

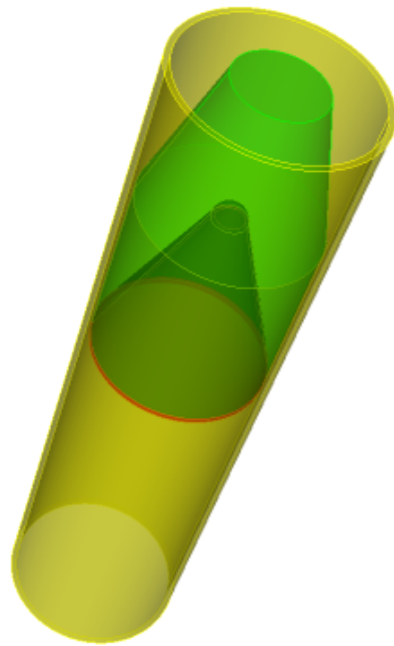
Trelis Basic Course

2019. 05



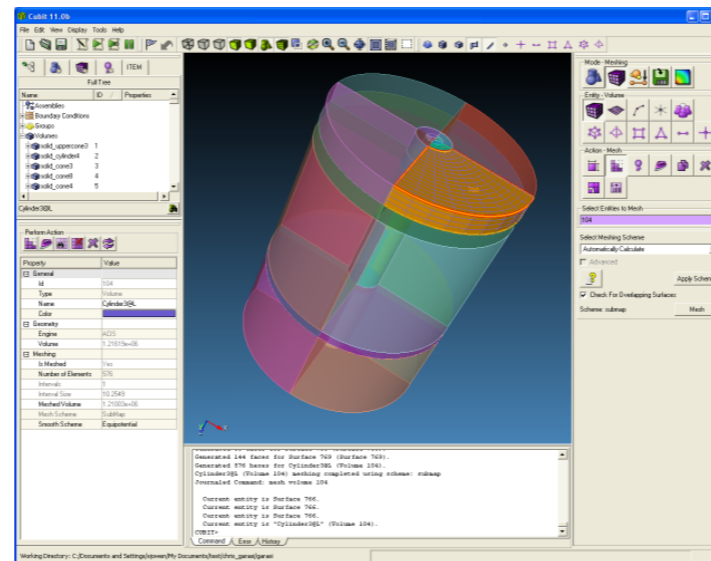


CAD



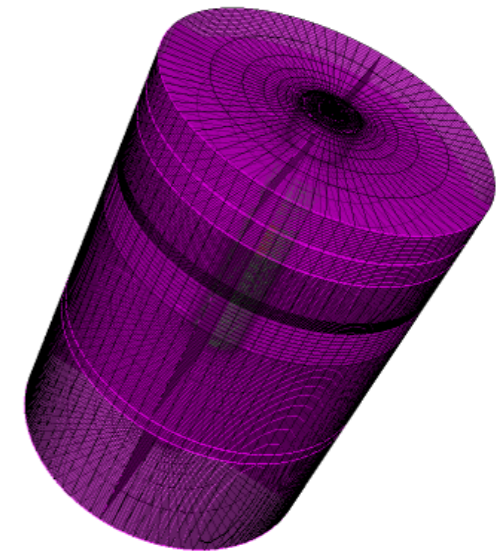
ACIS
STEP
IGES
STL
Pro/E
Facets
Exodus II

Trelis



Meshing Tools
Geometry Creation
Geometry Preparation
Mesh Optimization
Boundary Conditions
Scripting
Automation

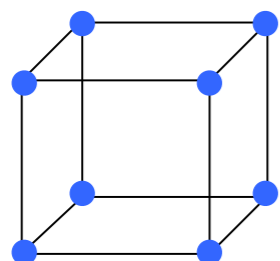
Mesh



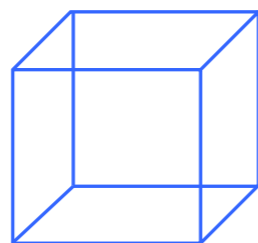
Exodus II
Abaqus
NASTRAN
ANSYS
Patran
LS-dyna
Fluent
OpenFOAM



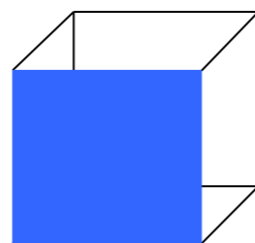
Geometry Entity



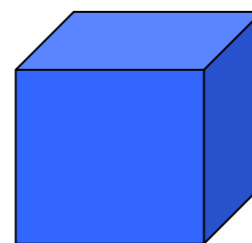
Vertex



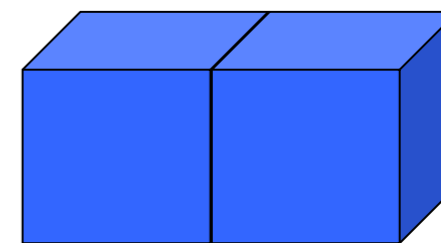
Curve



Surface



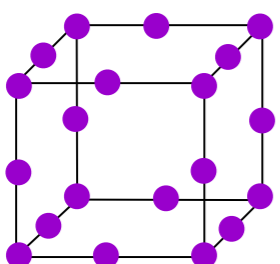
Volume



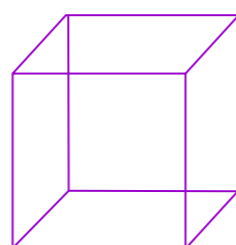
Body



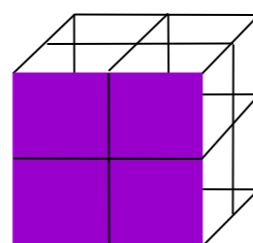
Mesh Entity



Node



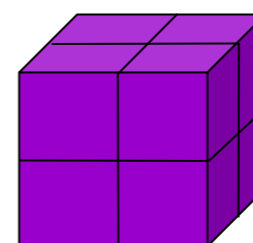
Edge



Face (Quad)



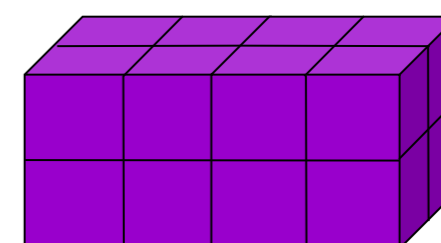
Tri



Volume mesh (Hex)



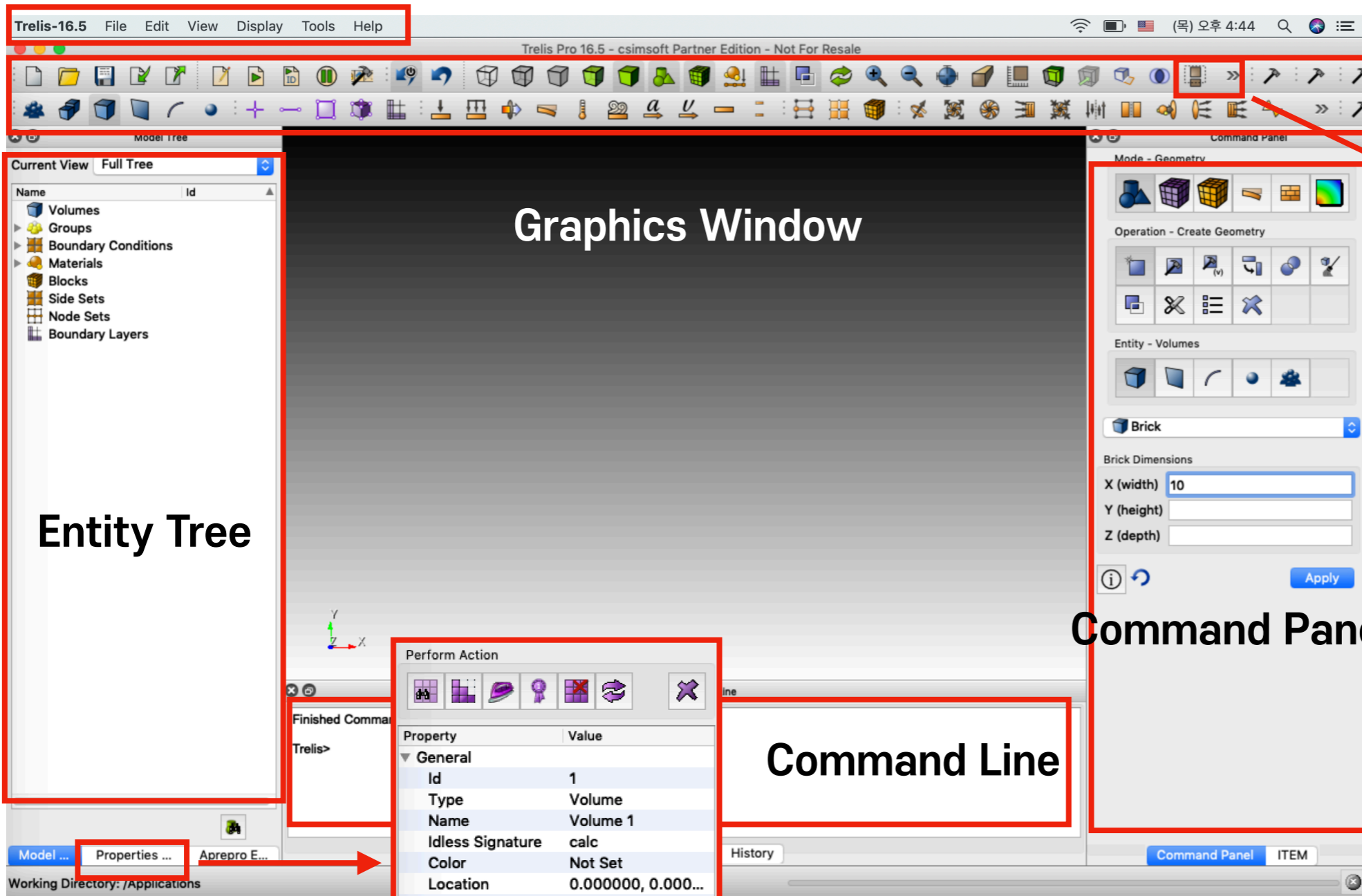
Tet



Volume mesh (Hex)



Drop Down Menu



Toolbar Commands

Mouse action

1. 마우스로 선택된 영역안에 완전히 포함 된 객체만 선택
2. 마우스로 선택된 영역안에 일부라도 포함된 모든 객체 선택
3. 마우스 선택 영역 모양 변경

