



Team 20: Levered Manhole Cover Remover

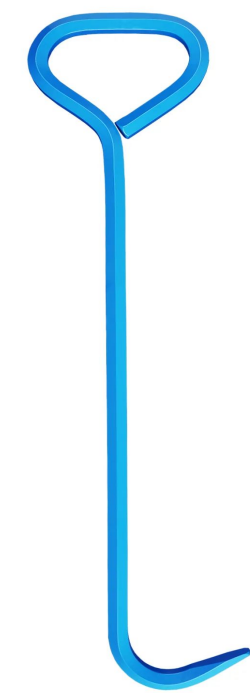
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GRAND VALLEY
STATE UNIVERSITY

Project Statement

- Current design has not changed in the last 50 years.
- Sponsor is looking for a portable and cost effective tool that they can manufacture and sell.
- The new design should allow a user to safely and more easily remove manhole covers.



Current T&T Manhole Cover Remover

Key Specifications

- Lift a slotstyle manhole cover up to 175 pounds - ✓
- Operate within 24 pounds of horizontal force - ✓
- Store into a 6 foot x 2 foot x 2 foot envelope - ✓
- Operate within 64 pounds of vertical force - ✓
- Have a final BOM cost of \$150 or less - ✓
- Weigh less than 30 pounds - ✓

