



CCLRC  
Rutherford Appleton Laboratory

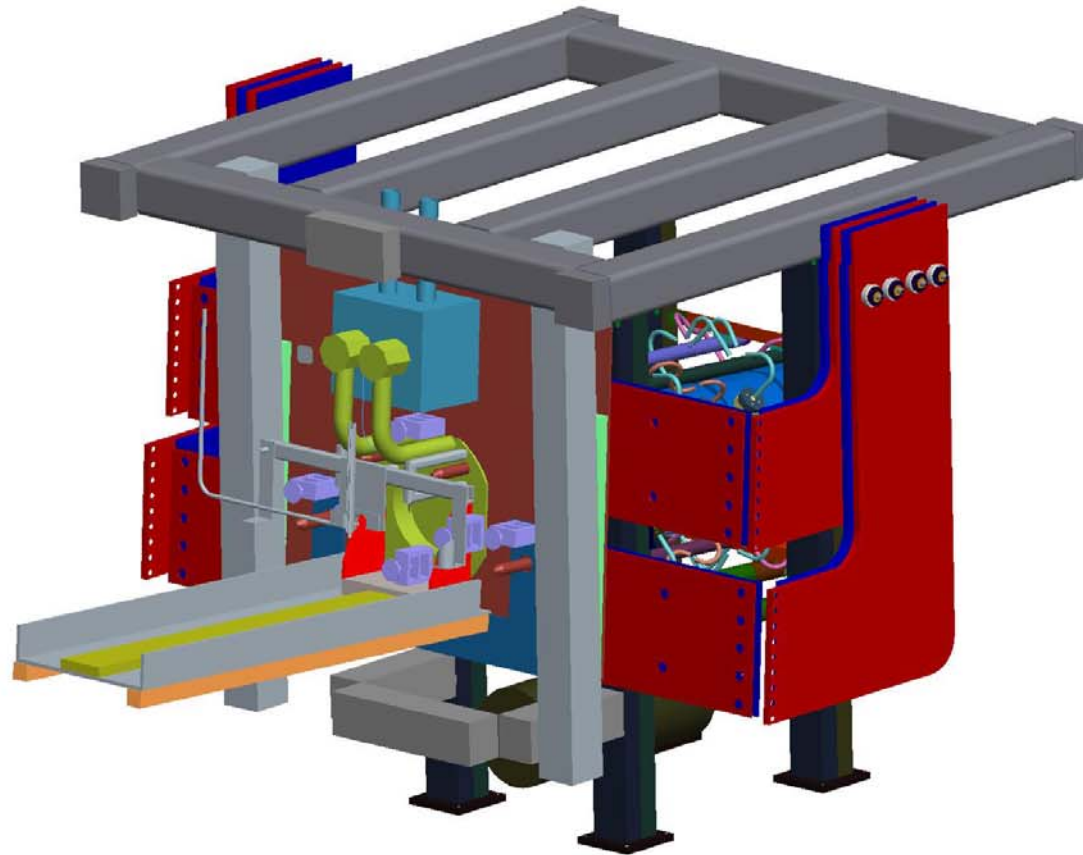
# T2K Target Remote Handling

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NBI Workshop CERN 6 September 2006