Entity Tree

Graphics Window

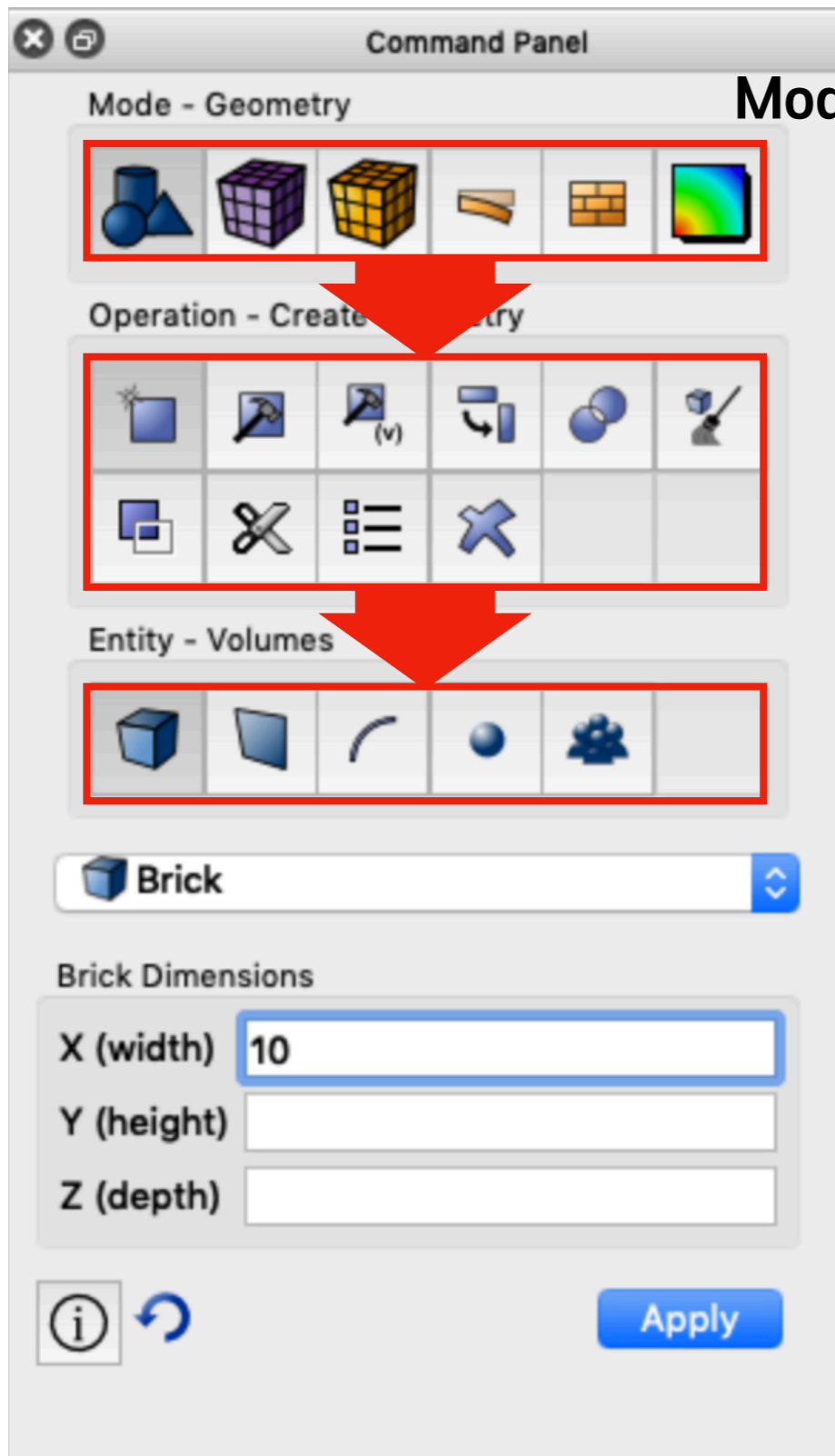
Command Panel

Command Line

Properties Page

| Property | Value |
|--------------------|--------------------|
| ▼ General | |
| Id | 1 |
| Type | Volume |
| Name | Volume 1 |
| Idless Signature | calc |
| Color | Not Set |
| Location | 0.000000, 0.000... |
| ▼ Geometry | |
| Engine | ACIS |
| Volume | calc |
| ▼ Meshing | |
| Is Meshed | No |
| Number of Elem... | 0 |
| Number of Nodes | 0 |
| Requested Inter... | Not Set |
| Requested Size | calc |
| Meshed Volume | calc |
| Mesh Scheme | Default |
| Smooth Scheme | Equipotential |
| Sizing Function | None |

GUI Interface의 경우, 마우스 드래그로 창의 위치 변경과 Undock이 가능함 (Redock : 마우스 더블 클릭)



Mode Icon 클릭으로 New Mode open



-Geometry : create, modify, clean-up, move....



-Mesh : intervals, schemes smoothing, refine....



-Analysis Groups and Materials : nodeset, sideset, block, materials....



-FEA BCs : force, pressure, velocity, constraint....



-CFD BCs : pressure inlet, velocity inlet, wall, symmetry....



-Post meshing tool launch : ParaView....



Drop Down Menu

On Curve

Curve ID(s) |

Specify Location Using

- Fraction
- Distance
- Position
- Start
- Midpoint
- End
- Close To Vertex
- At Location
- Extrema
- Segments
- Discontinuities
- Crossing

Fraction

From

- Start
- End
- Vertex

Pick Color... default



Apply

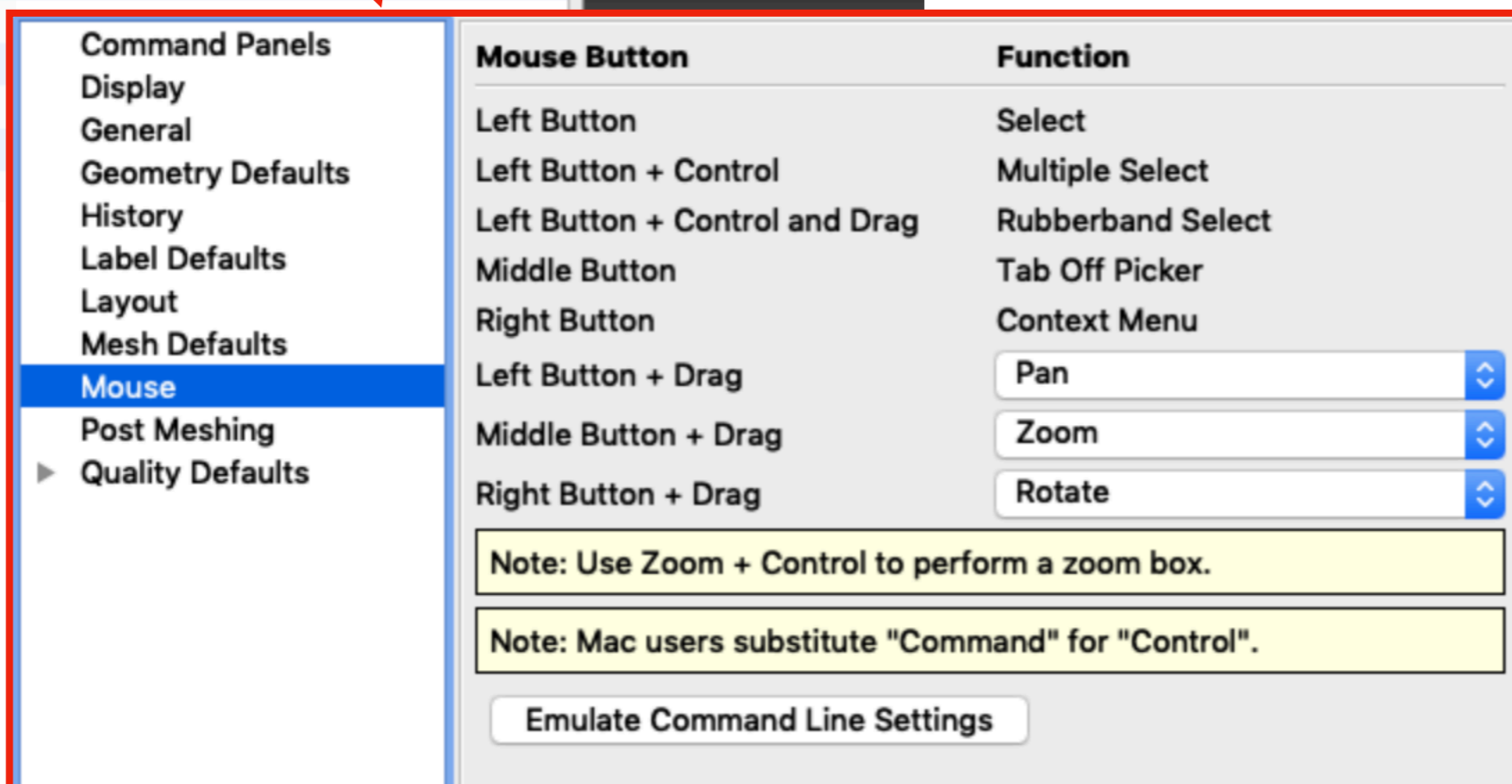
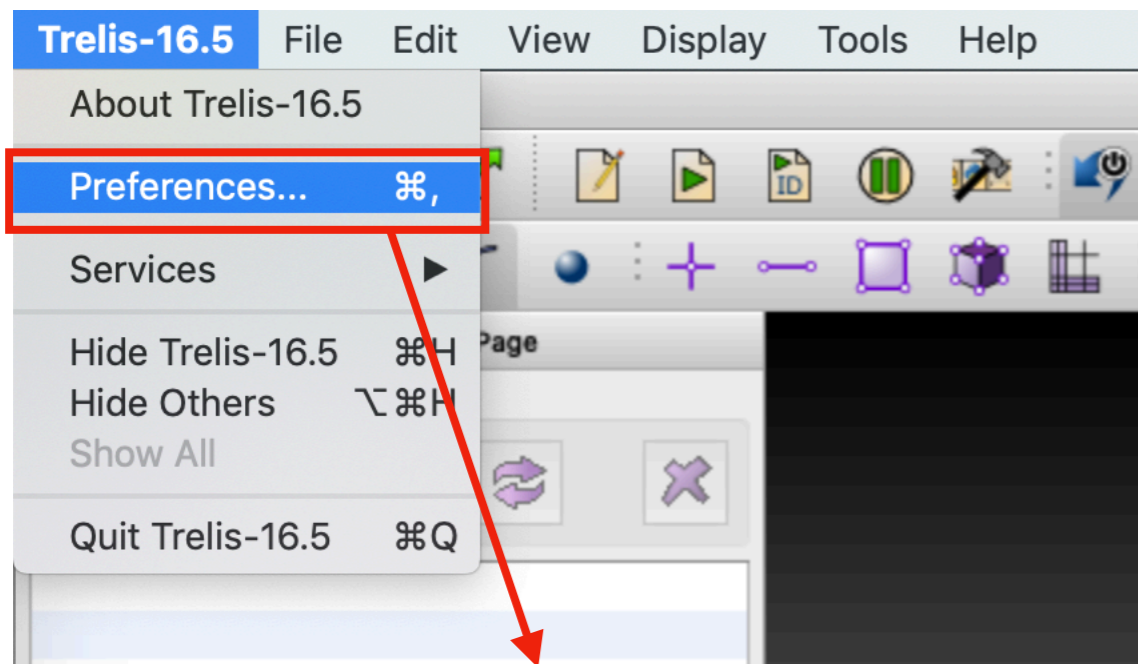
Execute Button

IDs Input Field : graphical selections, typed IDs, ranges, relations to other entities

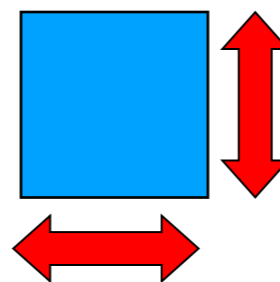
- Done Selecting
- Select All
- Highlight
- Reset Zoom
- Rotate About
- Draw
- Isolate
- Visibility Off
- Measure
- Mesh
- Delete Mesh
- Show Quality
- Reset Entity
- List Information
- Graphics View Hotkeys
- Delete

1 2 3
 1 to 6
 all
 curve in surface 2

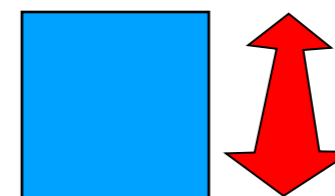
Graphics Window에서 활용 가능한 편리한 단축키를 확인할 수 있습니다.



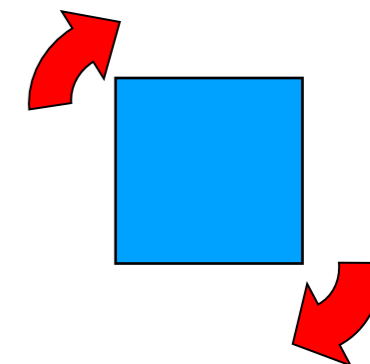
Pan



Zoom












Rotate

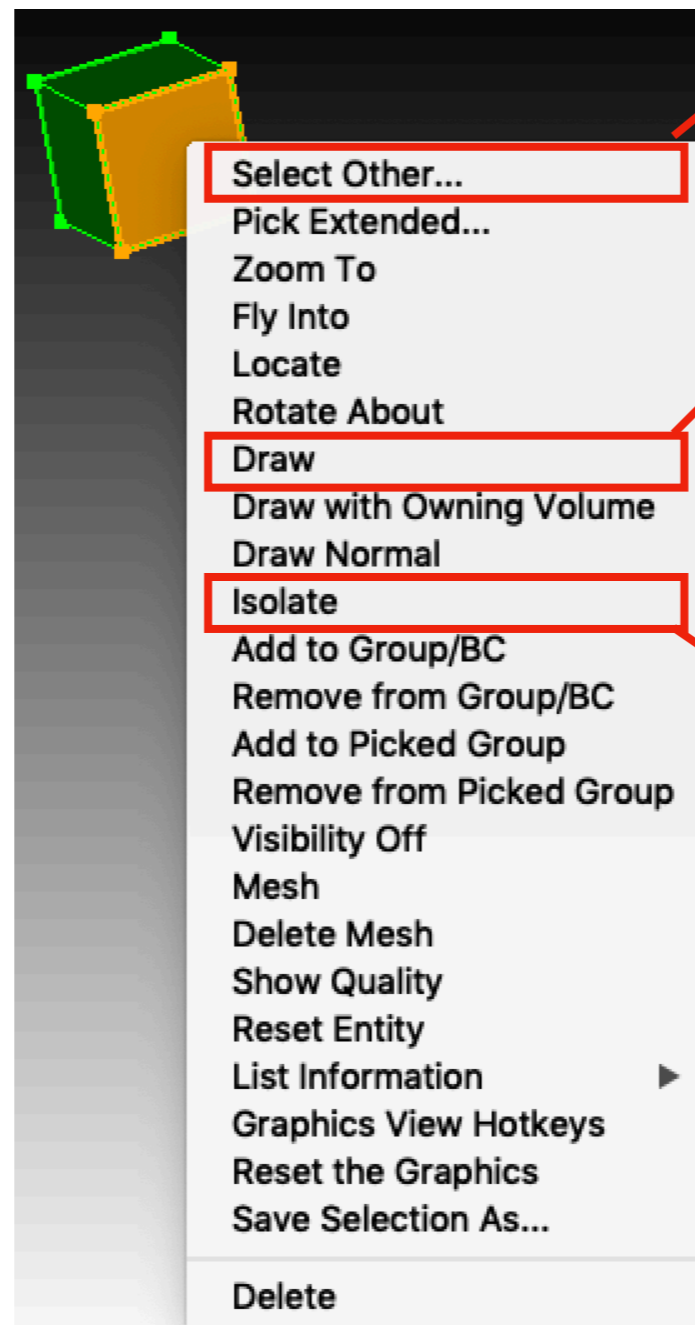
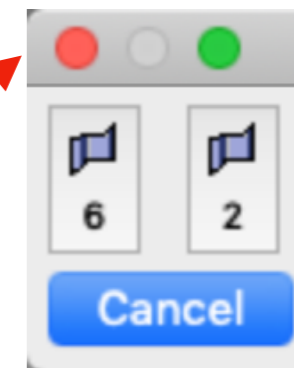


Option을 선택하여 사용자 편의에 맞게 변경하여 사용 가능합니다.



