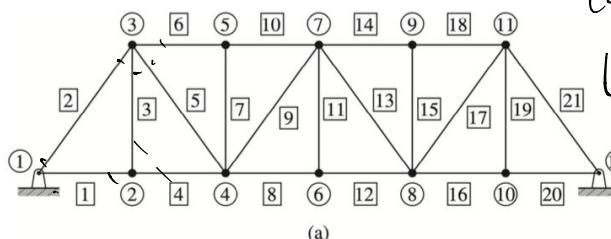


MAE 292 Spring 2020 Homework 5

Due on May 28, 2020, at 11:59 PM

1. For each of the truss structures below, provide the following:

- The number of nodes.
- The number of elements.
- The displacement constraints.
- The size of the global stiffness matrix.



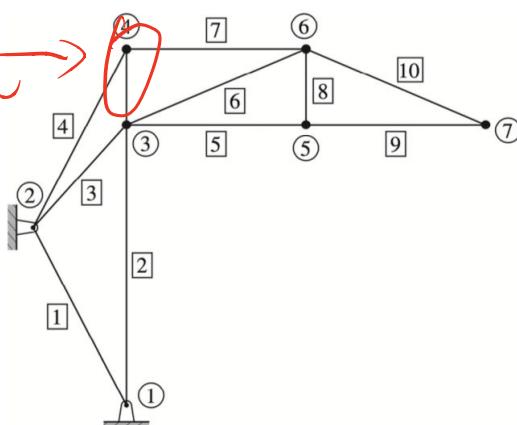
(a) node: 12

(b) Elements = 21

(c) (D) (B)

(d) 12×12

the element is not marked →

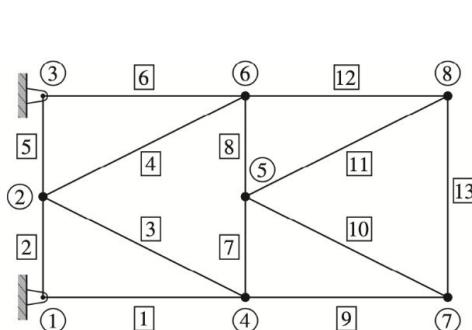


(a) node: 7

(b) Elements 11

(c) (D) (B)

(d) 7×7



(a) node: 8

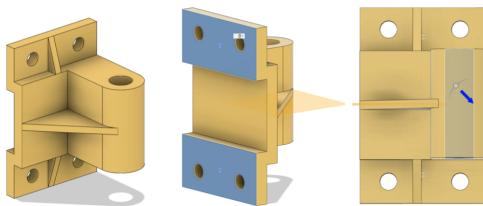
(b) elements 13

(c) (D) (B)

(d) 8×8

P 2. Perform the following FEA simulation on this part from HW 2:

Constrain the part by the two base-plate surfaces and apply a 2E4N force within the bore hole directed down at a 45 degree angle as shown below. The material is steel.