## Requirements for T2K target remote handling

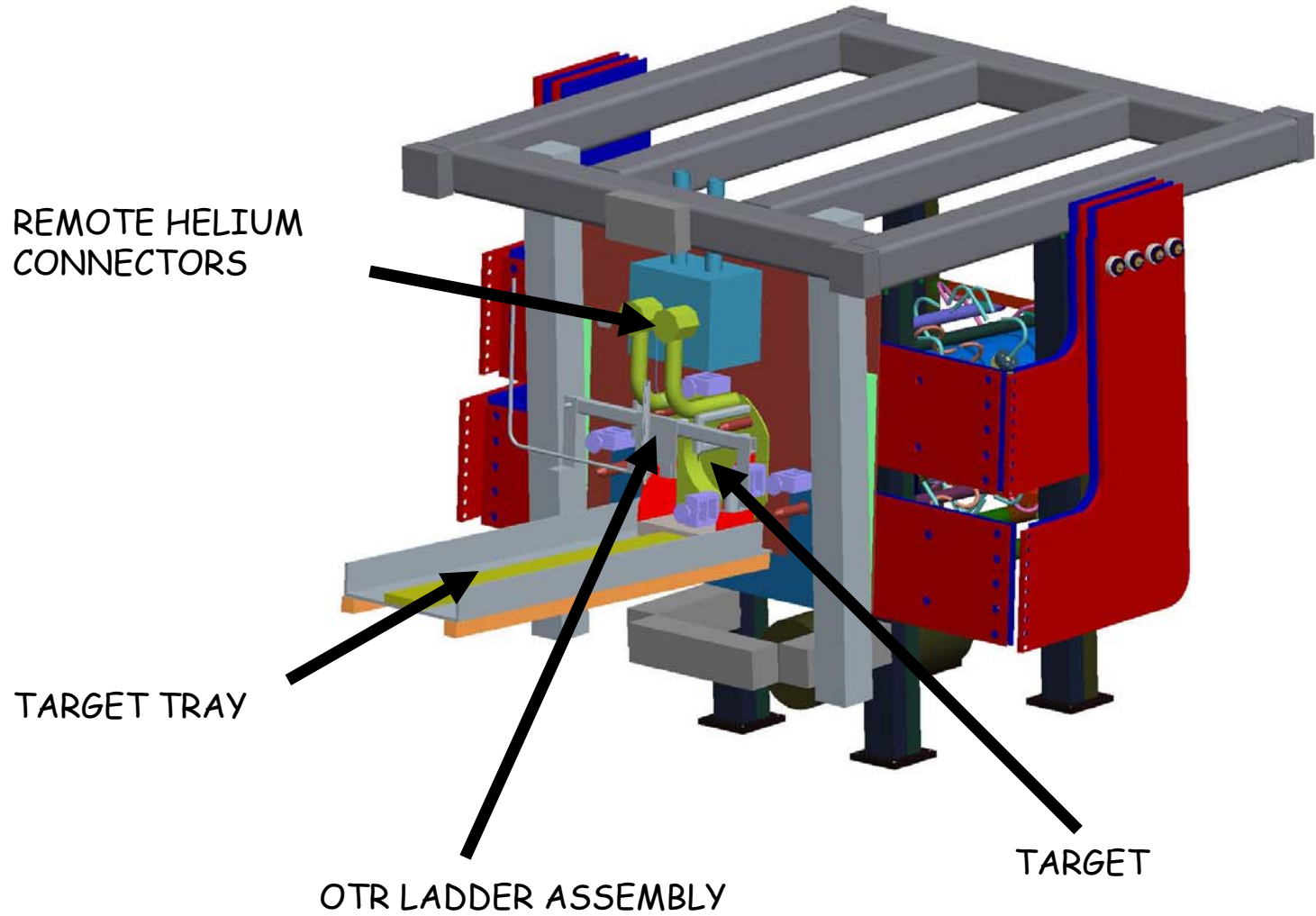
1. Remove a damaged target remotely without damaging horn.
  2. Install a new target remotely, making helium connections.
  3. Provide platform for OTR support & remote handling
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- Target and horn assembly with outline target insertion rig