First Round Prototypes



Compound Lever

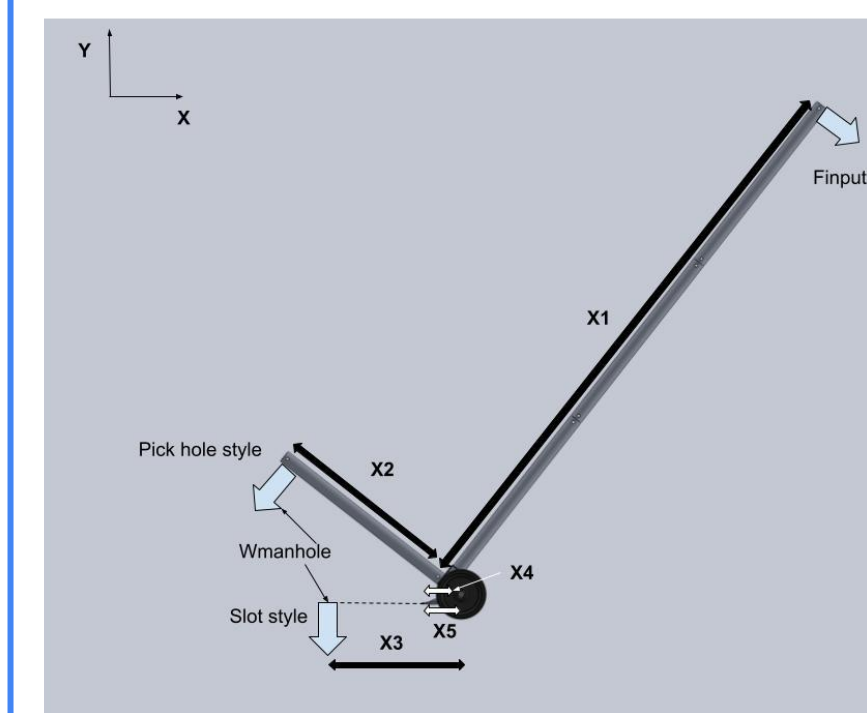


Tripod Lifter

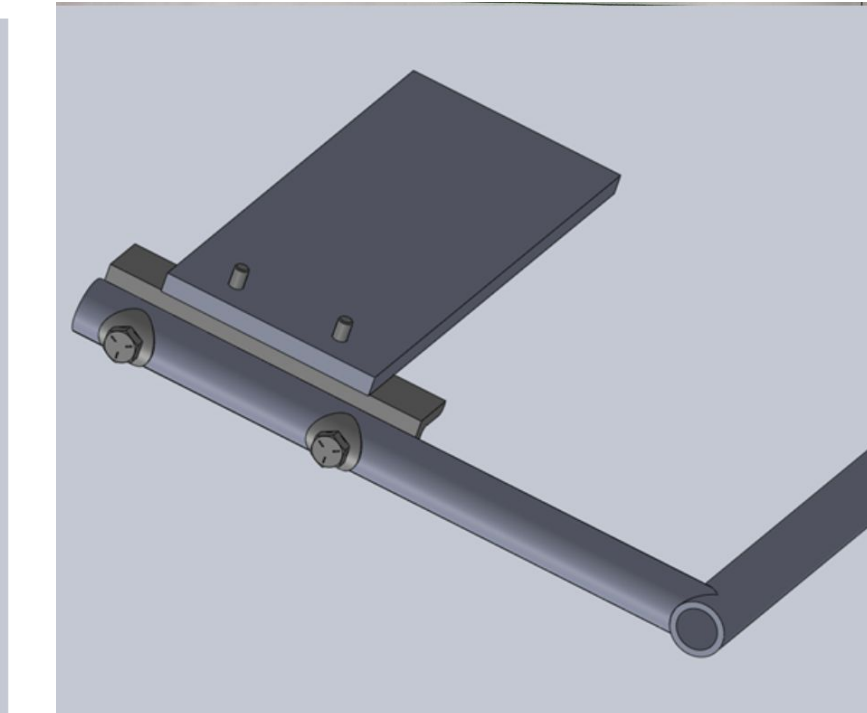


Simple Lever

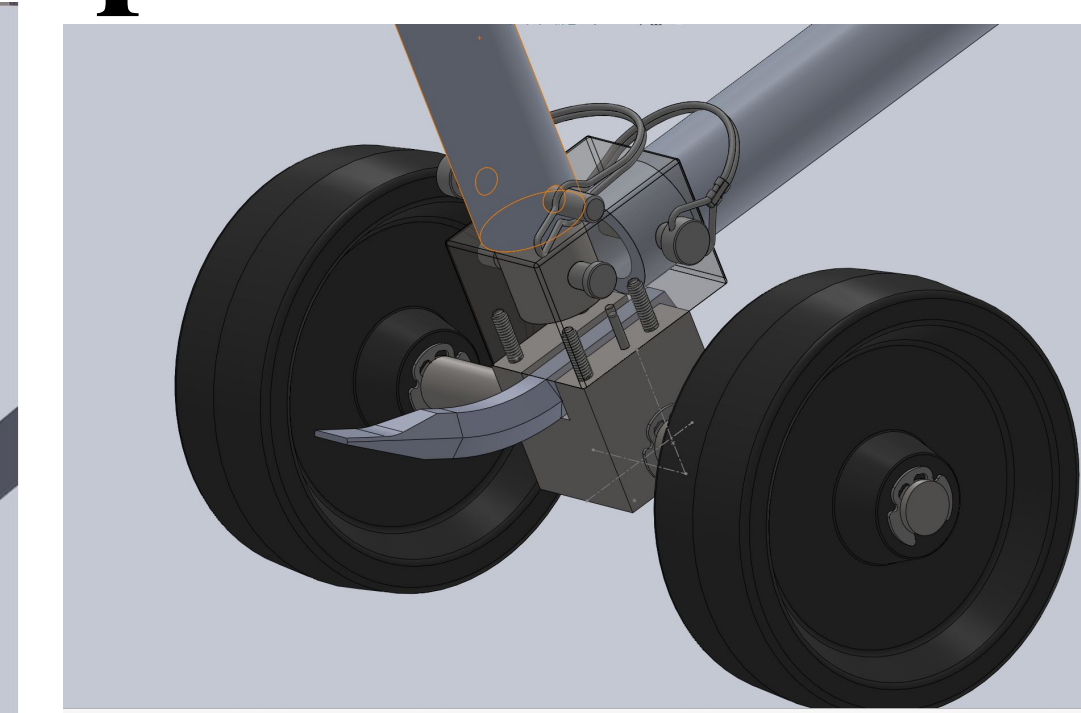