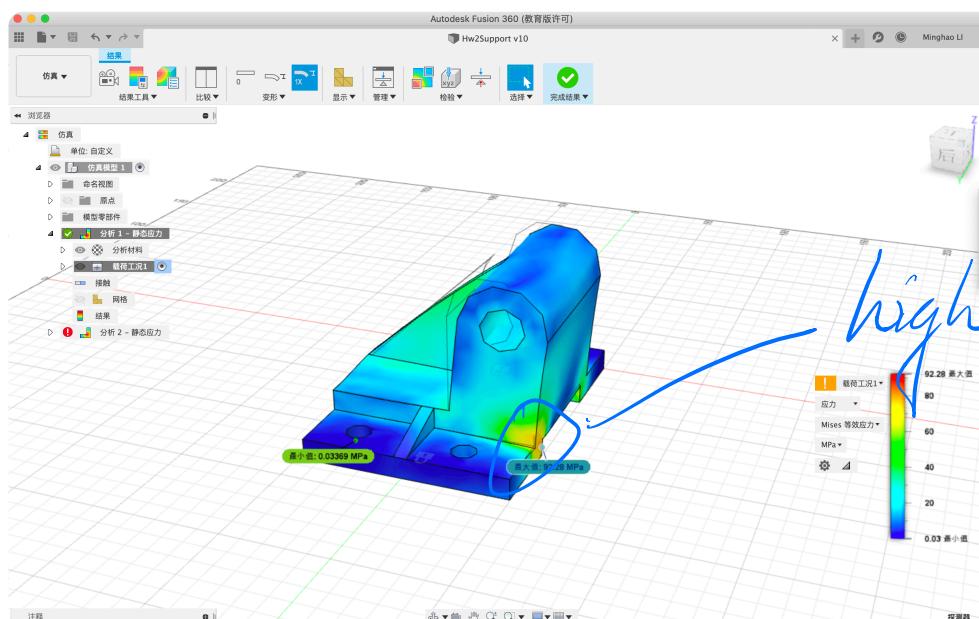
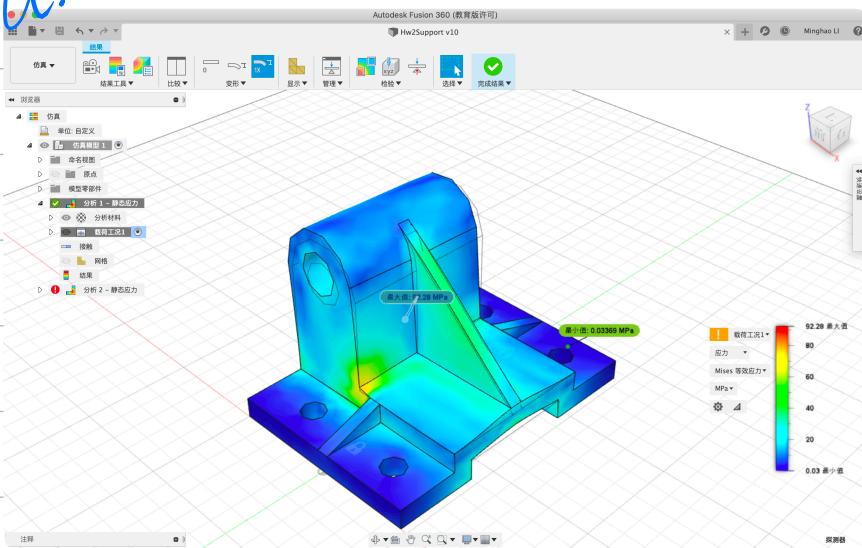


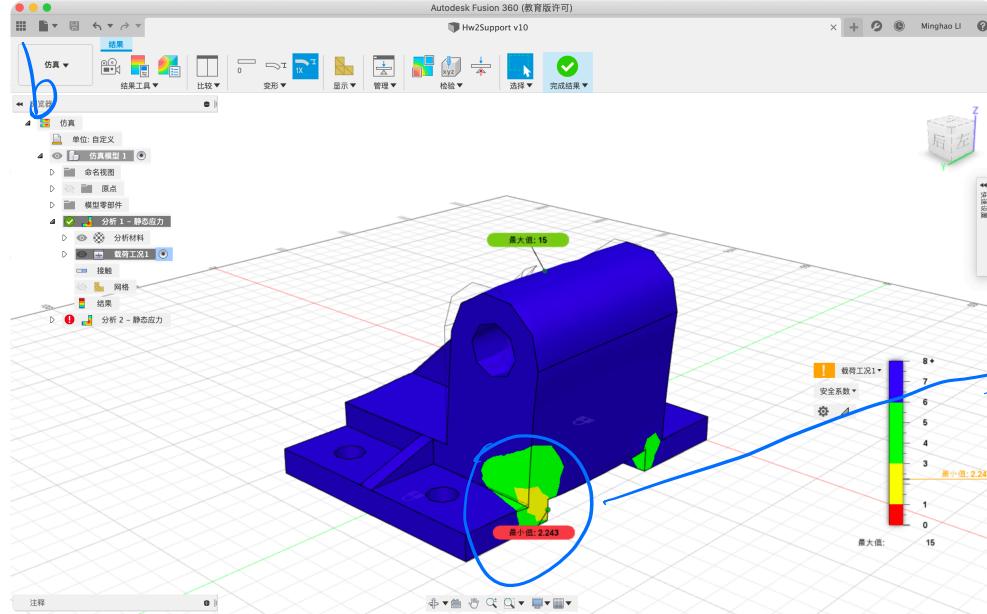
- a. Perform a stress analysis of this loading case. Provide an image of the Von Mises stress and identify regions of high-stress.

- b. Provide the minimum safety factor of the part in this loading condition.