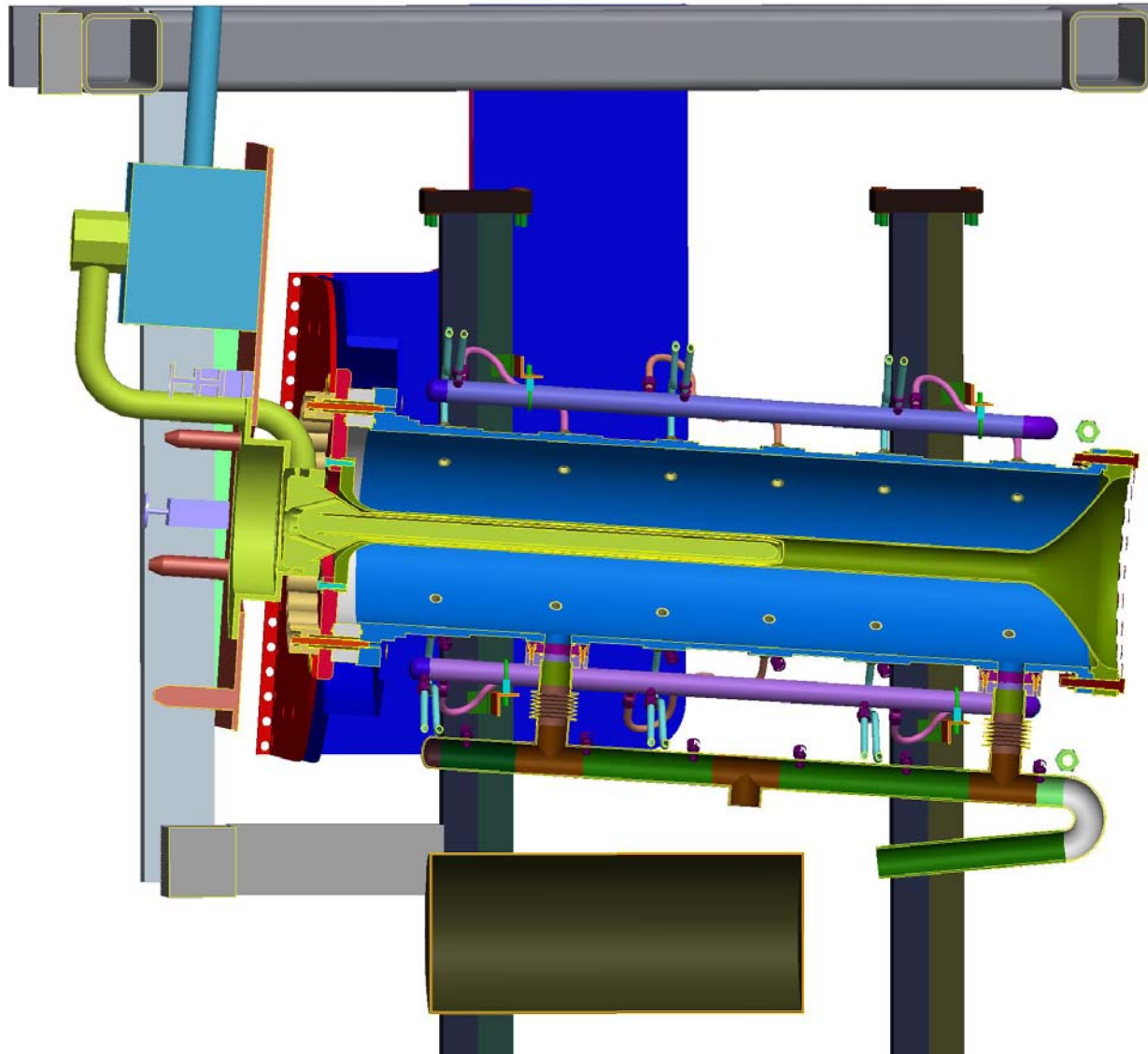
# FULL HORN ASSEMBLY



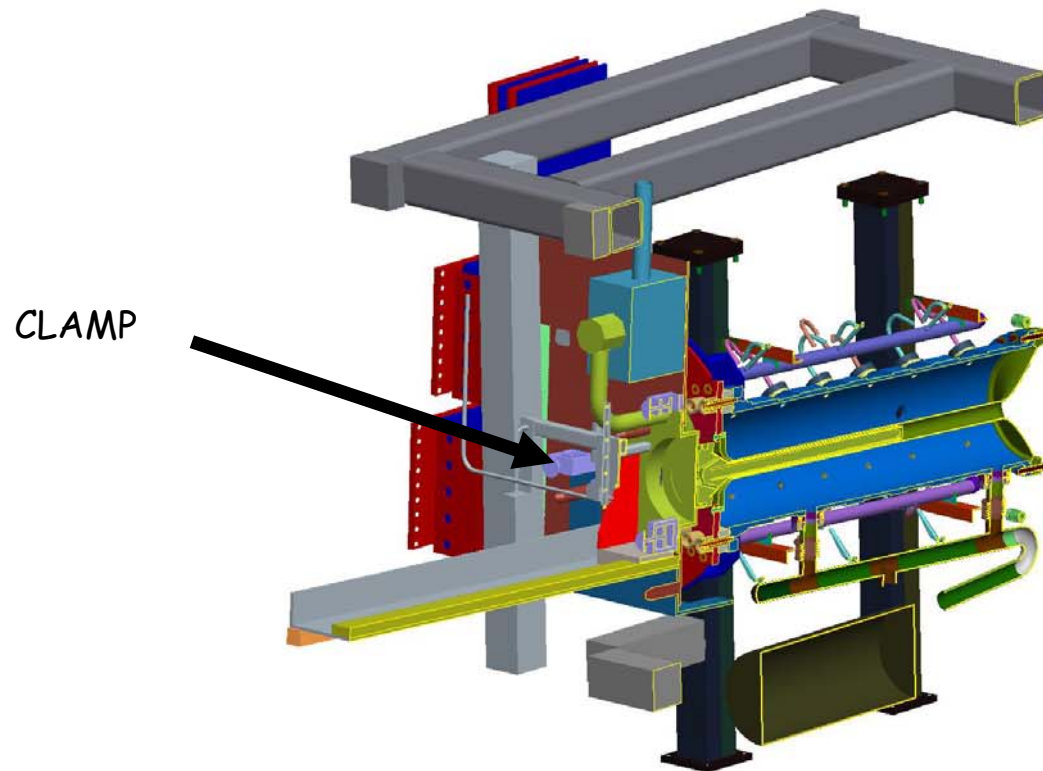
# TARGET REMOVAL



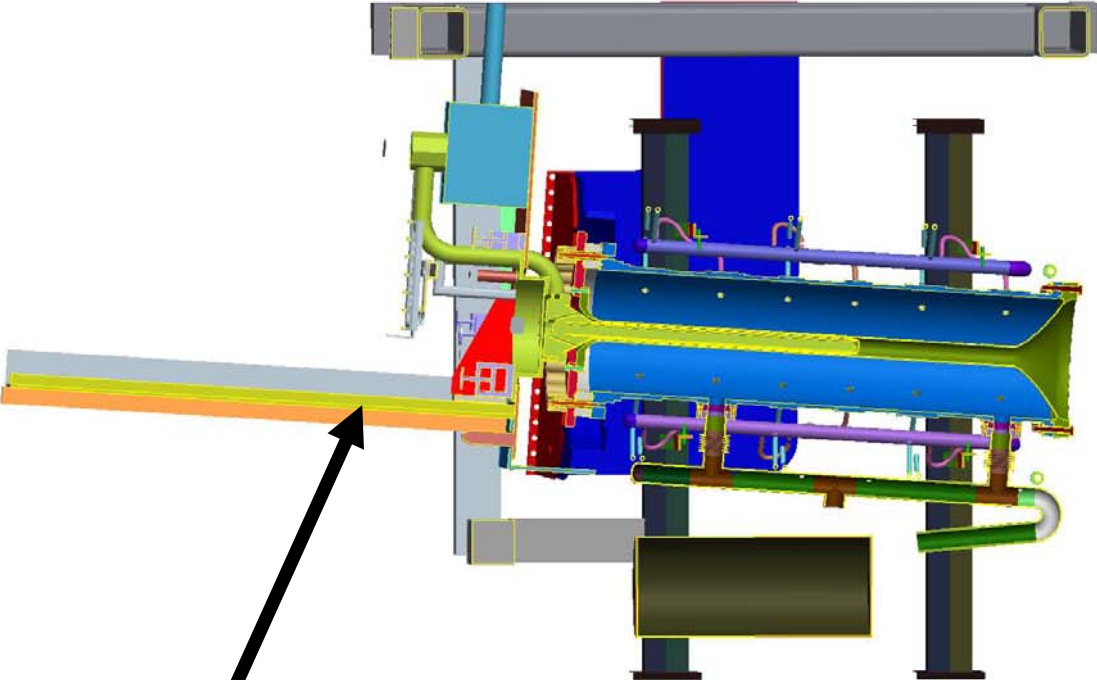
## TARGET IN HORN



## ATTACH REMOVAL TRAY VIA CLAMPS



SLIDE TARGET OUT OF HORN



LINEAR BEARING

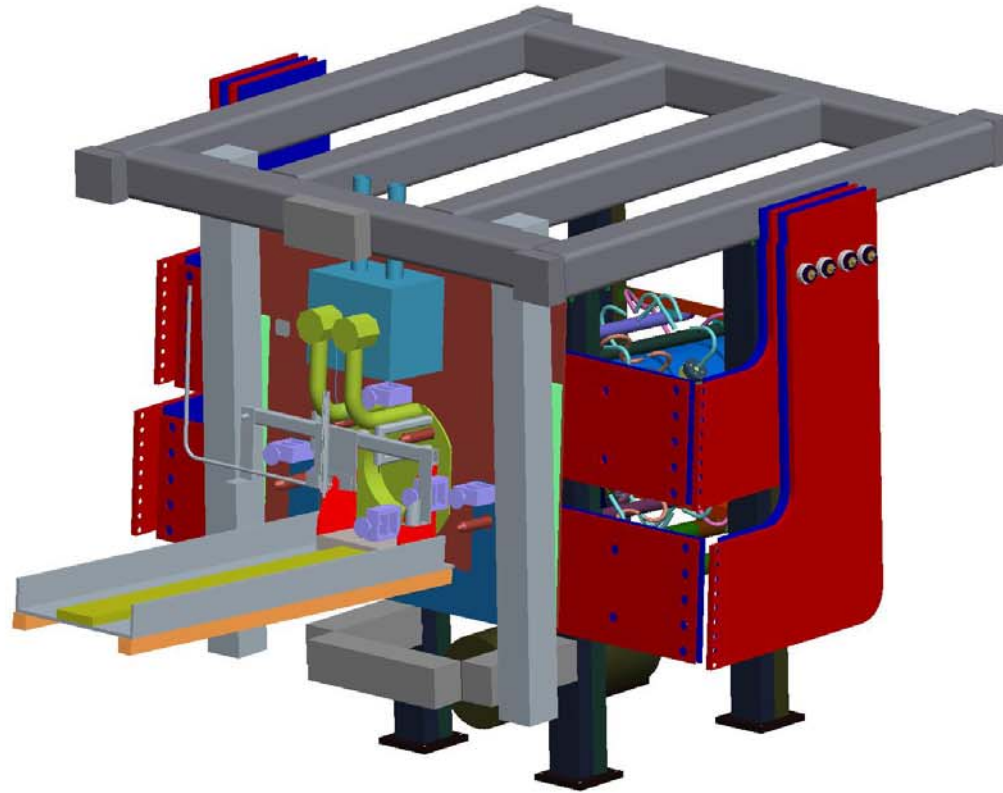




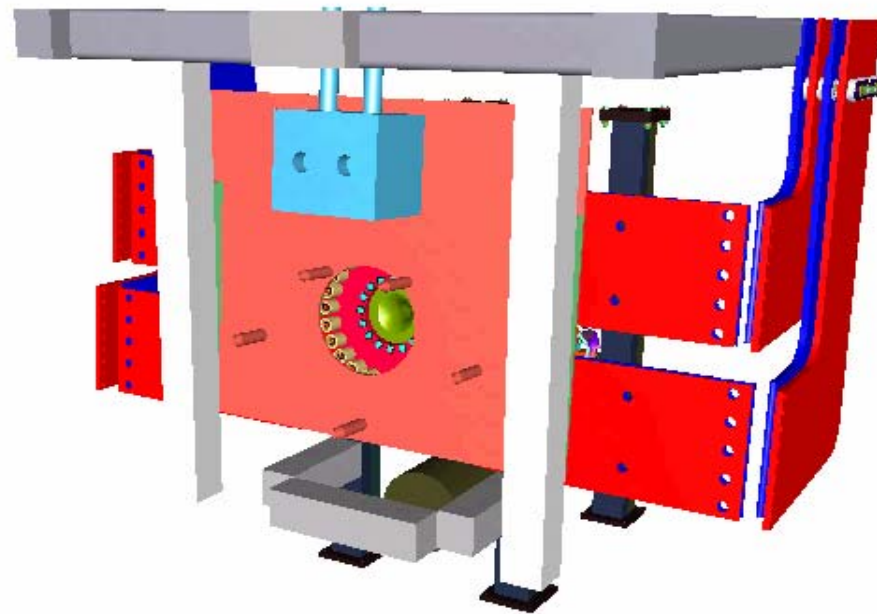
- INSTALL REMOTE HANDLING SYSTEM
  - LOCK TARGET ON TRAY,
  - DISCONNECT HELIUM LINES
