UNH First Responder Training Tools

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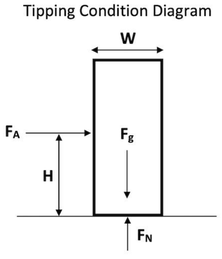
Introduction

The UNH first responders undergo training to prepare themselves for certain situations. There might be a situation that requires first responders to gain access that are behind secured doors. To train for those scenarios, a breaching door would be used. Another situation that first responders are exposed to are ones that require firearms. In those scenarios, accuracy and precision are important. For firearm training, an in-line target rack could be used. The UNH Police is interested in an innovative design for door breaching and firearm training equipment to add to their inventory.

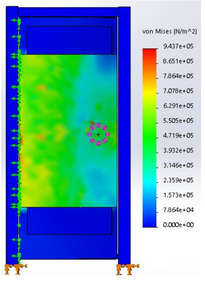
Analysis

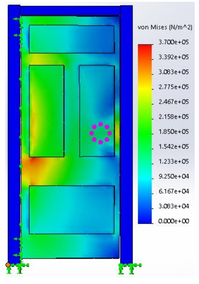
Tipping Condition Diagram



Tipping Condition:

$$F_A \geq \frac{F_g W}{2H}$$





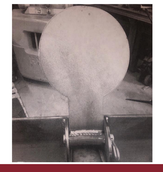
Criteria

Breaching Door:

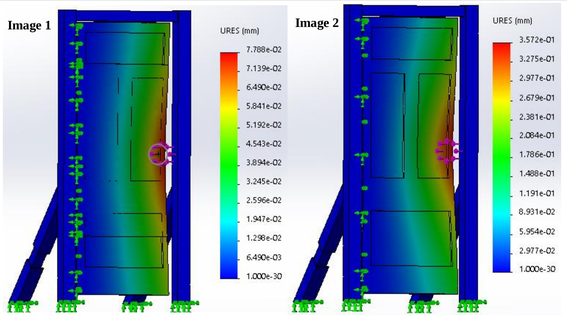
- Freestanding & portable.
- Withstand repeated impacts from a 30-40-pound ram tool.
- Simulates a lock function.
- Contains easily replaceable parts.

In-Line Target Rack:

- Freestanding & portable.
- All visible parts can withstand bullets from an assault rifle and pistol.
- Targets are easily replaceable.
- Targets recline back once bullet strikes.
- Installed controllers to allow for remote reset.



Results



Force Applied	Displacement in Door With Metal Plate	Displacement in Door Without Metal Plate	Force Applied	Stress in Door With Metal Plate	Stress in Door Without Metal Plate
177 N	7.788e-02 mm	0.3572 mm	177 N	0.9437 MPa	0.3700 MPa
3,780 N	1.663 mm	7.629 mm	3,780 N	20.16 MPa	7.902 MPa

Image 1: Applied force of 177 N with steel plate. *Image 2: Applied force of 177 N without steel plate.*

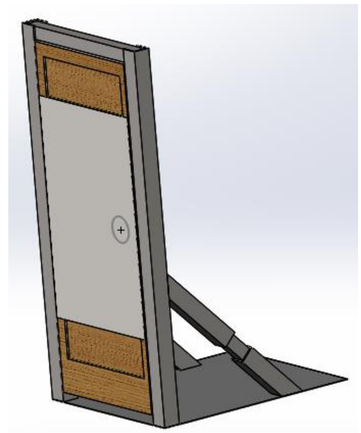


Figure 1: SolidWorks model of door.

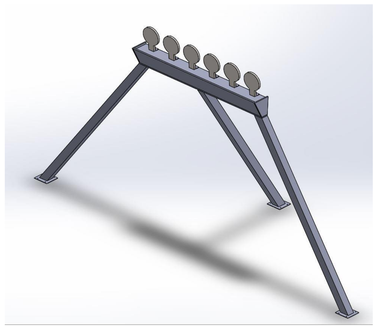


Figure 2: SolidWorks model of target rack.

Figure 3: Prototype of door with steel plate.

Conclusions

Breaching Door:

- Door setup will not tip over while being used.
- Different sized wooden dowels will be used to simulate different lock strengths.
- The door, plate, and hinges will be designed with high durability.

In-Line Target Rack:

- The metal parts will not ricochet bullets in the officer's direction.
- The Arduinos will allow for remote resetting of the targets, increasing safety.
- Physical design will allow for increased portability.

Future Steps

Breaching Door:

- Build baseplate
- Cut support beams
- Drill holes for bolts
- Attach locking mechanism

In-Line Target Rack:

- Finish welding base target set up
- Fabricate and attach servo mount and reset mechanism
- Wire servos to a central controller and program

- Test the two designs for durability and reliability.
- Bring designs to UNH police and show them proper usage and how to replace the necessary parts.

References

[1] https://ratools.com/product/35-pound-megaram/