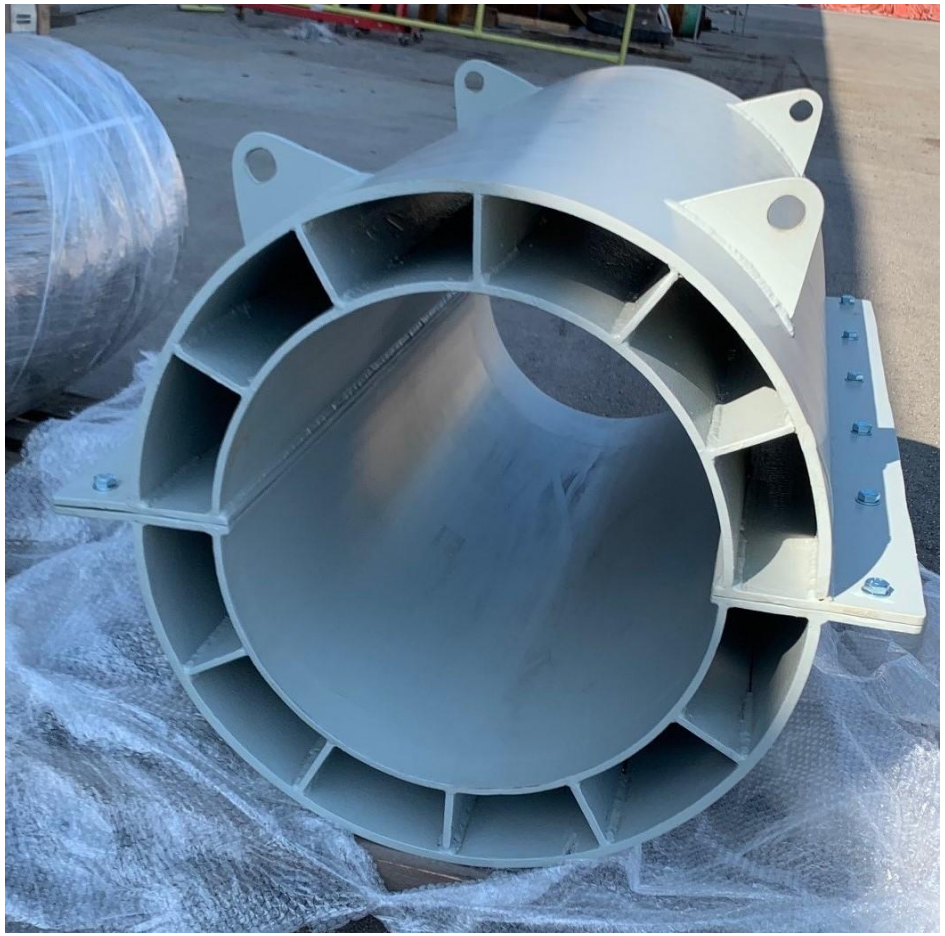
Protection Method Design



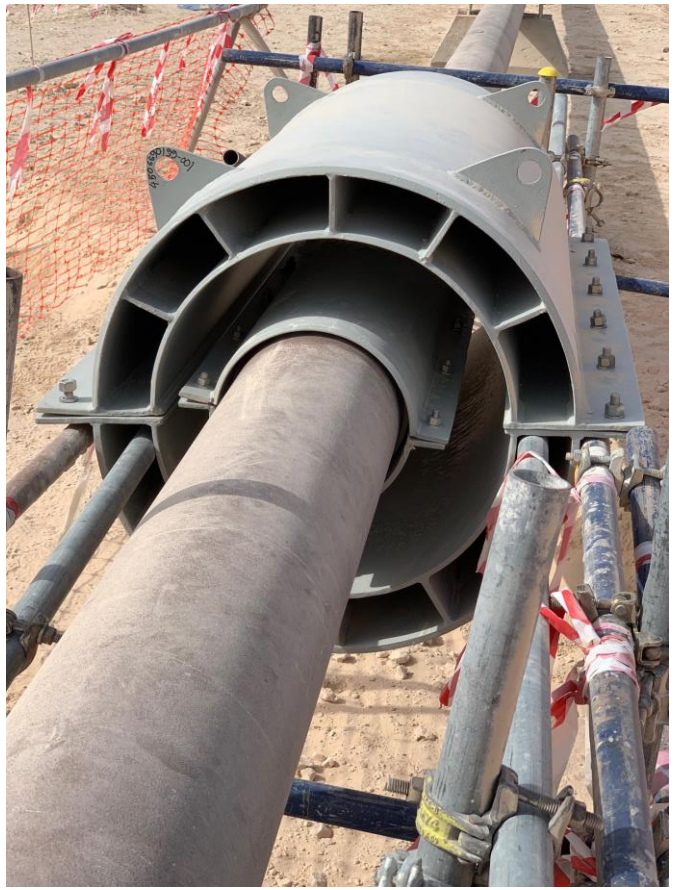
Protection Method Design



Prototype



Aboveground Assembly



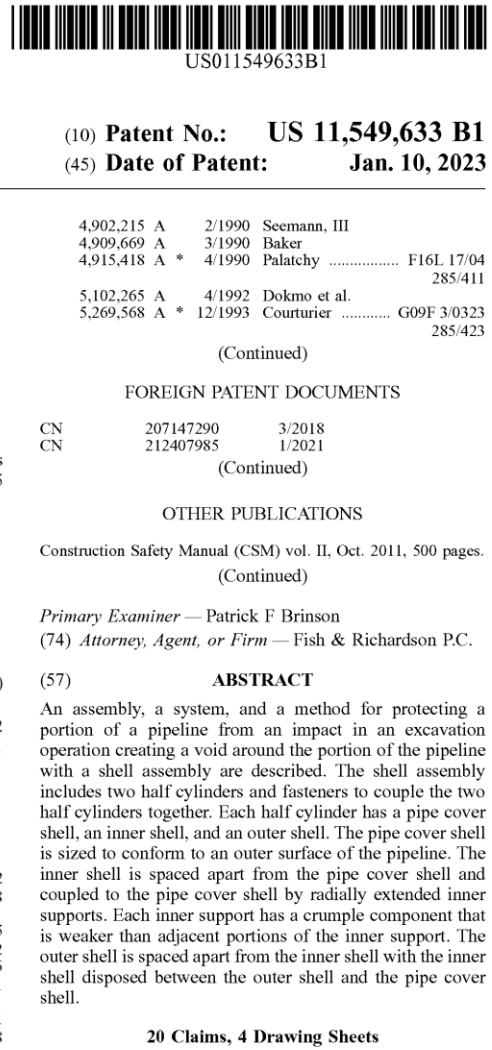
Underground Assembly

Advantages and Benefits of this Protection Method

- Protects pipelines against impact with zero load transferred to the pipe due to the wide crumple zone
- Facilitates the use of heavy excavation equipment at pipe crossings
- Saves around 70% of the project scheduled time at each Pipeline Crossing (money saving!)
- Enhances safety of people in the vicinity of the crossings
- Protection against impact, encourages more nonmetallic pipes deployment

Conclusions

- Prototype was manufactured
- Field trials were conducted
- Full deployment at Saudi Aramco projects is being considered
- It is estimated that this technology will yield a significant saving in project time and money
- This technology is protected under US Patent # 11,549,633



US011549633B1

(12) **United States Patent**
Dweib et al.

(10) **Patent No.: US 11,549,633 B1**
(45) **Date of Patent: Jan. 10, 2023**

(54) **PROTECTING A PORTION OF A PIPELINE FROM AN IMPACT**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(22) Filed: **Sep. 1, 2021**

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F16L 57/06 (2006.01)

(52) **U.S. Cl.**
CPC ***F16L 57/06*** (2013.01)

(58) **Field of Classification Search**
CPC F16L 57/06; F16L 58/181; F16L 11/12
USPC 138/110, 156–161
See application file for complete search history.