  - WITHDRAW TARGET
  - UNCLAMP TRAY,
  - REMOVE TRAY AND DAMAGED TARGET,  
FOR DISPOSAL.
-

# TARGET INSERTION



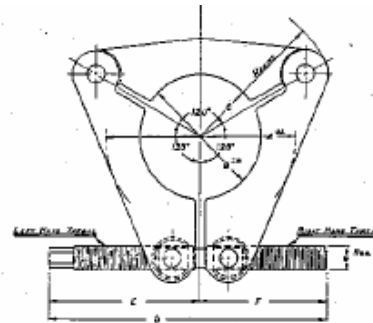


- LOCK TARGET ON TRAY,
  - OFFER TRAY TO HORN,
  - CLAMP TRAY,
  - INSERT NEW TARGET,
  - MAKE HELIUM CONNECTIONS
  - UNCLAMP TRAY,
  - REMOVE TRAY FOR STORAGE
  - INSTALL LADDER ASSEMBLY.
-



# REMOTE HELIUM CONNECTION

# COMMERCIAL HELIUM CONNECTOR



Size Clamp	Dimensions						Trunnion Height in. Dia.	
	A	B	C	D	E	F	G	H
3"	4 1/2	2 1/2	2 1/2	0	1 1/2	2 1/2	1/2	2
4"	5 1/2	3 1/2	3 1/2	0	2 1/2	3 1/2	1/2	2
6"	7 1/2	5 1/2	5 1/2	0	4 1/2	5 1/2	1/2	2 1/2
8"	9 1/2	7 1/2	7 1/2	0	6 1/2	7 1/2	1/2	3 1/2
12"	13 1/2	11 1/2	11 1/2	0	10 1/2	11 1/2	1/2	5 1/2

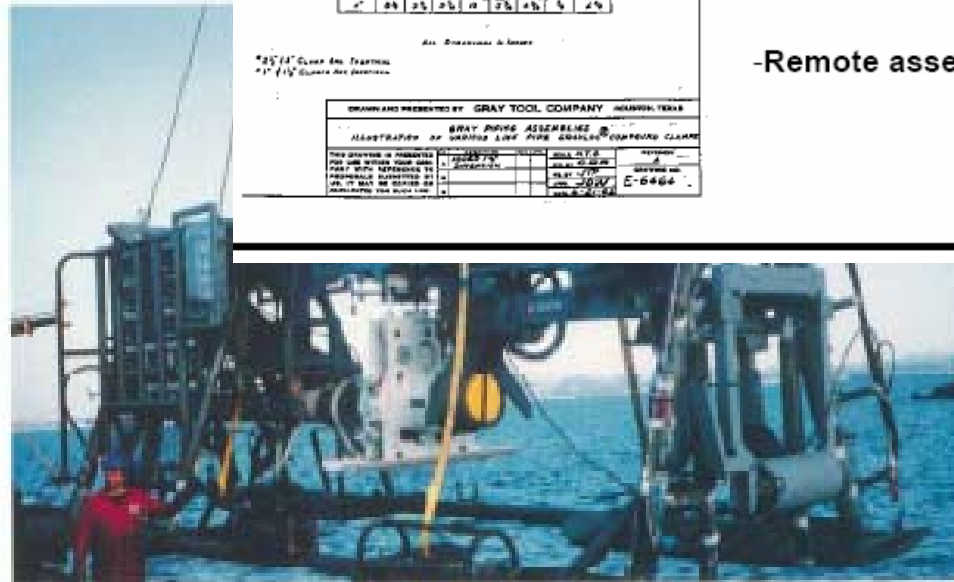
ALL DIMENSIONS IN INCHES  
 \*25/32" CLAMP AND TRUNNION  
 \*1" (1 1/2") CLAMP AND TRUNNION