Further Concepts



Welded Levers

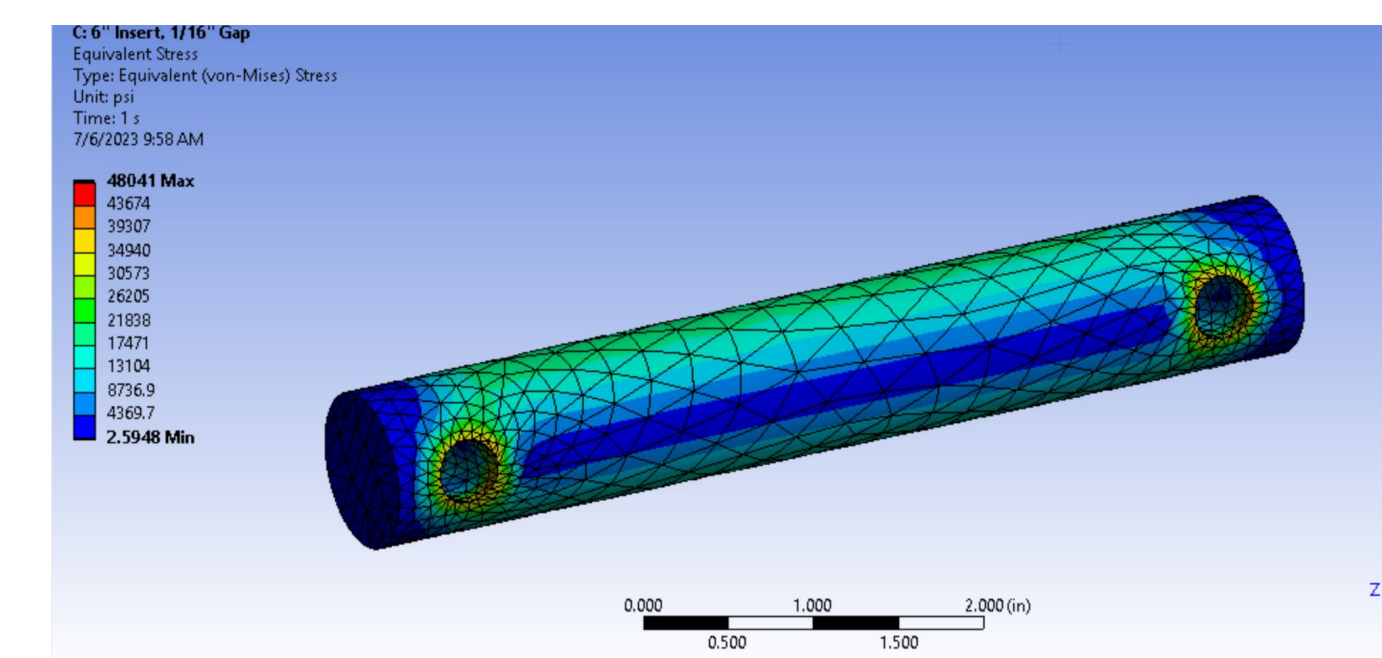


Seated Lever

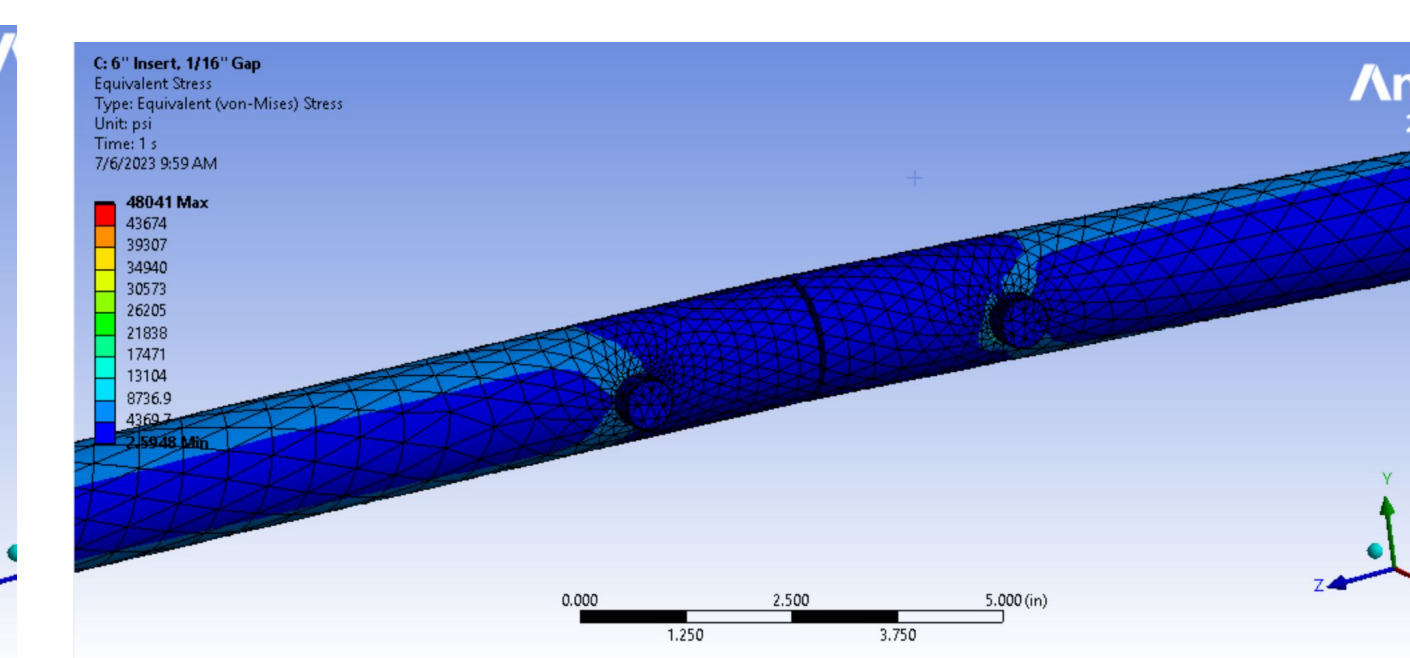


2-piece Chassis

FEA Screenshots