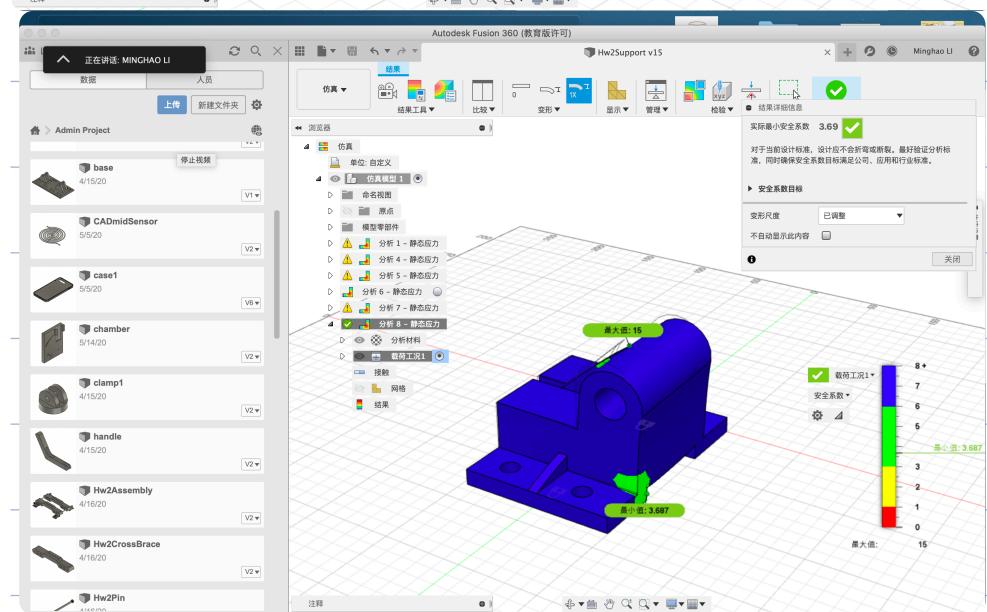
- c. Add any features you want to the part to increase the safety factor as long as they maintain the locations of the bolt holes and the bore hole. Describe in words what changes you made.

a.