DRAWN AND PRESENTED BY GRAY TOOL COMPANY - INDEPENDENCE, TEXAS			
GRAY DRIVE ASSEMBLY & REMOTE CLAMP			
ILLUSTRATION OF REMOTE LINE PIPE GRABBER REMOTE CLAMP			
THIS DRAWING IS PREPARED FOR USE UNDER YOUR OWN RESPONSIBILITY. IT MAY BE CHANGED OR MODIFIED WITHOUT NOTICE.	DATE: 11/11/62	BY: J.W.	REVISED: 11/11/62
NO. 100	REV. 1	DATE: 11/11/62	BY: J.W.

- Developed in 1962
- Nuclear (Hot Cell Applications)
- Metal-to-metal sealing technology
- Simple, reliable trunnion & screw
- Unitized design
- Remote assembly / disassembly

Special design for handling

- ✦ **Research and development**
  - Quick opening closures for laboratory pressure vessels
  - Ideally suited for high pressure/high temperature testing
- ✦ **Nuclear fuels**
  - Initially developed for mechanical joints handling radioactive materials
  - Isolated hot cell environments
  - Proven application for personnel safety



Remote clamp connector to connect flexible jumpers to previously installed fixed flowlines in the North Sea. The 3-1/2" (7500 psi), 6" (5000 psi) and 12" (5000 psi) are operating in 330 to 580 ft. water depth.