-  - Volumes, can be selected by **double clicking on surfaces**
-  - Hex Elements
-  - Tet Elements
-  - Quad Elements
-  - Tri Elements
-  - Element Edges
-  - Nodes
-  - Groups
-  - Bodies

선택된 객체의 뒤에 있는 객체 선택시

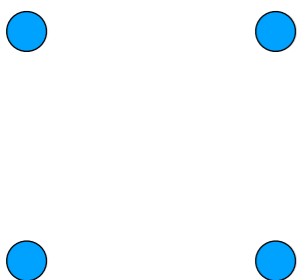


선택된 객체만 display, refresh(F5) 기능으로만 다른 객체 display 가능 (Draw은 상위 객체 선택 불가, 하위 객체 선택 가능하나 후작업에 대한 결과가 display 되지 않음)

선택된 객체만 display, All Visible 기능으로만 다른 객체 display 가능 (Isolate은 상위 객체 선택 가능, 하위 객체 선택 가능하며 후작업에 대한 결과가 display 됨)

Right click pop-up menu without selection





Vertices 좌표 정의

Mode - Geometry

Operation - Create Geometry

Entity - Vertices

Coordinates

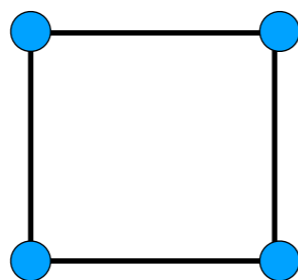
X Coordinate 0
Y Coordinate 0
Z Coordinate 0

Create On
 Curve Surface

Curve ID

Pick Color... default

Apply



각 Vertices를 Curve로 연결

Mode - Geometry

Operation - Create Geometry

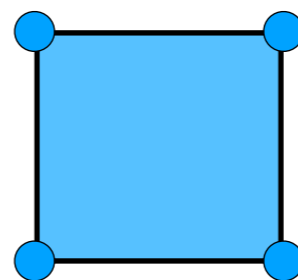
Entity - Curves

Line

Build Using
 Vertex IDs
 Locations
 Location and Direction

Vertex IDs

Apply



Closed Curve로 Surface 생성

Mode - Geometry

Operation - Create Geometry

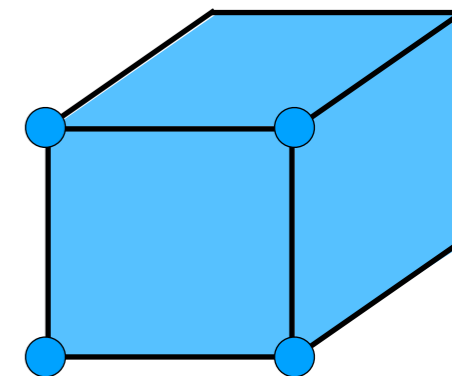
Entity - Surfaces

Bounding Curves

Curve ID(s)

On Surface

Apply



Closed Surface로 Volume 생성

Mode - Geometry

Operation - Create Geometry

Entity - Volumes

Bounding Surfaces

Surface ID(s)

Heal
 Keep Original
 Create Sheet Body

Stitch

Apply



Surface

Volume

Mode - Geometry

Operation - Create Geometry

Entity - Surfaces

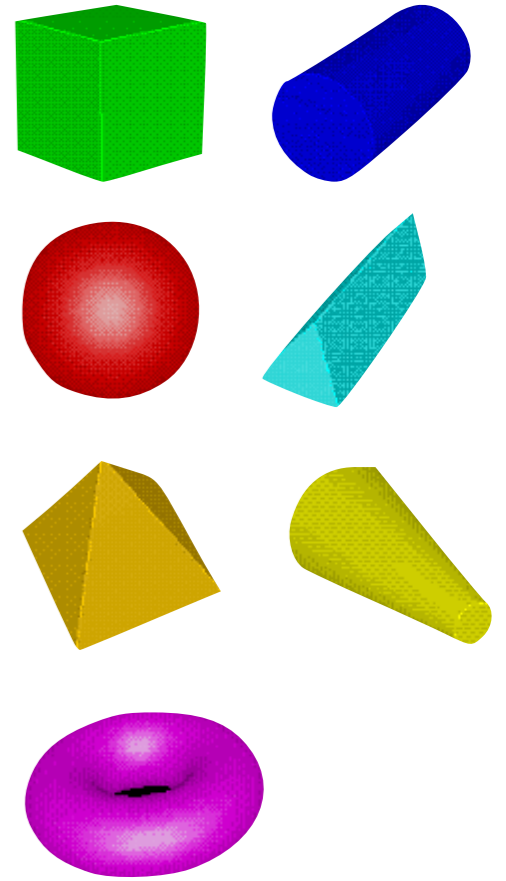
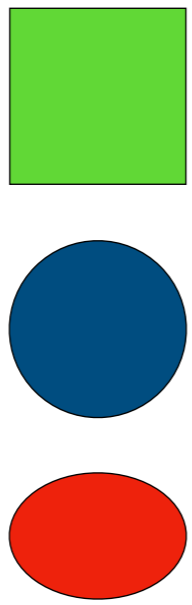
- Bounding Curves
- Circle
- Copy and Transform
- Ellipse
- Extended Surface
- Vertex List
- Auto Midsurface
- Midsurface
- Net Surface
- Offset
- Parallelogram
- Project
- Planar Surface
- Rectangle
- Skin Curve
- Sweep

Mode - Geometry

Operation - Create Geometry

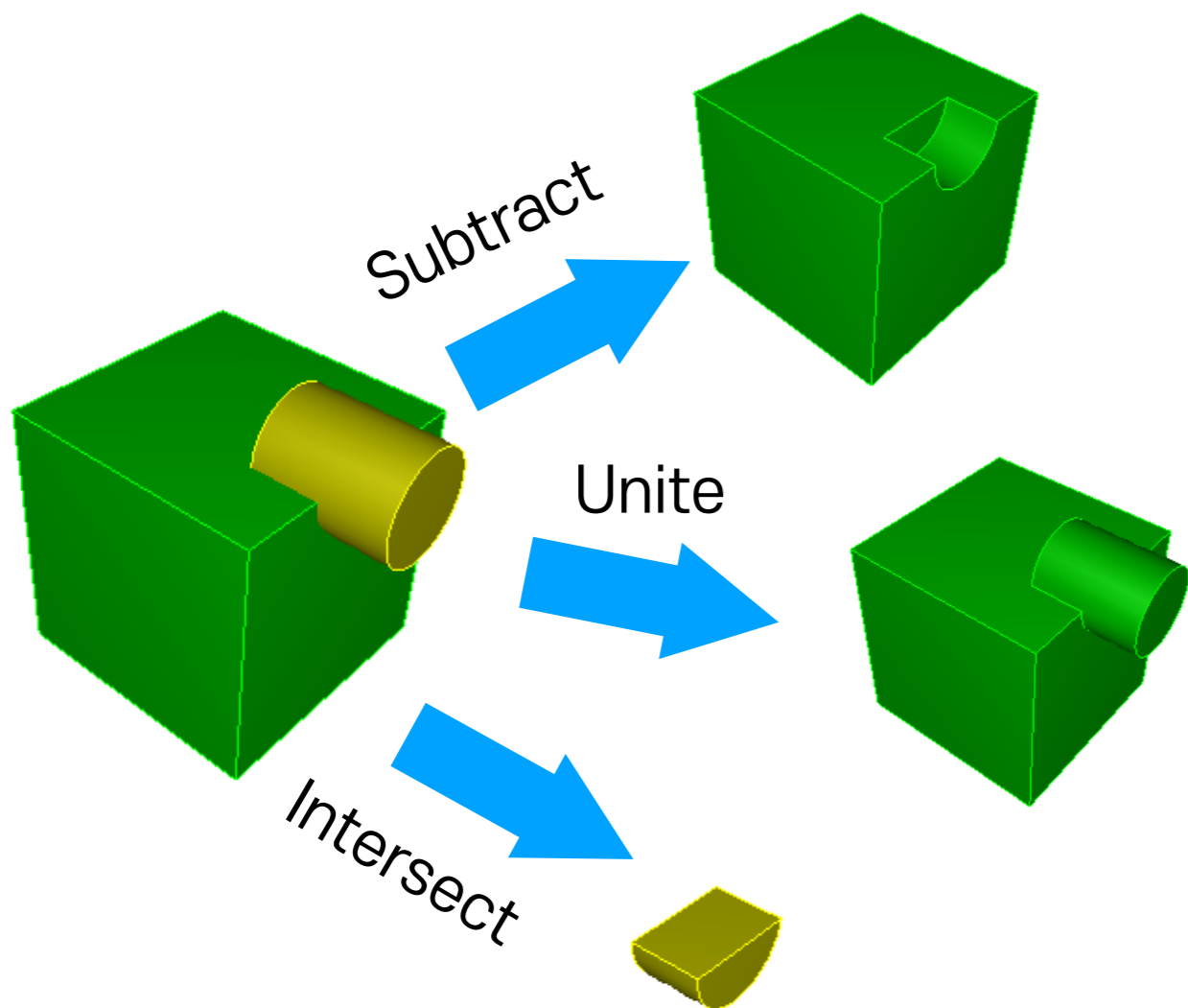
Entity - Volumes

- Brick
- Cone
- Cylinder
- Prism
- Pyramid
- Sphere
- Torus
- Bounding Surfaces
- Lofted Volume
- Sweep
- Copy and Transform
- Bounding Box