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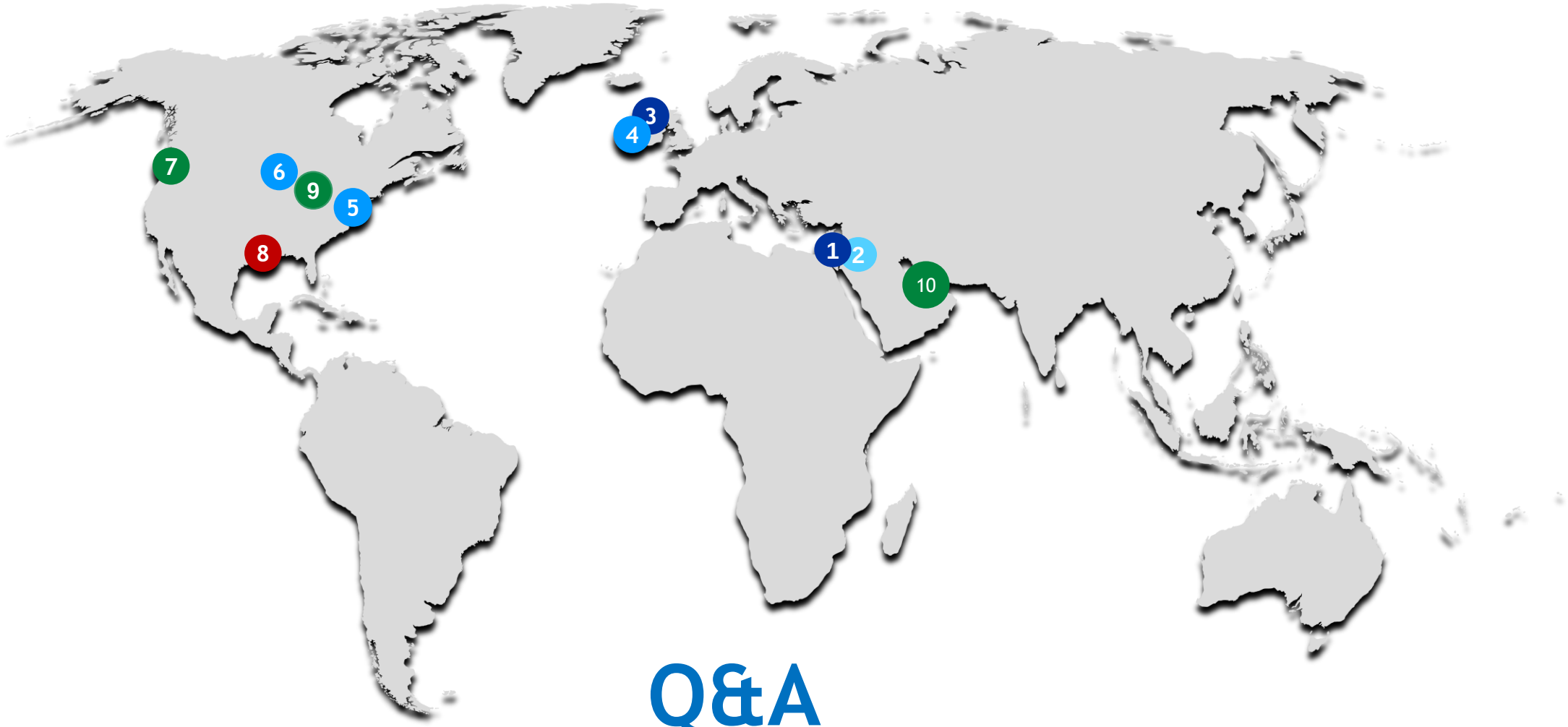
(57) **ABSTRACT**

An assembly, a system, and a method for protecting a portion of a pipeline from an impact in an excavation operation creating a void around the portion of the pipeline with a shell assembly are described. The shell assembly includes two half cylinders and fasteners to couple the two half cylinders together. Each half cylinder has a pipe cover shell, an inner shell, and an outer shell. The pipe cover shell is sized to conform to an outer surface of the pipeline. The inner shell is spaced apart from the pipe cover shell and coupled to the pipe cover shell by radially extended inner supports. Each inner support has a crumple component that is weaker than adjacent portions of the inner support. The outer shell is spaced apart from the inner shell with the inner shell disposed between the outer shell and the pipe cover shell.

20 Claims, 4 Drawing Sheets

Thank you



Q&A