

Imperial College London  
Department of Mechanical Engineering

**Put Title Here**

Your name

June 6, 2016

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## **Abstract**

This is where you type the abstract.

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# 1. First Chapter

## 1.1. Introduction

Please find the template for citing stuff here. The figure is shown in Figure 1.1.

DUmmbladfasl;dfk

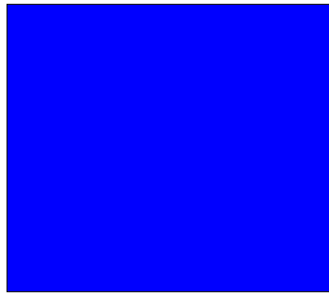


Figure 1.1.: A Figure

Figure 1.1 is shown above

### 1.1.1. My Subsection 1

Just refer to Table 1.1

Number Stored	Description
Content 1	Content 2

Table 1.1.: My Table Caption

### 1.1.2. My Subsection 2

Now there are two ways to type equation one is  $e = mc^2$  or  $e = mc^2$  The other see Eq. (1.1). This is the reference [?]

$$\frac{Numerator}{Denominator}(\sigma) \tag{1.1}$$

## 1.2. Second section

This is the second section

## 2. Second Chapter

This is the second chapter test



## Bibliography

# **A. Appendices**

This is the appendix

## **A.1. Input file-TDCB model**

\*Heading

\*\* Job name: BC=30 Model name: CopyOfload=600X

\*\* Generated by: Abaqus/CAE 6.13-2

\*Preprint, echo=NO, model=NO, history=NO, contact=NO

\*\*

\*\* PARTS

\*\*

\*Part, name=BOTTOMPART

\*Node

1, 10.019454, 0.

2, 10., -0.400000006

...

4274, 4275, 4276, 4277, 4278, 4279, 4280, 4281, 4282, 4283

\*Nset, nset=BOTTOMLOAD

23,

\*\* Section: Section-2-ADHESIVE1

\*Solid Section, elset=ADHESIVE1, material=ADHESIVE(STANDARD)

,

\*\* Section: Section-3-ADHESIVE3

\*Solid Section, elset=ADHESIVE3, material=ADHESIVE(STANDARD)

,

\*\* Section: Section-4-BOTTOMBEAM

\*Solid Section, elset=BOTTOMBEAM, material=ALUMINIUM

,

\*\* Section: Section-5-ADHESIVE2

\*Solid Section, elset=ADHESIVE2, material=ADHESIVE(STANDARD)

,

\*End Part

\*\*

\*Part, name=COHESIVE-MESH-1

\*Node

1, -310., 0.

\*Nset, nset=ADHESIVE1

1, 2, 3, 4, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44

45, 46, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028

\*Elset, elset=ADHESIVE1

1, 2, 3, 4, 5, 6, 7, 4324, 4325, 4326, 4327, 4328, 4329, 4330

\*Elset, elset=ADHESIVE2, generate

4284, 4323, 1

\*Nset, nset=ADHESIVE3

...

\*Nset, nset=TOPPARTTIE

5, 8, 10, 11, 13, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127

...

6449, 6450, 6451, 6452

\*Nset, nset=TOPLOAD

22,

\*\* Section: Section-6-ADHESIVE1

\*Solid Section, elset=ADHESIVE1, material=ADHESIVE(STANDARD)

,

\*\* Section: Section-7-ADHESIVE3

\*Solid Section, elset=ADHESIVE3, material=ADHESIVE(STANDARD)

,

\*\* Section: Section-8-TOPBEAM

\*Solid Section, elset=TOPBEAM, material=ALUMINIUM

,

\*\* Section: Section-9-ADHESIVE2

\*Solid Section, elset=ADHESIVE2, material=ADHESIVE(STANDARD)

,

\*End Part

\*\*

\*\*

\*\* ASSEMBLY

\*\*

\*Assembly, name=Assembly

\*\*

\*Instance, name=COHESIVE-MESH-1-1, part=COHESIVE-MESH-1

370., 0., 0.