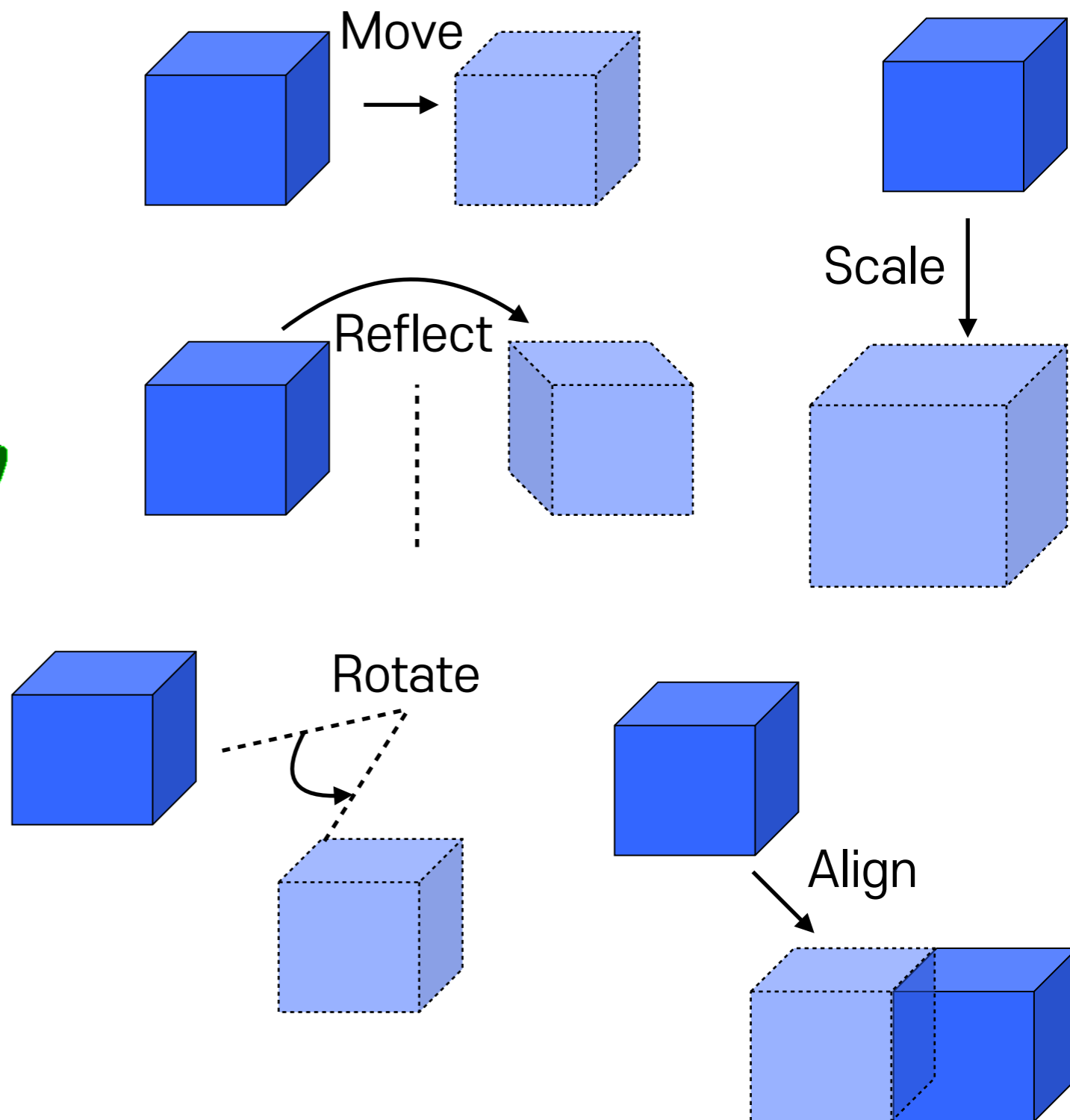




Boolean



Transform





Mode - Geometry

Operation - Decompose Geometry

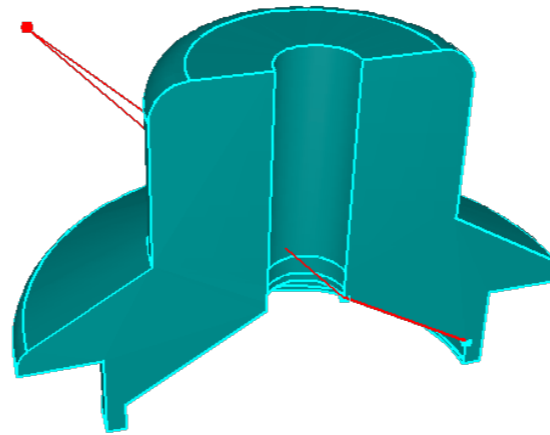
Entity - Volumes

Chop

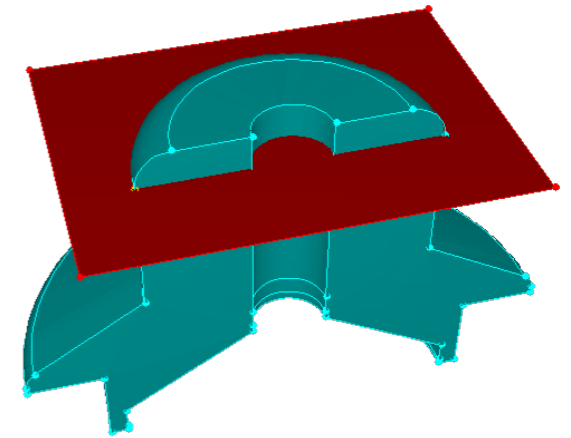
- Coordinate Plane
- General Plane
- Plane From Surface
- Plane from Curve
- Plane From Vertex
- Loop
- Sheet
- Sheet Extended From Surface
- Cone
- Cylinder Radius
- Tool
- Sweep Curve
- Sweep Surface
- Suggest Decomposition

Apply

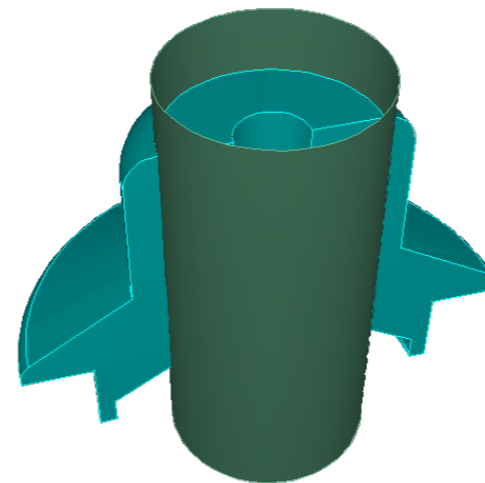
Plane from vertices:



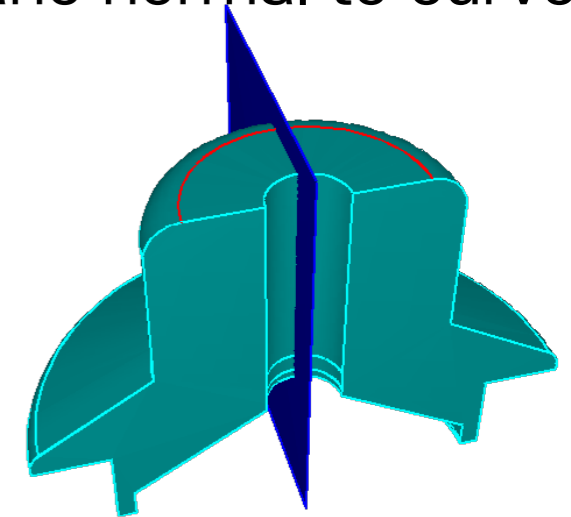
Coordinate plane:



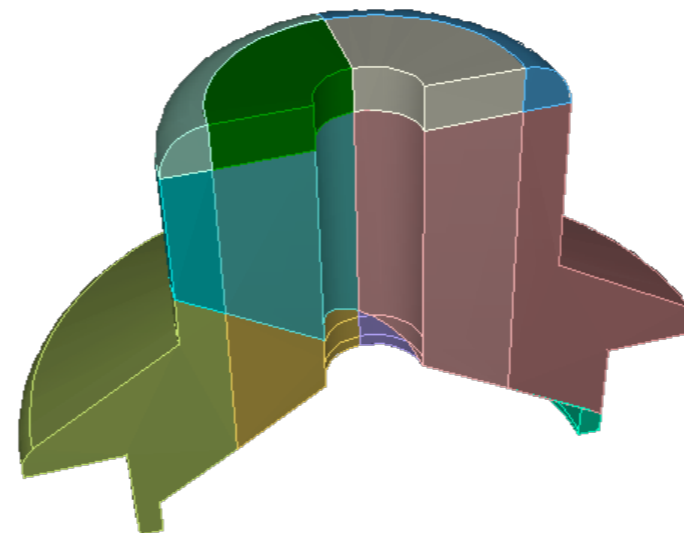
Cylindrical surface:



Plane normal to curve:



Webcuts Result

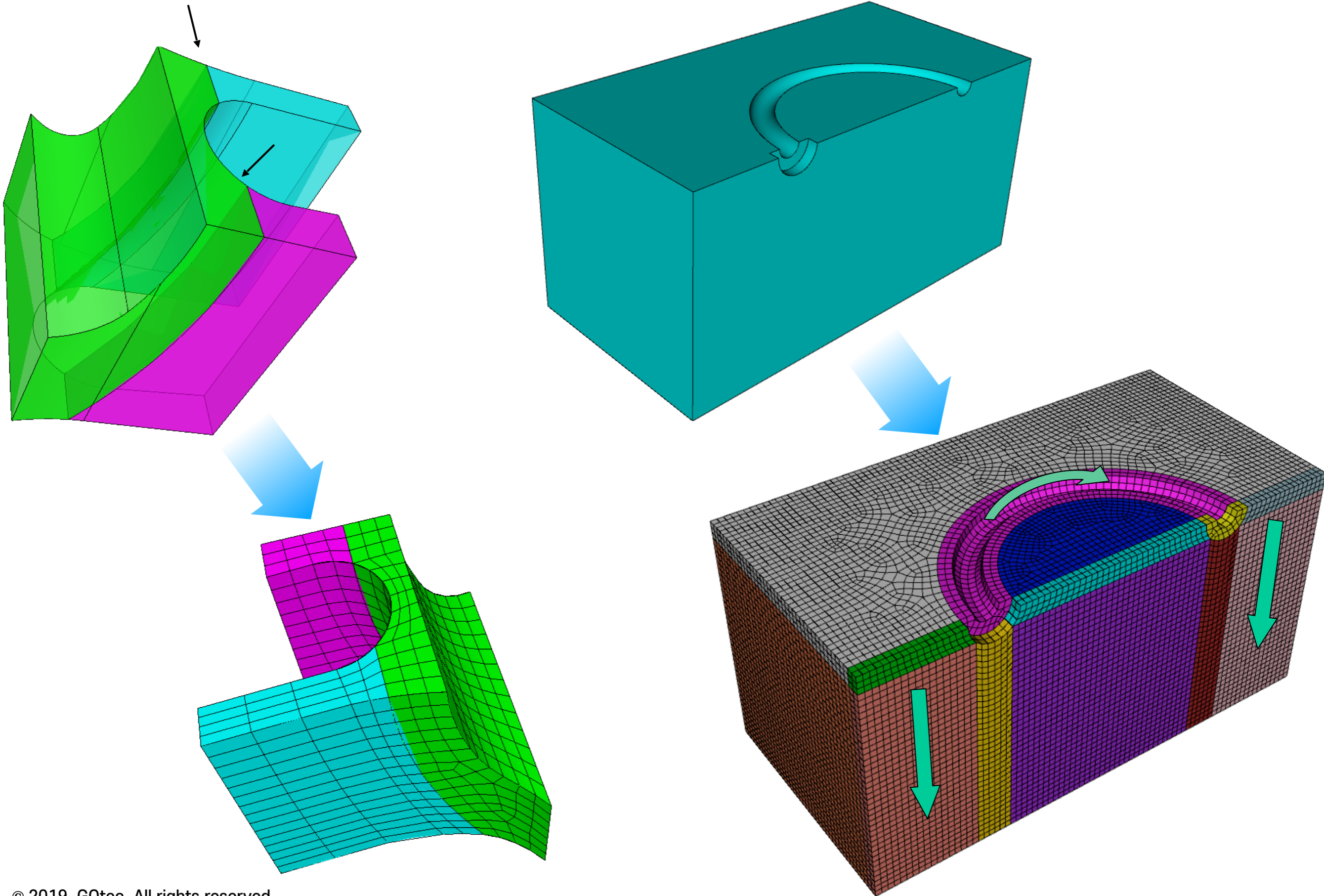


Geometry의 Decomposition 이유

: mesh quality

: mesh count

----> 해석 시간 및 정확도와 밀접한 상관관계가 있음





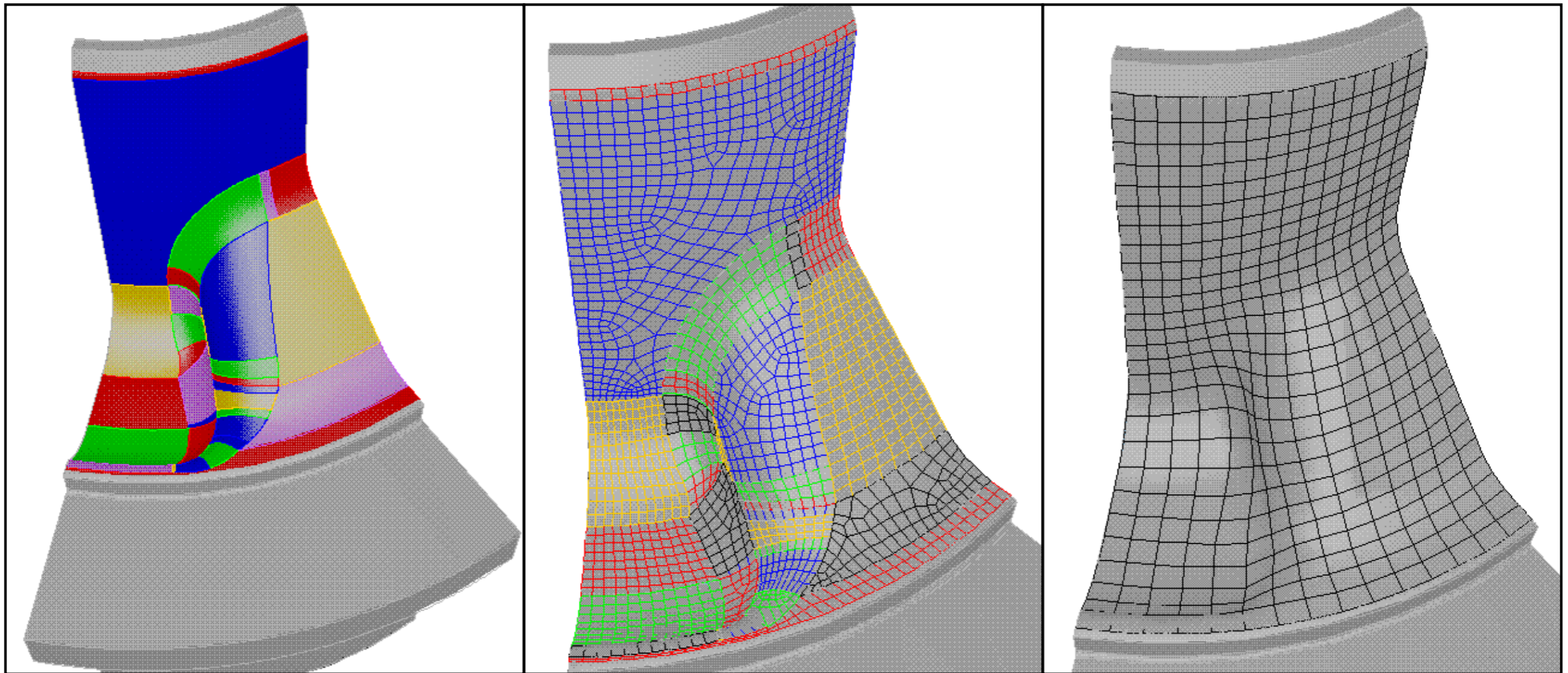
Composite Operation :

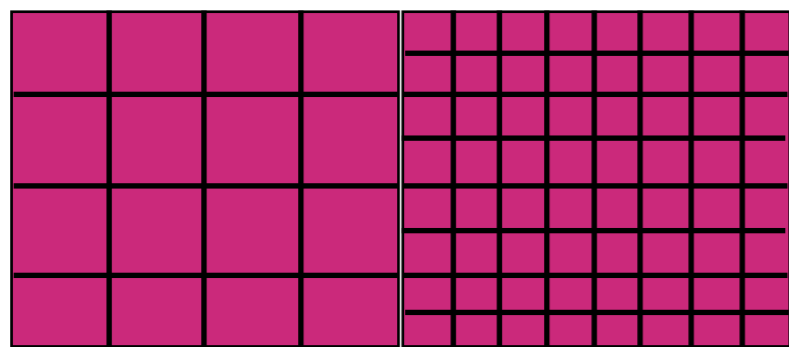
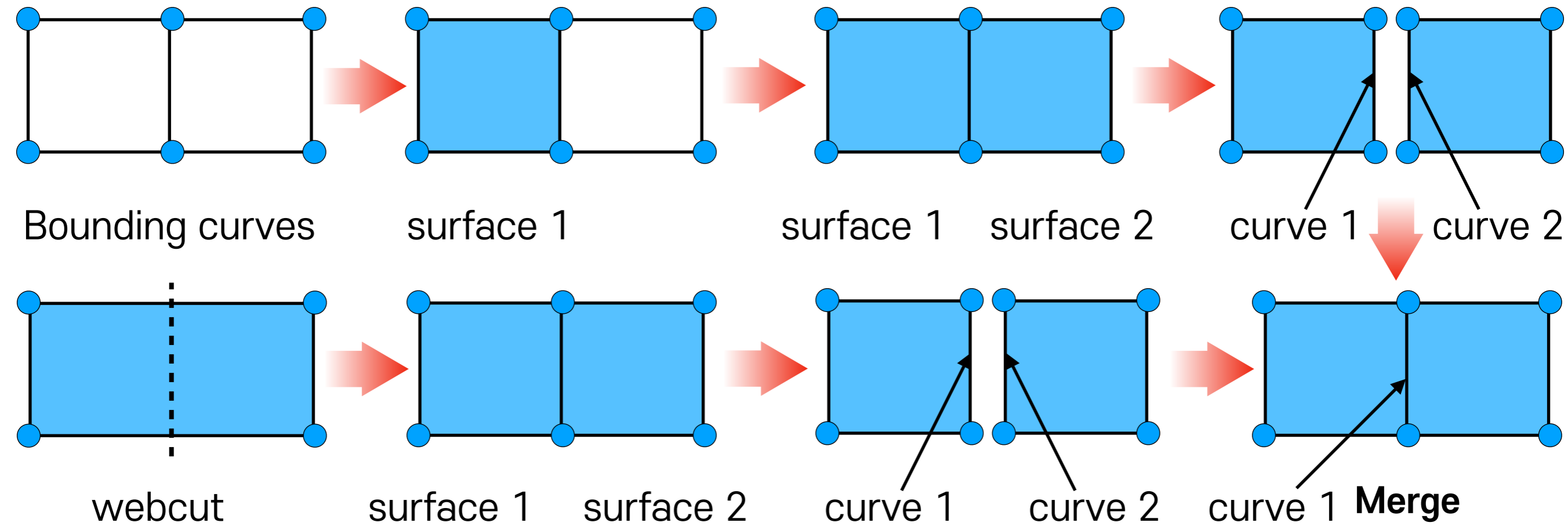
Combines surfaces together

Mesh is not constrained to intermediate curves

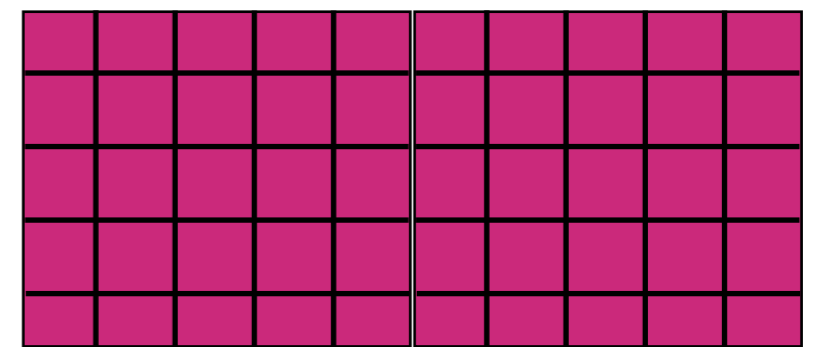
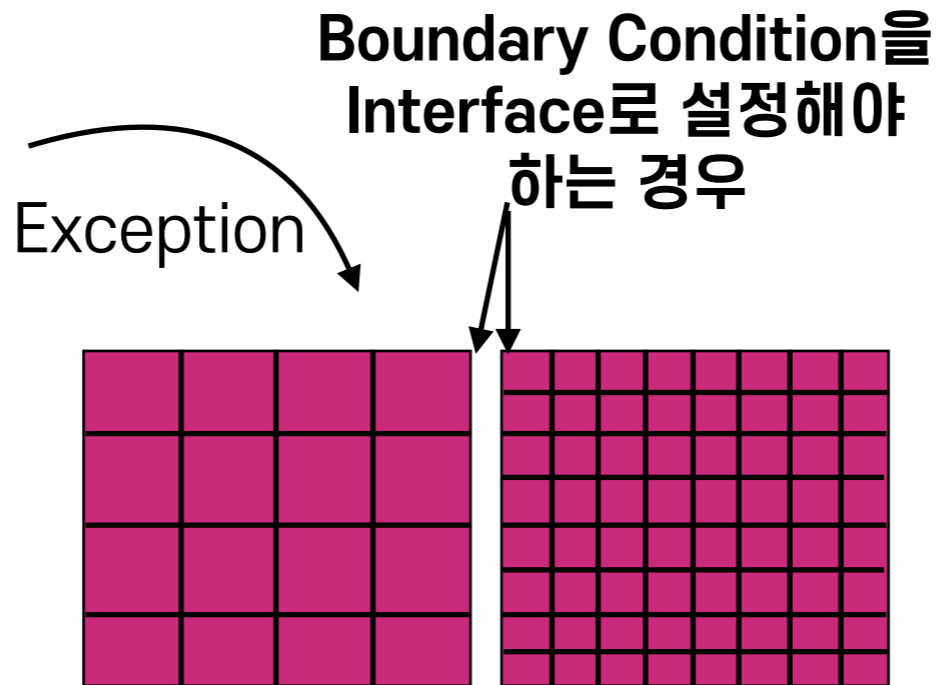
Used to improve mesh quality

Does not change the CAD model

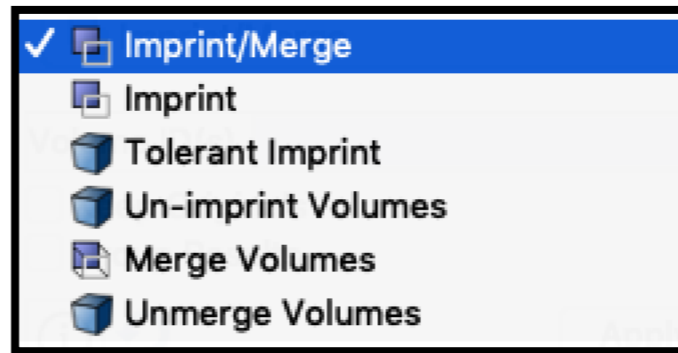
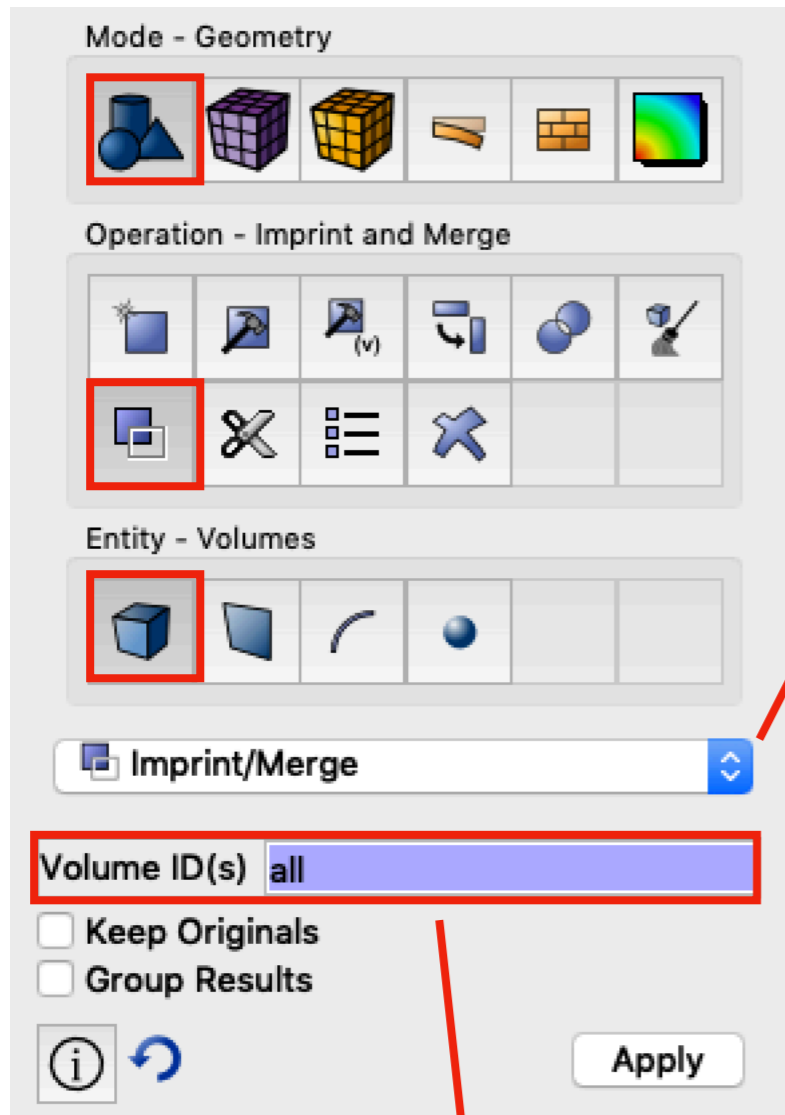