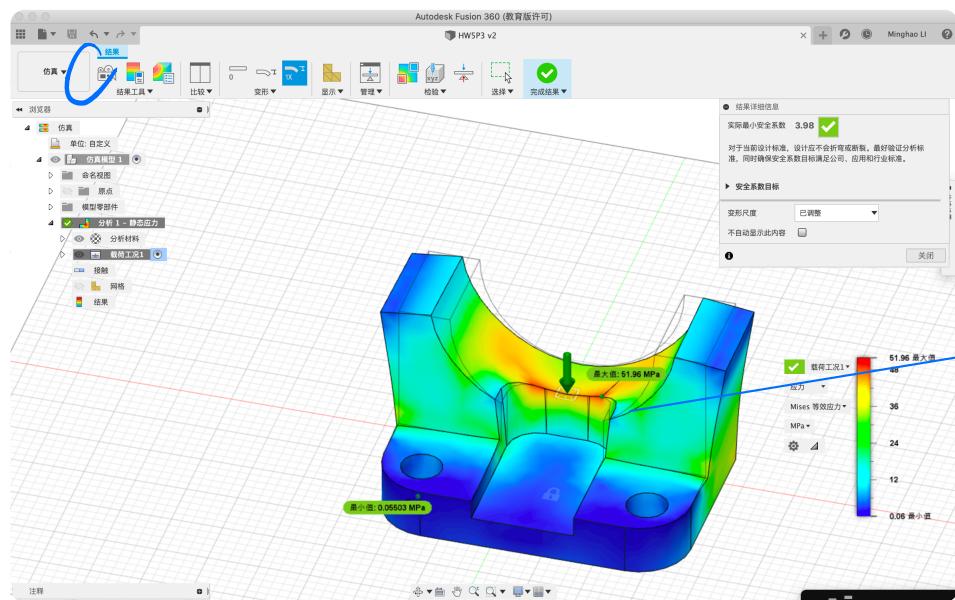
minimum safety factor
2.243



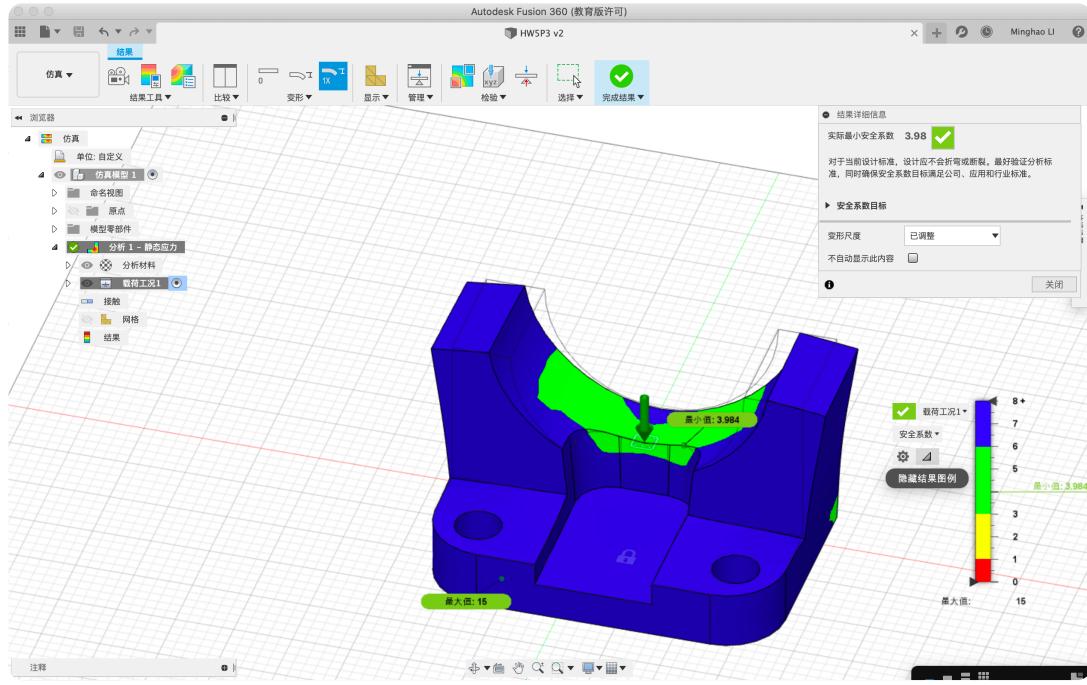
minimum safety
factor 3.687

above 70 mm

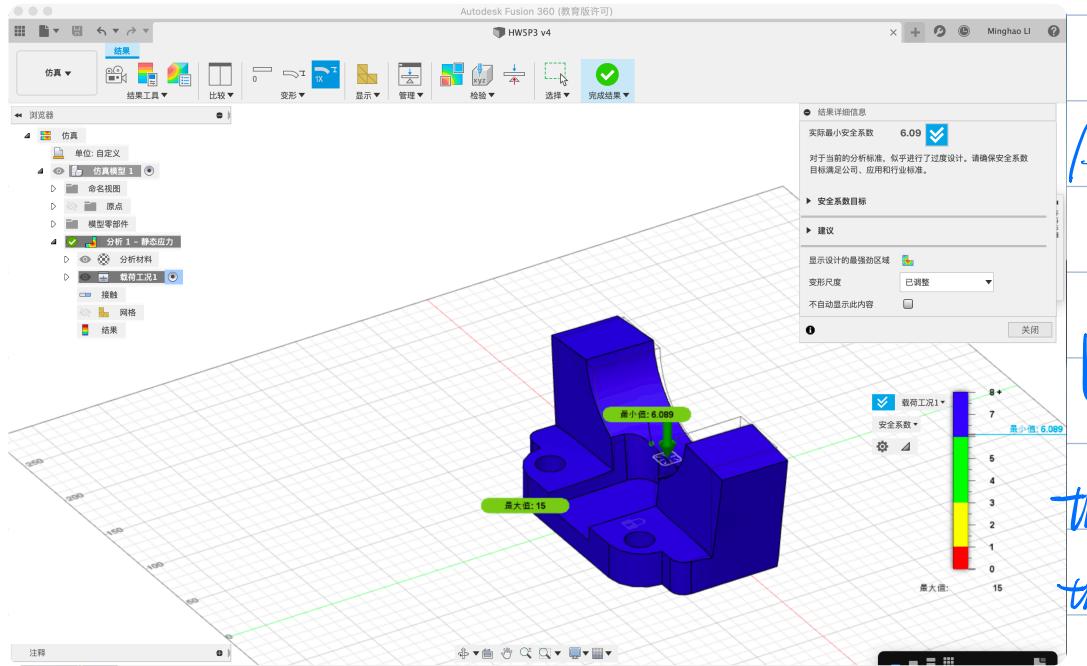
increasing the height of basement, which remarkably
increase the contact area and share the force