\*End Instance

\*\*

\*Instance, name=BOTTOMPART-1, part=BOTTOMPART

\*End Instance

\*\*

\*Instance, name=TOPPART-1, part=TOPPART

\*End Instance

\*\*

\*Nset, nset=Set-3, instance=TOPPART-1

21, 22, 25, 26, 28, 29, 31, 32, 696, 697, 698, 699, 700, 701, 722, 723  
724, 725, 737, 738, 739, 740, 741, 742, 752, 753, 754, 755, 770, 771, 772, 773  
774, 775, 776, 777, 778, 784, 785, 786, 787, 788, 789, 804, 805, 806, 807, 808  
809, 810, 811, 812, 1029, 1030, 1031, 1032, 1033, 1034

\*Nset, nset=Set-4, instance=BOTTOMPART-1

20, 23, 24, 27, 28, 31, 32, 33, 770, 771, 772, 773, 774, 775, 776, 777  
778, 779, 794, 795, 796, 797, 798, 799, 806, 807, 808, 809, 824, 825, 826, 827  
828, 829, 830, 831, 832, 842, 843, 844, 845, 846, 847, 864, 865, 866, 867, 868  
869, 870, 871, 872, 1029, 1030, 1031, 1032, 1033, 1034

\*Nset, nset=BOTTOMPART-1\_BOTTOMPARTTIE\_CNS\_, internal, instance=BOTTOMPART-1

5, 8, 10, 11, 13, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107

...

934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944

\*Nset, nset=TOPPART-1\_TOPPARTTIE\_CNS\_, internal, instance=TOPPART-1

5, 8, 10, 11, 13, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127

...

849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864

865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875

\*Surface, type=NODE, name=BOTTOMPART-1\_BOTTOMPARTTIE\_CNS\_\_CNS\_, internal  
BOTTOMPART-1\_BOTTOMPARTTIE\_CNS\_, 1.

\*Surface, type=NODE, name=TOPPART-1\_TOPPARTTIE\_CNS\_\_CNS\_, internal  
TOPPART-1\_TOPPARTTIE\_CNS\_, 1.

\*\* Constraint: BOTTOMCOHESIVE-1

\*Tie, name=BOTTOMCOHESIVE-1, adjust=yes

COHESIVE-MESH-1-1.Surf-2, BOTTOMPART-1\_BOTTOMPARTTIE\_CNS\_\_CNS\_

\*\* Constraint: TOPCOHESIVE-1

\*Tie, name=TOPCOHESIVE-1, adjust=yes

COHESIVE-MESH-1-1.Surf-1, TOPPART-1\_TOPPARTTIE\_CNS\_\_CNS\_

\*End Assembly

\*\*

\*\* ELEMENT CONTROLS

\*\*

\*Section Controls, name=EC-1, ELEMENT DELETION=YES

1., 1., 1.

\*Amplitude, name=Amp-1

0., 0., 1., 1.

\*\*

\*\* MATERIALS

\*\*

\*Material, name=ADHESIVE(STANDARD)

\*Elastic

2900., 0.35

\*Material, name=ALUMINIUM

\*Elastic

70000., 0.3

```
*Material, name=COHESIVE

*Damage Initiation, criterion=QUADS

60.,60.,60.

*Damage Evolution, type=ENERGY

20.,

*Elastic, type=TRACTION

1e+06, 1e+06, 1e+06

** -----

**

** STEP: Step-1

**

*Step, name=Step-1, nlgeom=YES, inc=1000000

*Static, stabilize=0.0002, allsdtol=0.05, continue=NO

0.0001, 1., 1e-08, 0.01

**

** BOUNDARY CONDITIONS

**

** Name: BC-1 Type: Displacement/Rotation

*Boundary, amplitude=Amp-1

Set-3, 1, 1

Set-3, 2, 2, 25.

Set-3, 6, 6

** Name: BC-2 Type: Displacement/Rotation

*Boundary, amplitude=Amp-1

Set-4, 1, 1

Set-4, 2, 2, -25.

Set-4, 6, 6

**

** OUTPUT REQUESTS

**

*Restart, write, frequency=0
```

\*\*

\*\* FIELD OUTPUT: F-Output-1

\*\*

\*Output, field

\*Node Output

CF, RF, U

\*Element Output, directions=YES

LE, PE, PEEQ, PEMAG, S, STATUS

\*Contact Output

CDISP, CSTRESS

\*\*

\*\* HISTORY OUTPUT: H-Output-3

\*\*

\*Output, history

\*Node Output, nset=Set-4

RF1, RF2, RF3, RM1, RM2, RM3

\*\*

\*\* HISTORY OUTPUT: H-Output-1

\*\*

\*Output, history, frequency=1000

\*Node Output, nset=BOTTOMPART-1.BOTTOMLOAD

RF1, RF2, RF3, RM1, RM2, RM3, U1, U2

U3, UR1, UR2, UR3

\*\*

\*\* HISTORY OUTPUT: H-Output-2

\*\*

\*Node Output, nset=TOPPART-1.TOPLOAD

RF1, RF2, RF3, RM1, RM2, RM3, U1, U2

U3, UR1, UR2, UR3

\*End Step