Unconnect

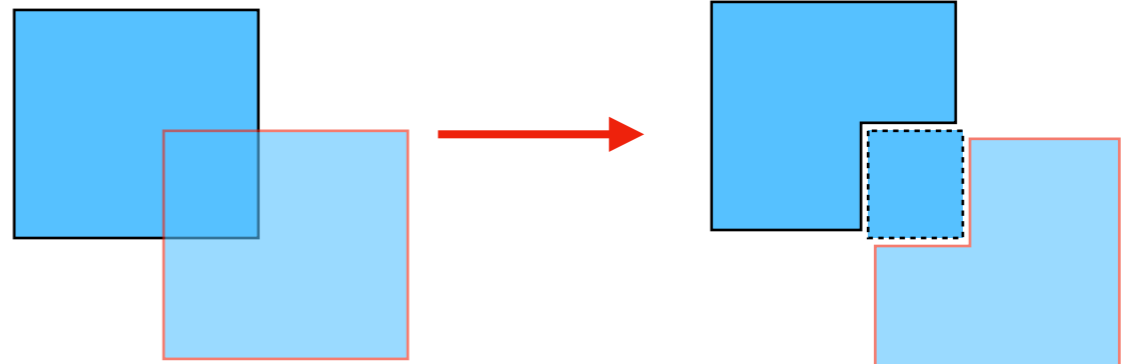


Connect

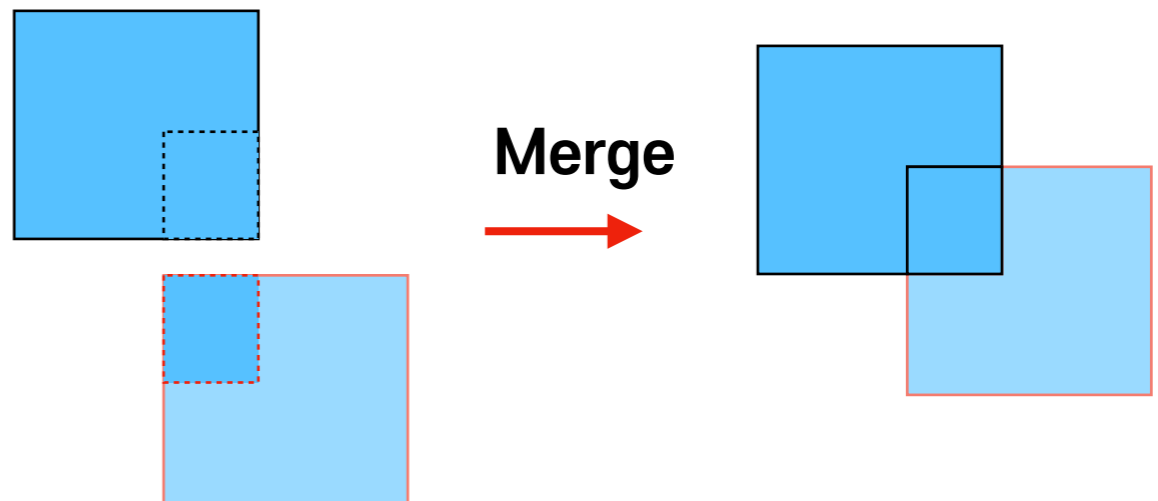


1. Imprint - 객체 각인
2. Merge - 객체 connect

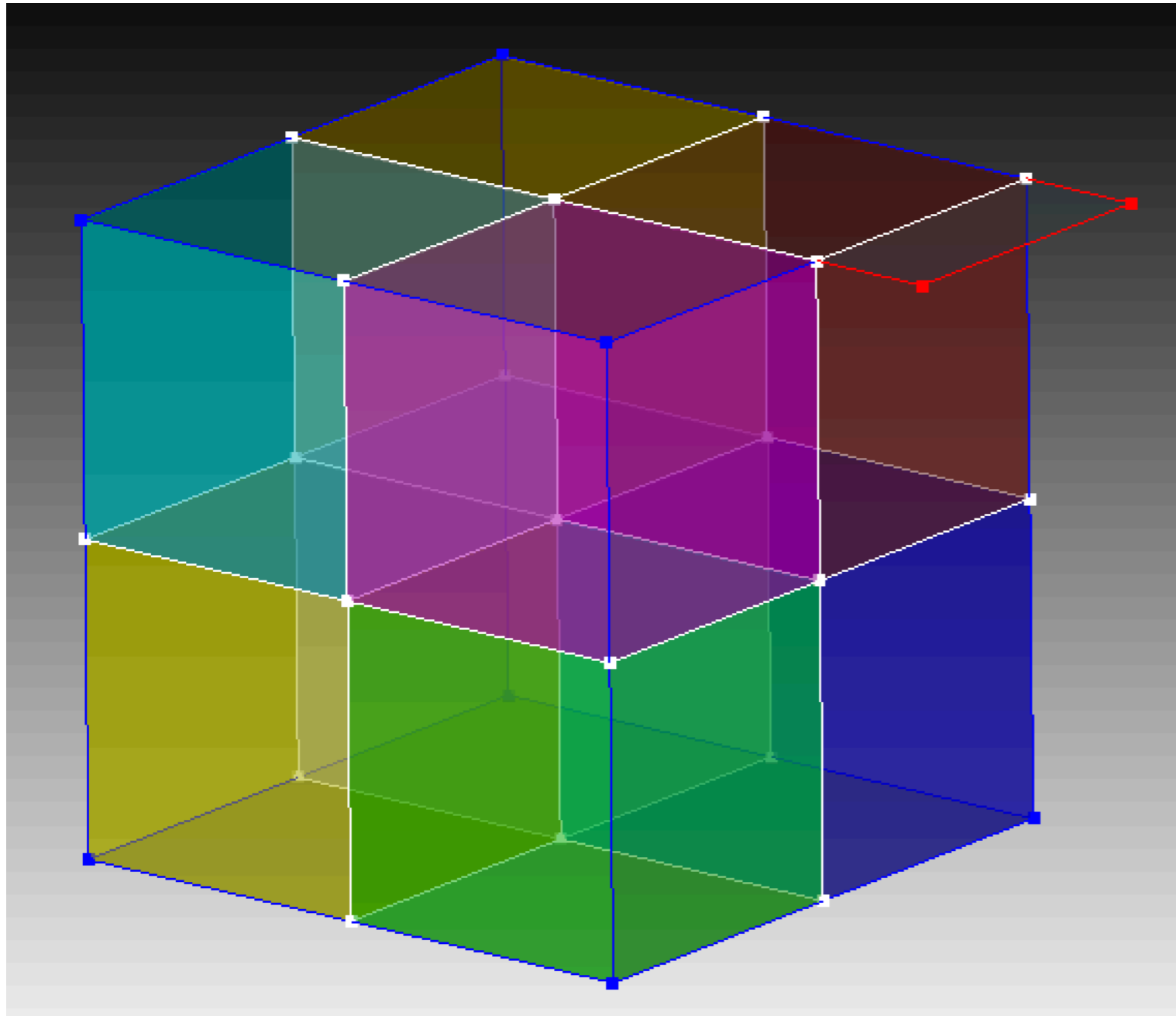
Imprint



Imprint



Boundary Condition을 Interface로 설정해야 하는 경우는 field에 all 설정이 아닌 connecting 되어야하는 객체 IDs를 설정하여야 함



상단 Icon 클릭시 graphic window상에 curve의 색상으로 connect 상태 확인이 가능함

1. Red - 해당 curve에 1개의 surface 만 존재하는 경우
2. Blue - 해당 curve에 2개의 surface 가 존재하는 경우
3. White - 해당 curve에 3개 이상의 surface가 존재하는 경우



ITEM

Prepare Geometry

Follow the steps below to help prepare your geometry for meshing.

Run Checked Diagnostics

- [Fix invalid topology](#)
- [Remove small features](#)
- [Connect volumes](#)
- [Build meshable topology](#)
- [Set element sizes](#)

Completing one geometry preparation phase can sometimes introduce problems in another. You may need to revisit steps to make sure all problems are resolved completely.

Tasks

- Import or Create Geometry
- Setup FEA Model
- Prepare Geometry**
- Mesh
- Validate Mesh
- Define BC's
- Export Mesh

ITEM Progress

- Look for invalid topology
- Look for small surfaces
- Look for small curves
- Look for narrow surfaces
- Look for meshable topology
- Look for overlapping surfaces

Finished

Close 2

Prepare Geometry

Follow the steps below to help prepare your geometry for meshing.

Run Checked Diagnostics

- [Fix invalid topology](#)
- [Remove small features](#)
- [Connect volumes](#)
- [Build meshable topology](#)
- [Set element sizes](#)

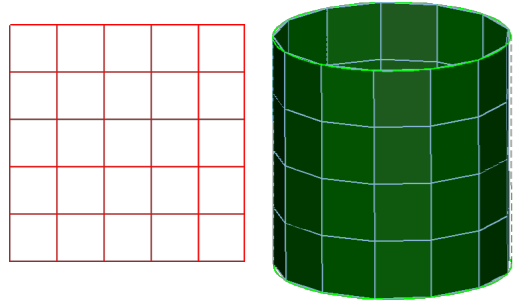
Completing one geometry preparation phase can sometimes introduce problems in another. You may need to revisit steps to make sure all problems are resolved completely.

connect volumes 앞에 OK Icon이 Display 되어야만 모든 volume이 connect된 상태임.