maximum pressure
→ 61.96 MPa

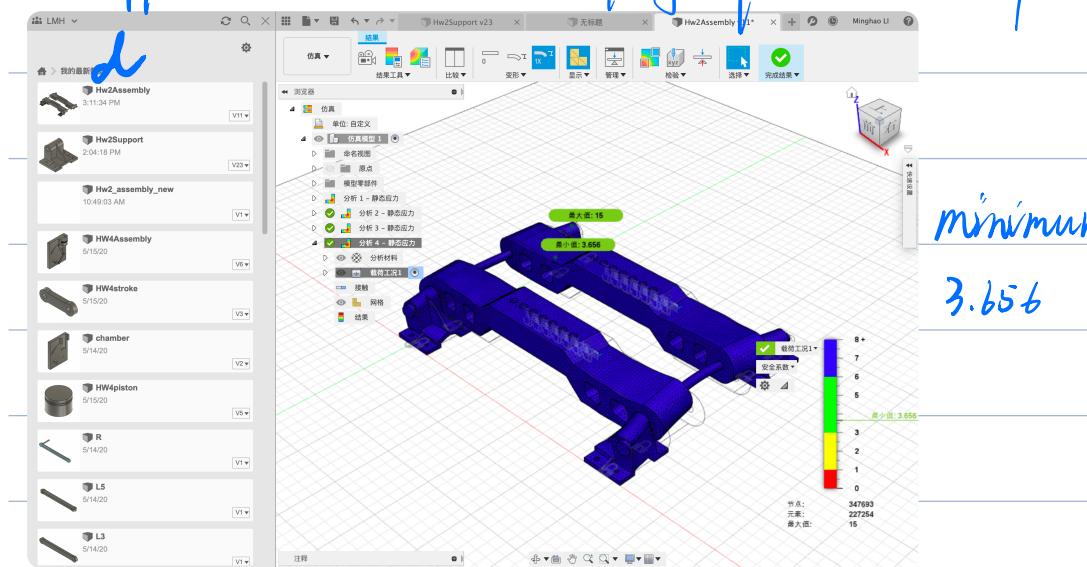


minimum safety factor
3.984

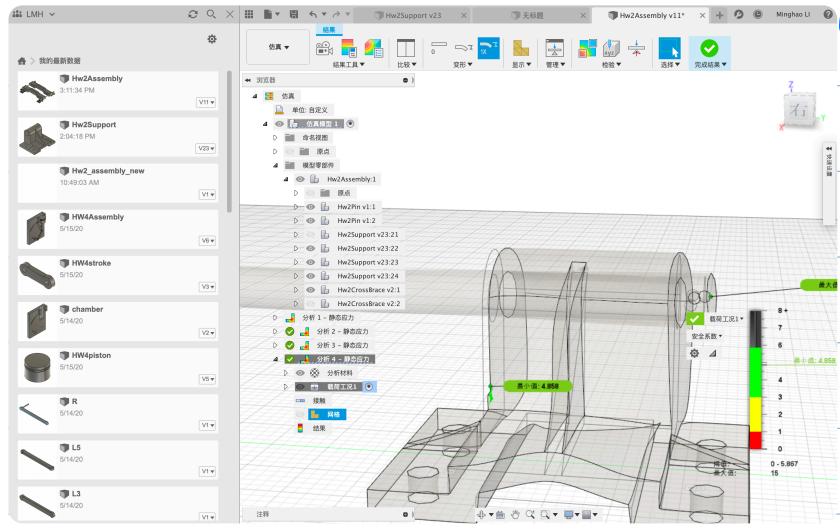


As we can known
from b. the upper
part of the circle
has larger deformation,
thus we could increase
the thickness of that
area to offer higher