# PROPOSED REMOTE CONNECTOR



USED IN THE  
NUCLEAR AND  
OIL INDUSTRY



STANDARD  
PRODUCT

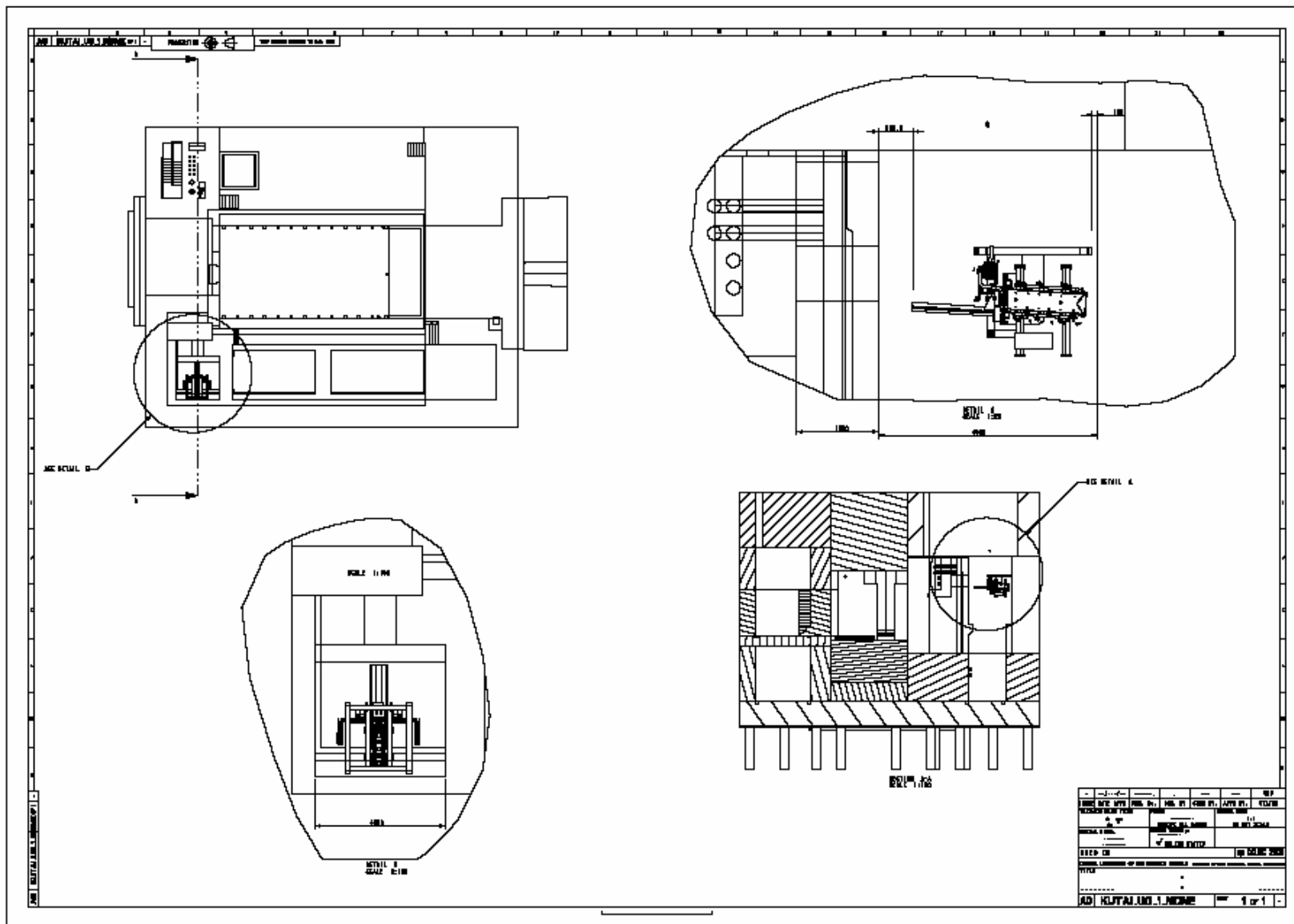


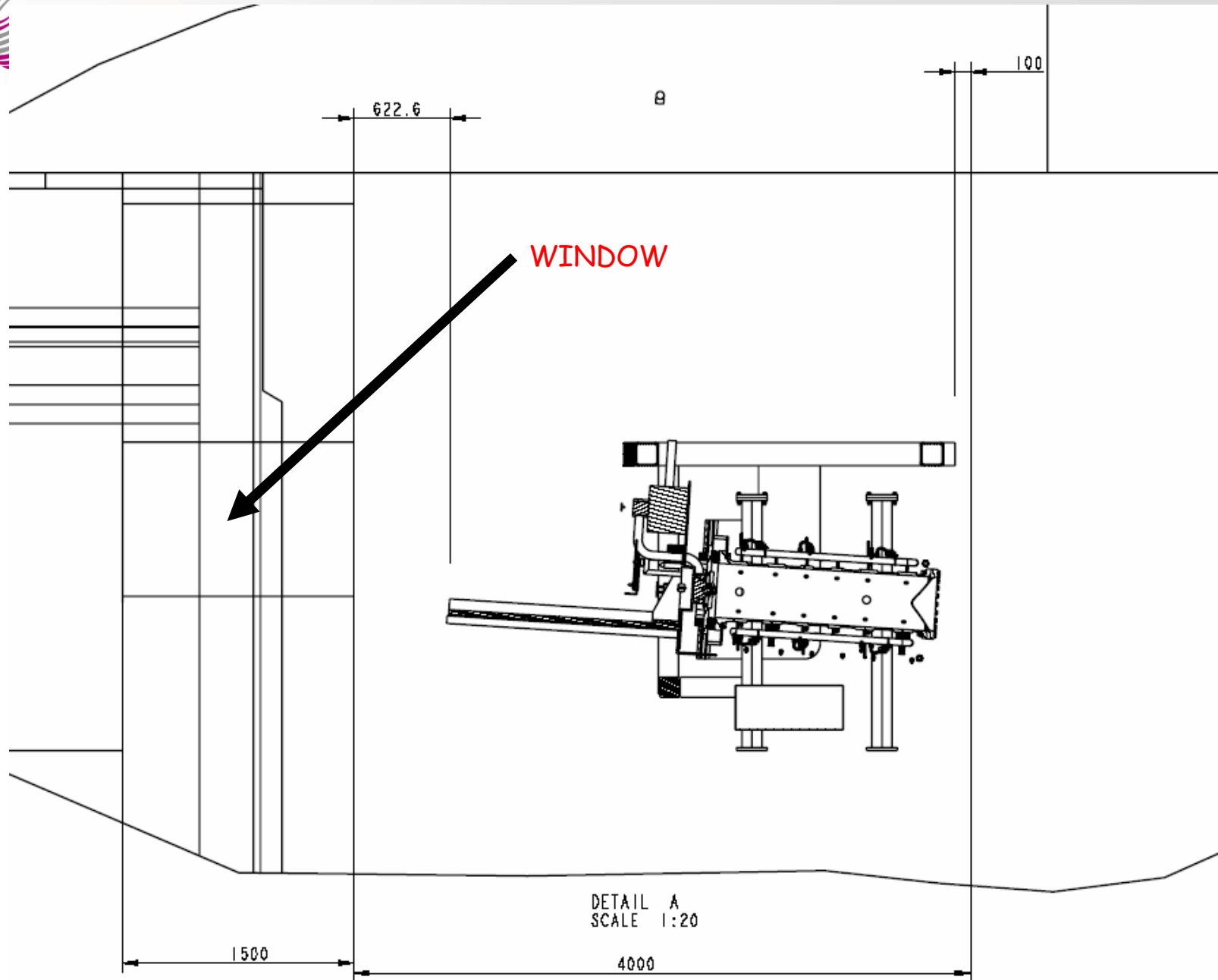


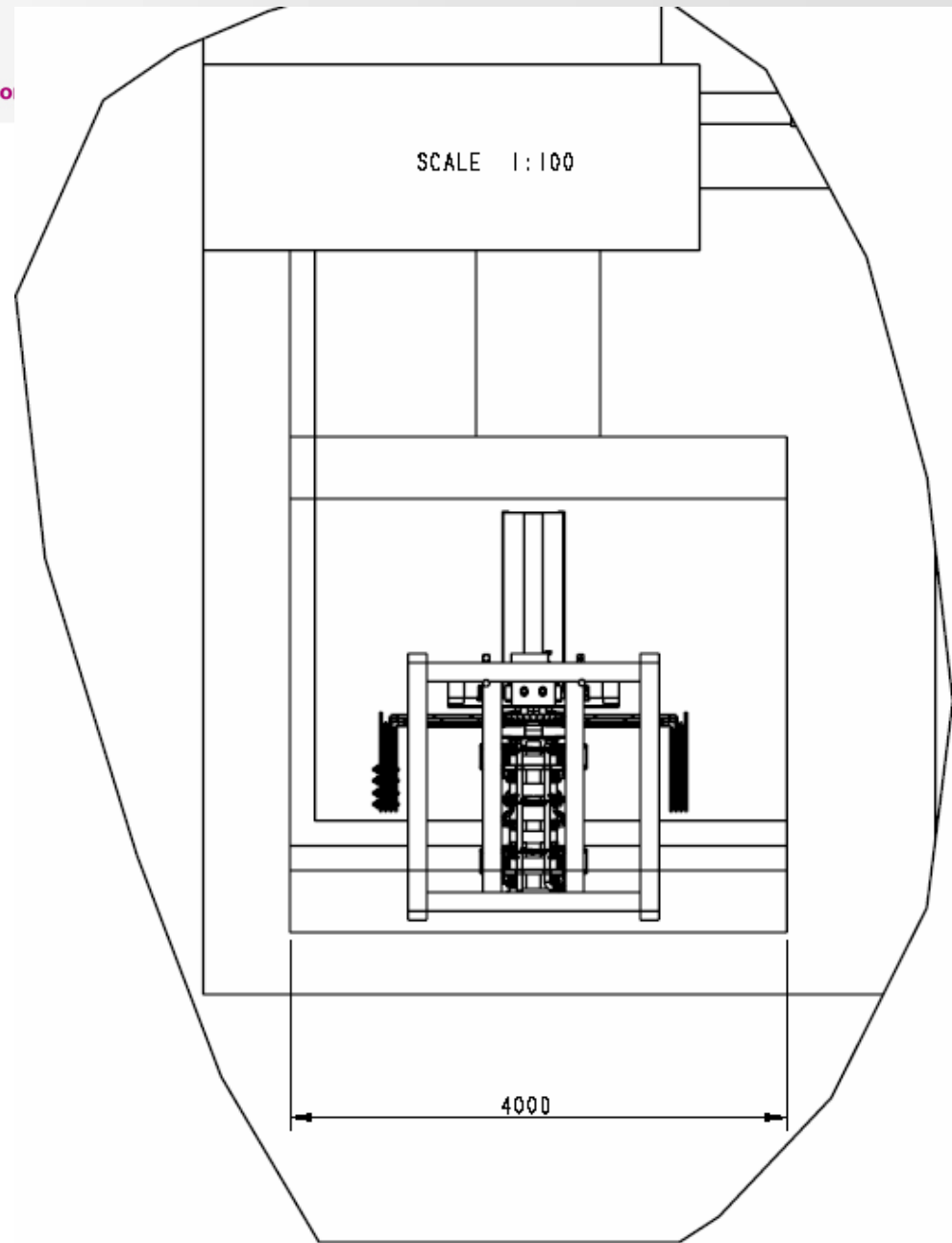
## BENEFITS

- ALLOW IN-LINE CONNECTION, REDUCES SHARP BENDS, MINIMISES PRESSURE DROPS,
  - EASY TO CONNECT AND DISCONNECT,
  - NOT TOO EXPENSIVE,
  - STANDARD PRODUCT WITH NO ADDITIONAL R&D REQUIRED.
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# HORN IN HANDLING CELL







DETAIL B  
SCALE 3:100