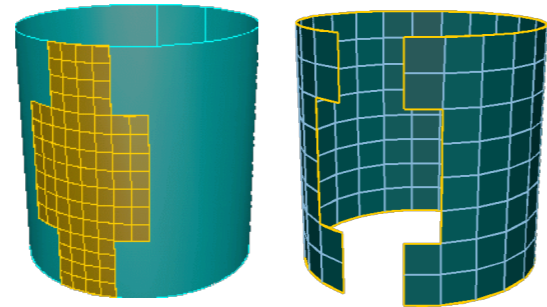


Surface Scheme

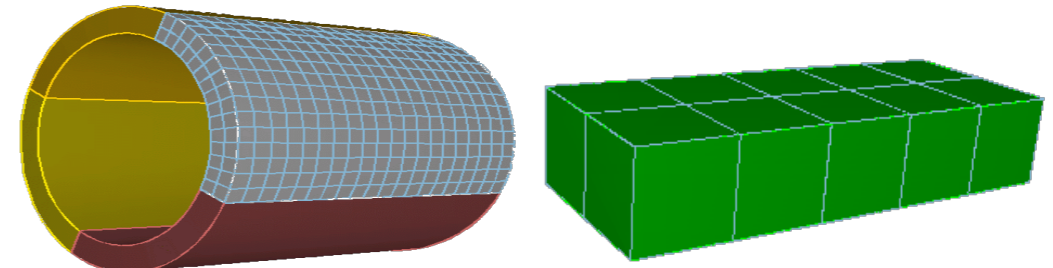
Volume Scheme



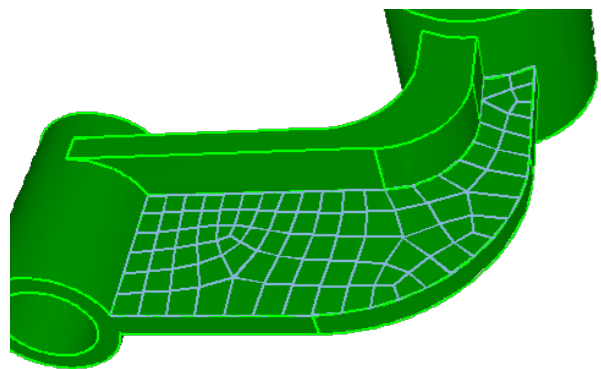
Mapped



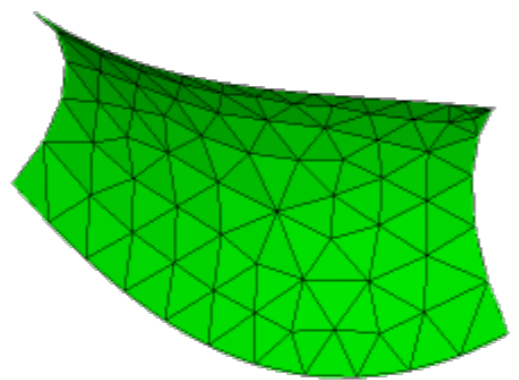
Sub-map



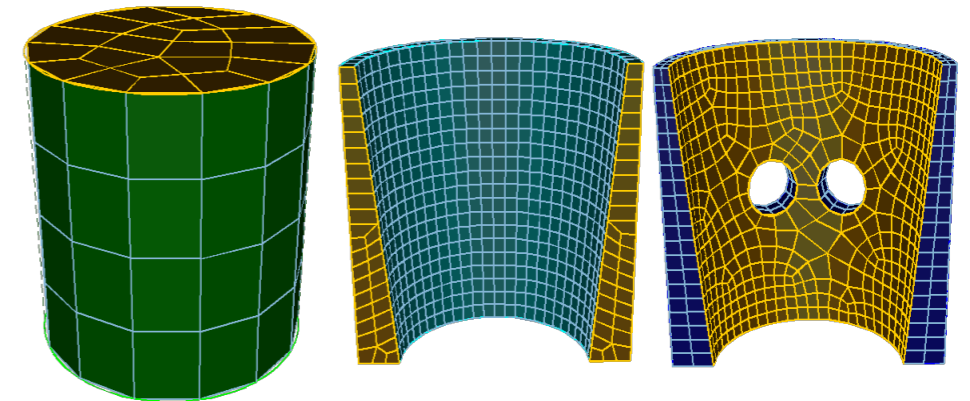
Mapped



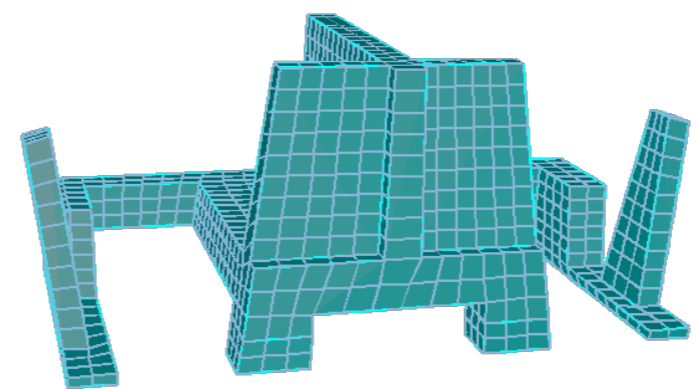
Pave



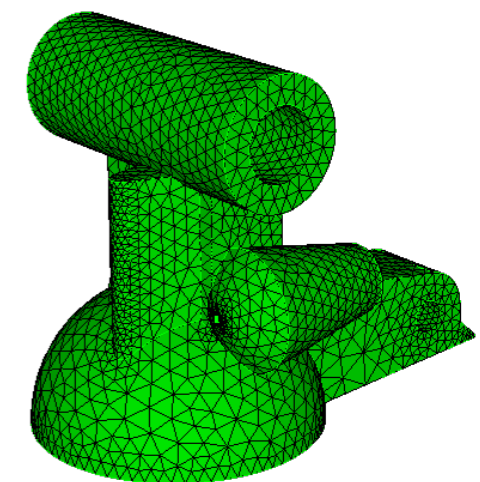
Trimesh



Sweep



Sub-map



Tetmesh



Mode - Mesh

Entity - Curves

Action - Mesh

Select Curves

Settings For Curve

Bias

Auto

Modify Curve Sense

Preview

Apply Size Before Meshing

Mesh

- ✓ Bias
- Curvature
- Equal
- PinPoint
- Stretch

- ✓ Auto
- Intervals & Bias
- First Size & Bias
- First Size & Last Size
- First/Last Ratio
- Last/First Ratio
- First Fraction & Intervals
- Propagate Curve Bias

Intervals & Bias

Change Interval Count

Interval Count 15

Dual Bias

Bias Factor 1.1

Bias Factor 1.0

Start Vertex ID

Bias Factor > 1 →



Bias Factor < 1 →



Dual Bias





Mode - Mesh

Entity - Surface

Action - Intervals

Automatic Sizing

Select Surfaces

Auto Factor

Fine Coarse

Propagate
 Preview

Check For Overlapping Surf.
 Apply Size Before Meshing

1 **Apply Size**

3 **Mesh**

- Automatic Sizing
- Approximate Size
- Approximate Interval Count
- Sizing Function
- Geometry Adaptive

Mode - Mesh

Entity - Surface

Action - Mesh

Automatically Calculate

Select Surfaces

2 **Apply Scheme**

Check For Overlapping Surfaces
 Apply Scheme Before Meshing

Scheme:

3 **Mesh**

- Automatically Calculate
- Map
- SubMap
- Pave
- QuadDominant
- Trimesh
- TriPrimitive
- Circle
- Hole
- Polyhedron
- TriAdvance
- TriDelaunay

1. Apply Size와 2. Apply Scheme의 순서는 관계없으나, 1과 2를 적용한 이후에 3. Mesh를 실행해야 함



Mode - Mesh

Entity - Volumes

Action - Intervals

Automatic Sizing

Select Volumes

Auto Factor

Fine Coarse

Propagate
 Preview

Check For Overlapping Surf.
 Apply Size Before Meshing

1 **Apply Size**

3 **Mesh**

- Automatic Sizing
- Approximate Size
- Approximate Interval Count
- Sizing Function
- Geometry Adaptive

Mode - Mesh

Entity - Volumes

Action - Mesh

Automatically Calculate

Select Volumes

2 **Apply Scheme**

Check For Overlapping Surfaces
 Apply Scheme Before Meshing

Scheme:

3 **Mesh**

- Automatically Calculate
- Map
- SubMap
- Sweep
- Suggest Source/Target
- Tetmesh
- TetPrimitive
- Sphere
- Polyhedron

1. Apply Size와 2. Apply Scheme의 순서는 관계없으나, 1과 2를 적용한 이후에 3. Mesh를 실행해야 함



Mode - Mesh

Entity - Boundary Layers

Action - Create Boundary Layer

System Assigned ID 1

Settings Association

Curve Surface

Curve ID(s)

Surface ID

Add

Curve Surface

Remove

Create

System Assigned ID 1

Settings Association

Show Diagram

Algorithm Uniform

First row (a)

Growth Factor (b/i) 1.2

Number of Layer 4

Depth (D)

Internal Continuity

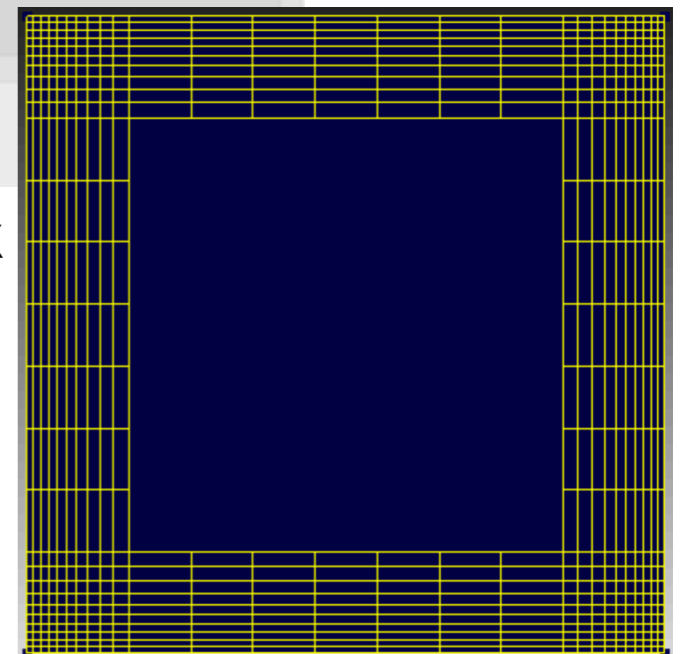
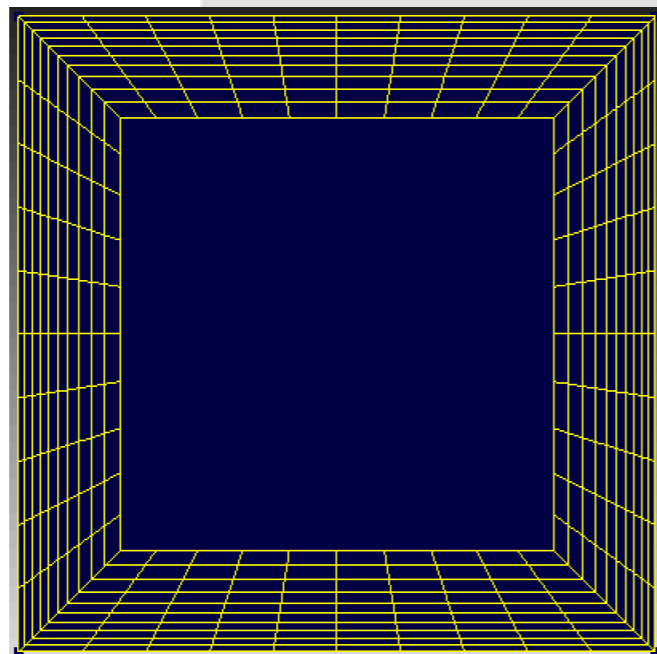
i ↺

Surface에 Layer 설정시

Volume에 Layer 설정시

Option check

Option uncheck





Mode - Analysis Groups and Materials

Entity - Blocks

Action - Create

Block ID 1

Select

- Group
- Volume
- Surface
- Curve
- Vertex
- Hex
- Tet
- Face
- Tri
- Edge
- Node

Allow Blocks to Contain Duplicate Elements

Reset All Blocks

Apply

Mode - Analysis Groups and Materials

Entity - Material/Media

Action - Add material/media

Name:

Description:

requested id>

Default-Steel

Cubit-CFD

| Property | Value |
|----------------|-------|
| CFD Media Type | |

Apply

Value 칸에 값을 입력
 fluid - 0(default)
 Porous - 1
 Solid - 2

Mode - Analysis Groups and Materials

Entity - Material/Media

Action - Assign material/media

Block ID(s) 1

Assign Material

Assign Media

Available Materials

No Materials Defined

Available Media

air

Reset All Blocks

Reset

Apply

반드시 block과 media 설정값을 match시켜야 함

Mode - CFD BCs

Operation - Create CFD BCs

Entity

해석 case에 맞는 BCs를 선택하여 설정



The image shows a file explorer window with the following elements:

- File Explorer:** Shows a folder named 'SNU' containing files 'kvlcc2m.igs' and 'kvlcc2m.trelis'. The file 'kvlcc2m.igs' is selected.
- Context Menu:** A list of file formats is displayed, with 'IGES (*.igs *.iges)' selected. Other options include ACIS (*.sat *.sab), STEP (*.stp *.step), Wavefront Object (*.obj), Stanford Polygon (*.ply), Assimp (*), GAMBIT Real Geometry (*.dbs), Exodus (*.e *.exo), Genesis (*.g *.gen), Abaqus (*.inp), STL Files (*.stl), Facets (*.fac), Fluent (*.msh), GAMBIT Neutral (*.neu), I-DEAS (*.unv), Nastran (*.bdf), Patran (*.pat *.neu *.out), AVS Files (*.avs), Cubit Files (*.cub), and Trelis (*.trelis).
- IGES Import Options Dialog:** A dialog box with the following settings:
 - Ignore Bodies
 - Ignore Free Surfaces
 - Ignore Free Curves
 - Ignore Free Vertices
 - Heal On Import
 - Convert Free Surfaces To Bodies
 - Show Each While Importing
 - Separate Multi-Volume Bodies
 - Sort
 - Create Group
 - Name:
 - Import Attributes
- Buttons:** 'New Folder' and 'Options' buttons are at the bottom left. 'Cancel' and 'Finish' buttons are at the bottom right of the dialog box.