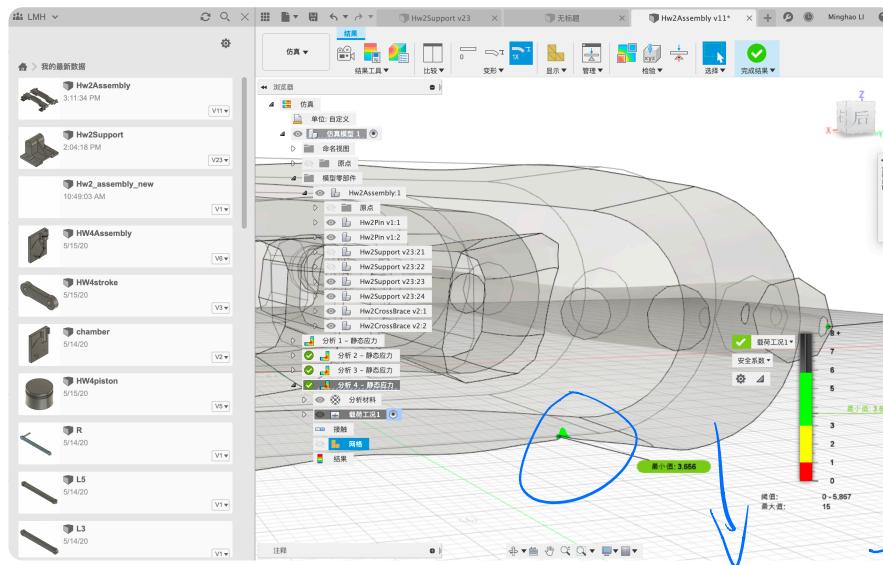
Support, Minimum Safety factor 6.089.



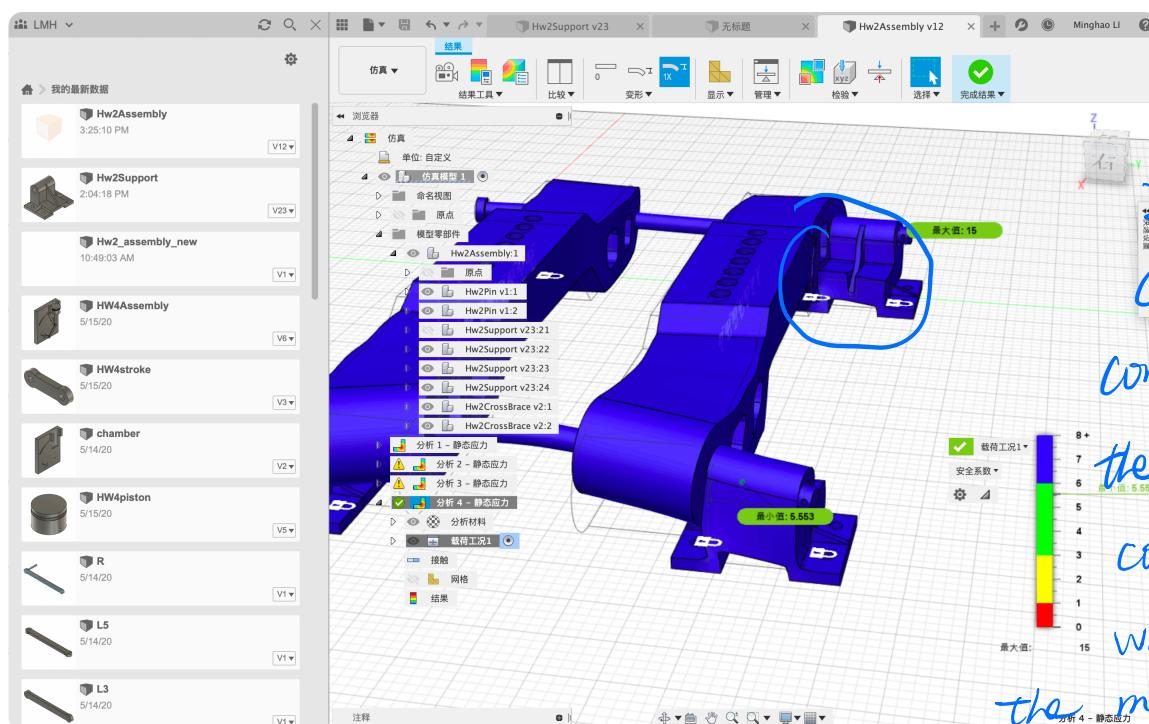
minimum safety factor
3.656



① When separately analysis the part, we could see the minimum safety factor is 4.858 which is higher than the whole assembly. These means this support base do not experience the highest force.



② When we analysis the Cross brace Separately the minimum safety factor is 3.656 which is equal to the minimum safety factor of the assembly. So. This component experience ^{the} highest stress.



Similar to Problem
2. This force is caused by the compression between the edges of two component. Thus we could increase the materials of

the base to share the force. (Just increasing to thickness by 20 mm). The minimum safety factor is 5.553