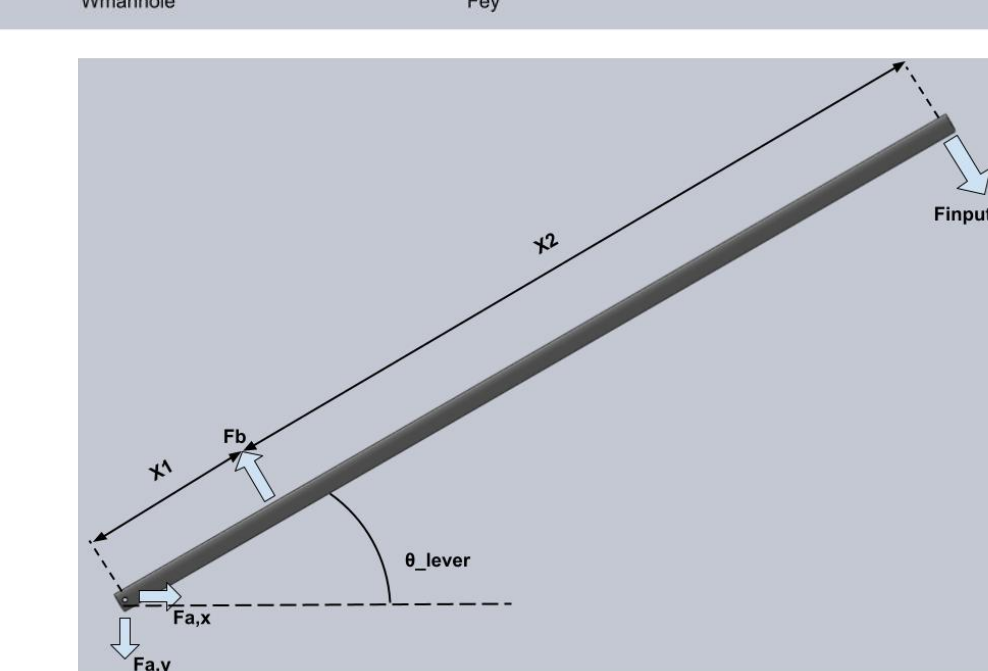
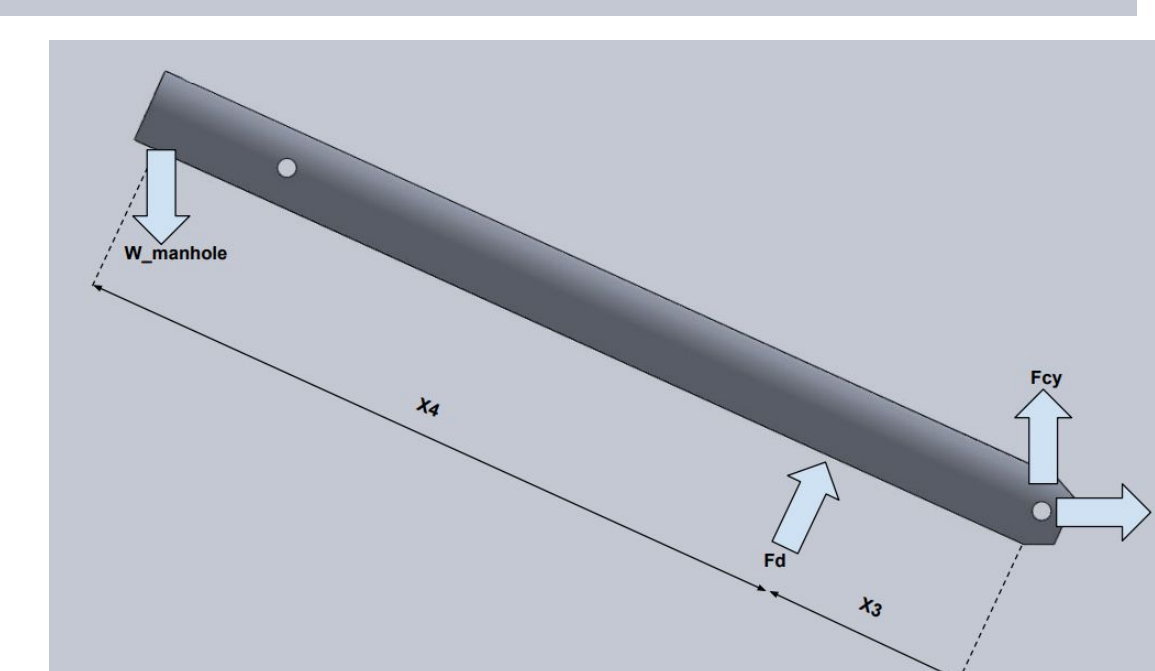
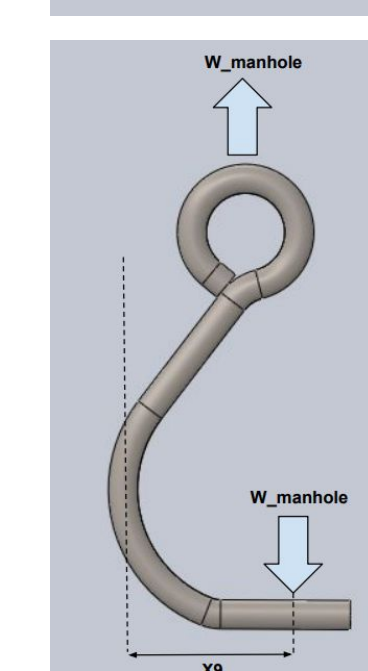
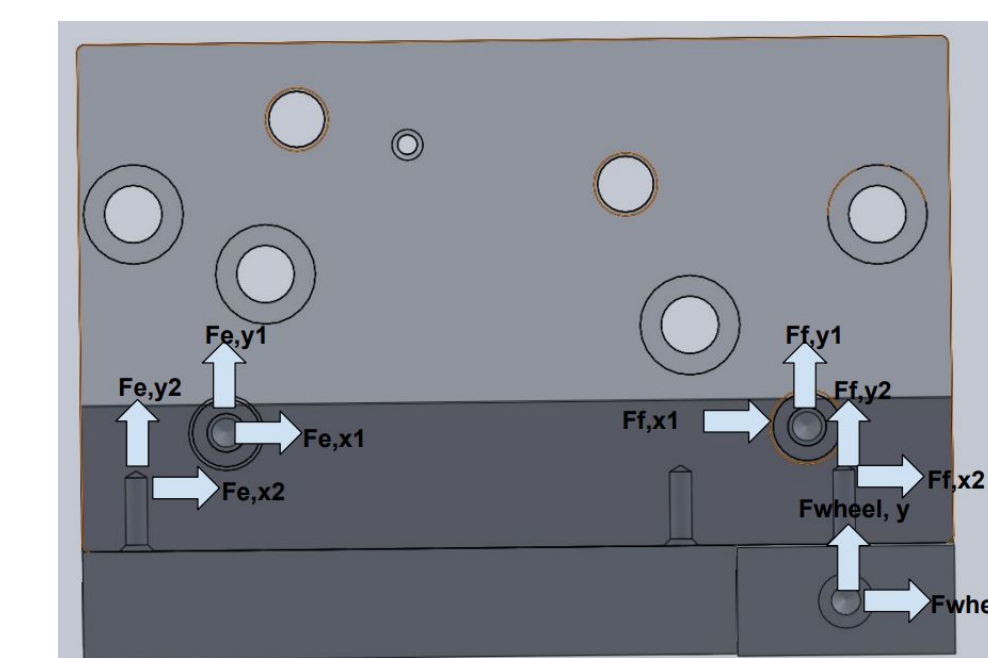
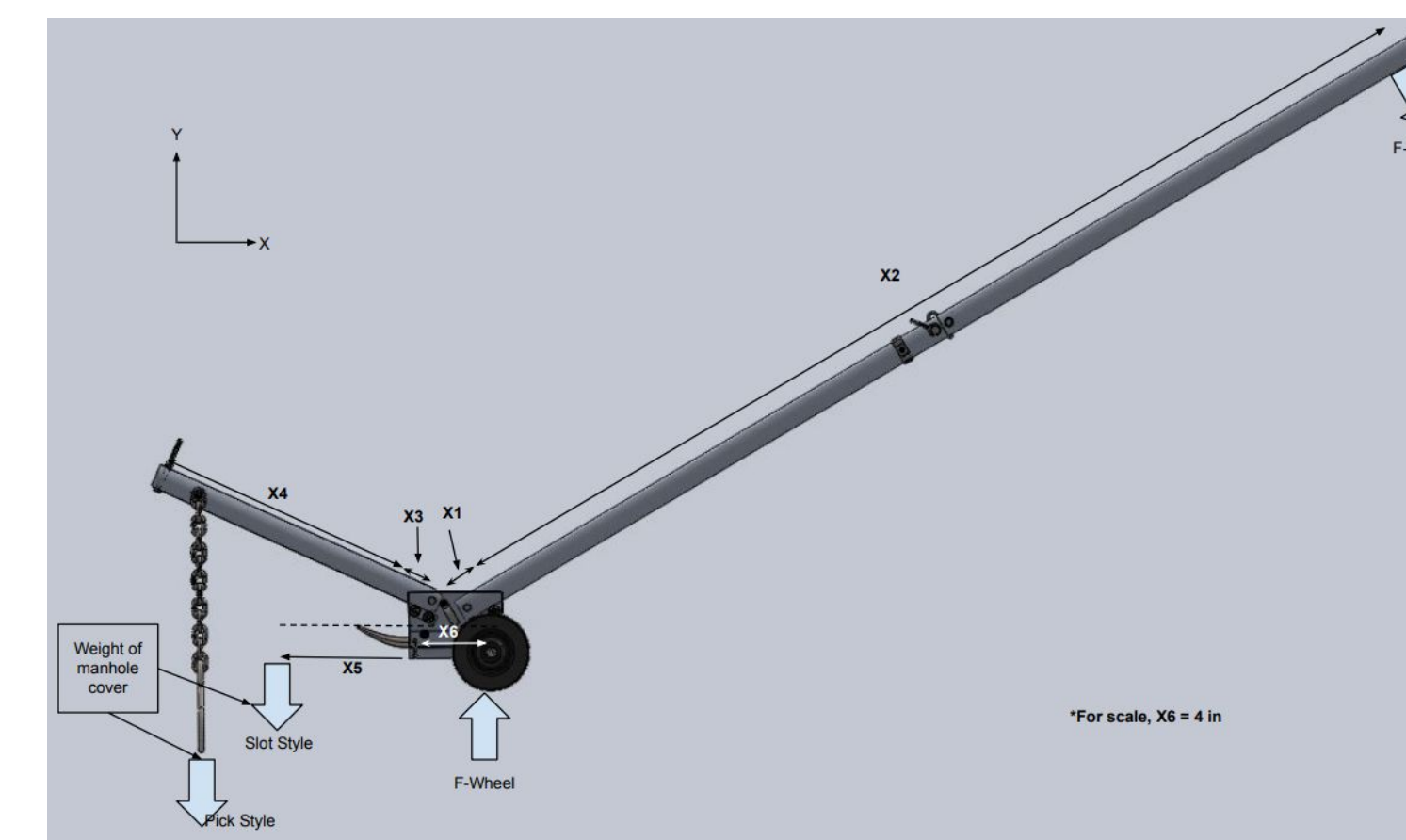


User lever connection rod



User lever pipes (connection area)

Free Body Diagrams



Final Product and Testing



Slot Style



Pick-hole Style



Tip Test

Special Thanks

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Assisting Faculty: Dr. Wendy Reffeor, Dr. Farid Jafari, Dr. Blake Ashby, Dr. Christopher Pung, Dr. Ryan Krauss



Storage position of device compared to standard hook