Mode - Geometry

Operation - Create Geometry

Entity - Surfaces

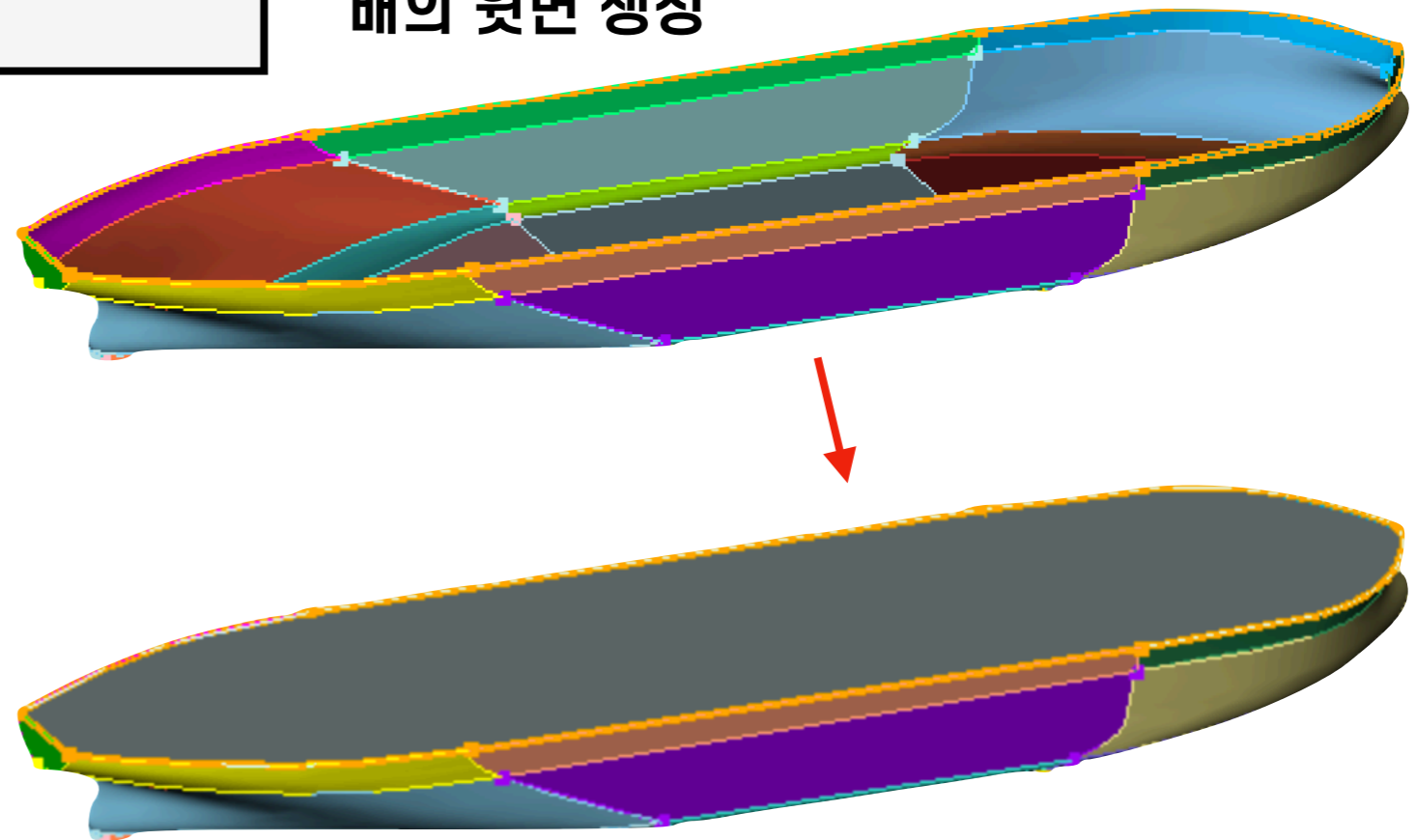
Bounding Curves

Curve ID(s) 1 6 9 64 63 79 80

On Surface

- Bounding Curves
- Circle
- Copy and Transform
- Ellipse
- Extended Surface
- Vertex List
- Auto Midsurface
- Midsurface
- Net Surface
- Offset
- Parallelogram
- Project
- Planar Surface
- Rectangle
- Skin Curve
- Sweep

배의 윗면 생성





Mode - Geometry

Operation - Modify Geometry

Entity - Volumes

Stitch

Body IDs

Specify Tolerance

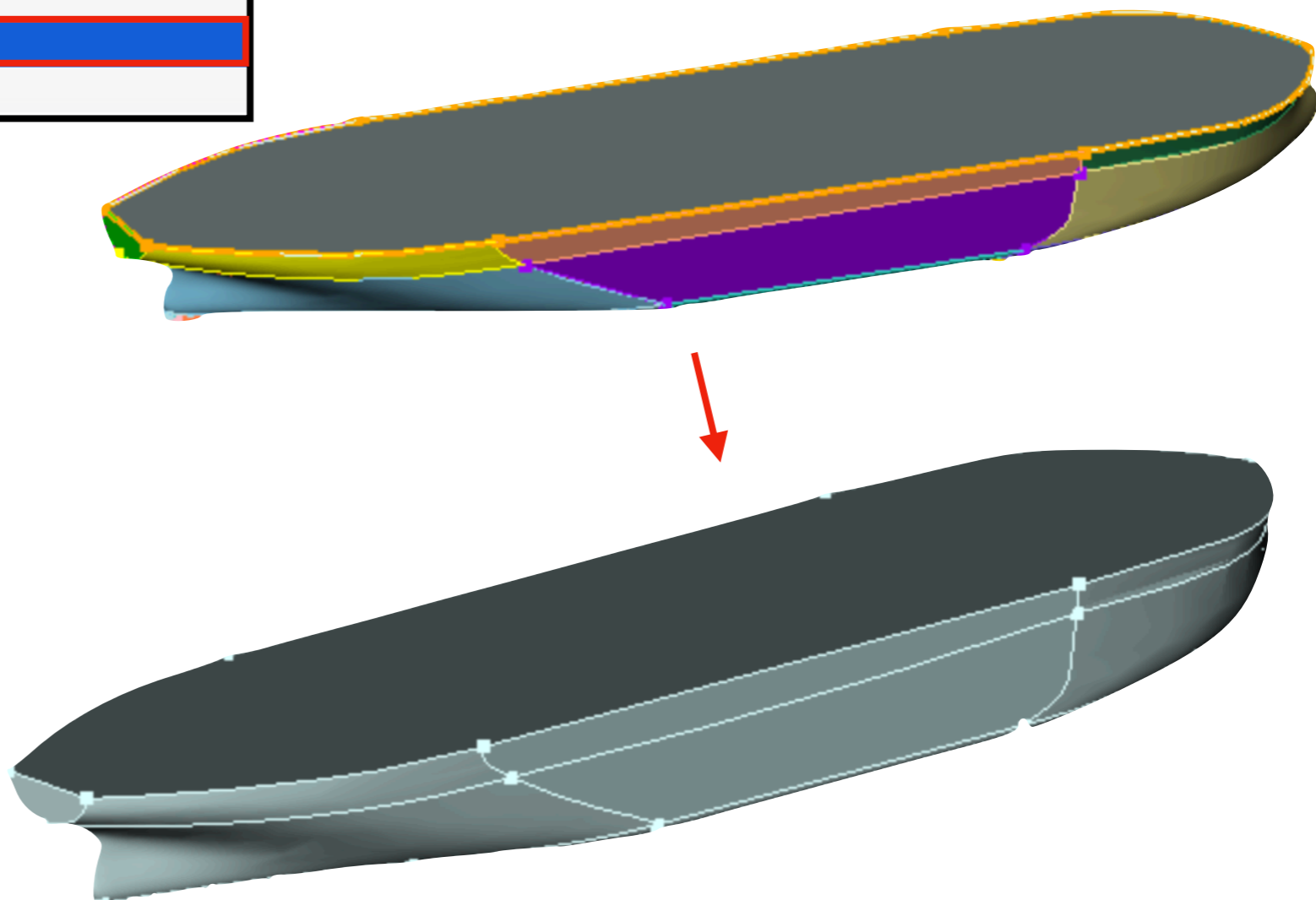
Tolerance Value

Tighten Gaps

Create From Bounding Surfaces

Apply

- Heal
- Extend by Sweep
- Regularize
- Separate
- Remove Slivers
- Section
- Split Periodic
- Stitch**
- Validate





Mode - Geometry

Operation - Create Geometry

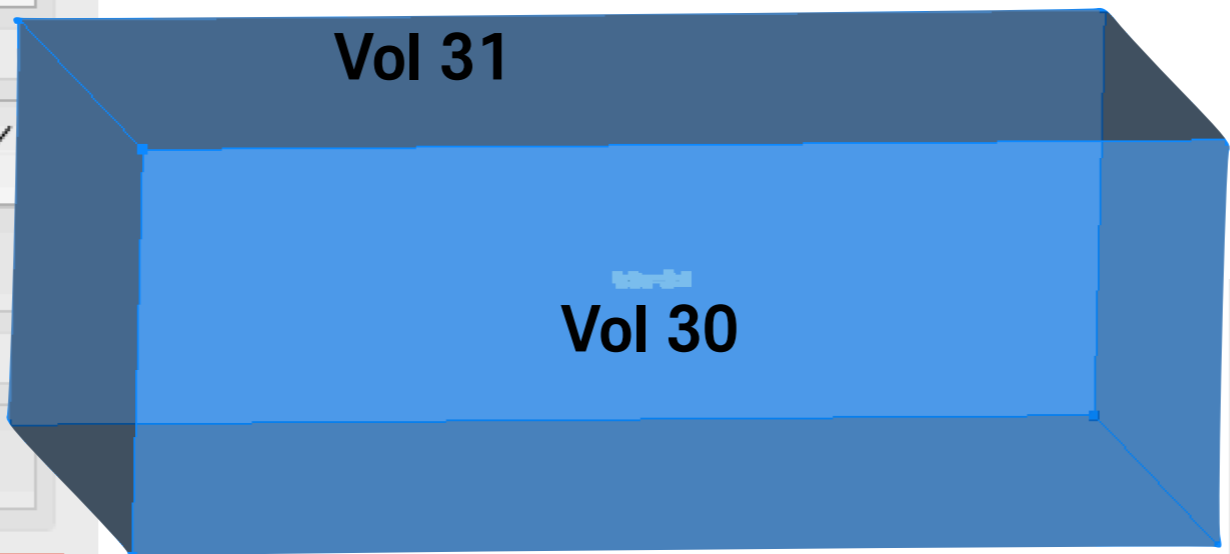
Entity - Volumes

Brick

Brick Dimensions

| | |
|------------|----|
| X (width) | 80 |
| Y (height) | 50 |
| Z (depth) | 30 |

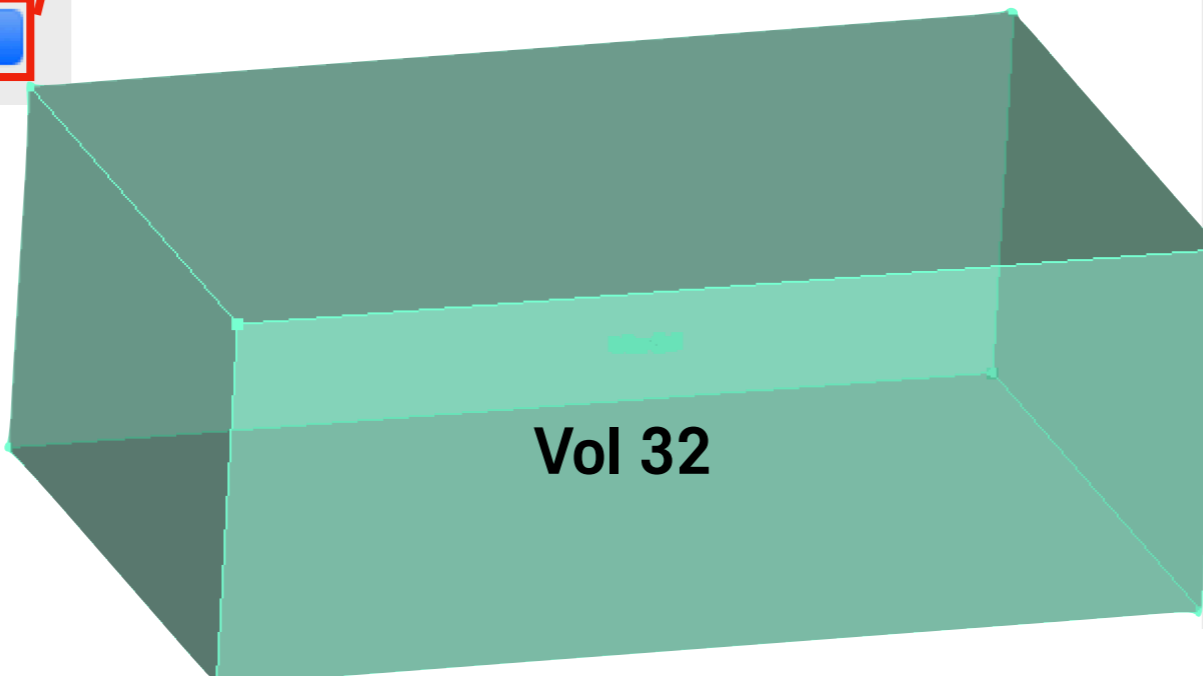
Apply



Mode - Geometry

Operation - Boolean Operations

Entity - Volumes



Subtract

A Volume ID(s) 31

B Volume ID(s) 30

Keep Originals

Imprint

Preview Apply



Mode - Geometry

Operation - Modify Virtual Geometry

Entity - Surfaces

Composite

Surface ID(s)

Select

Create Delete

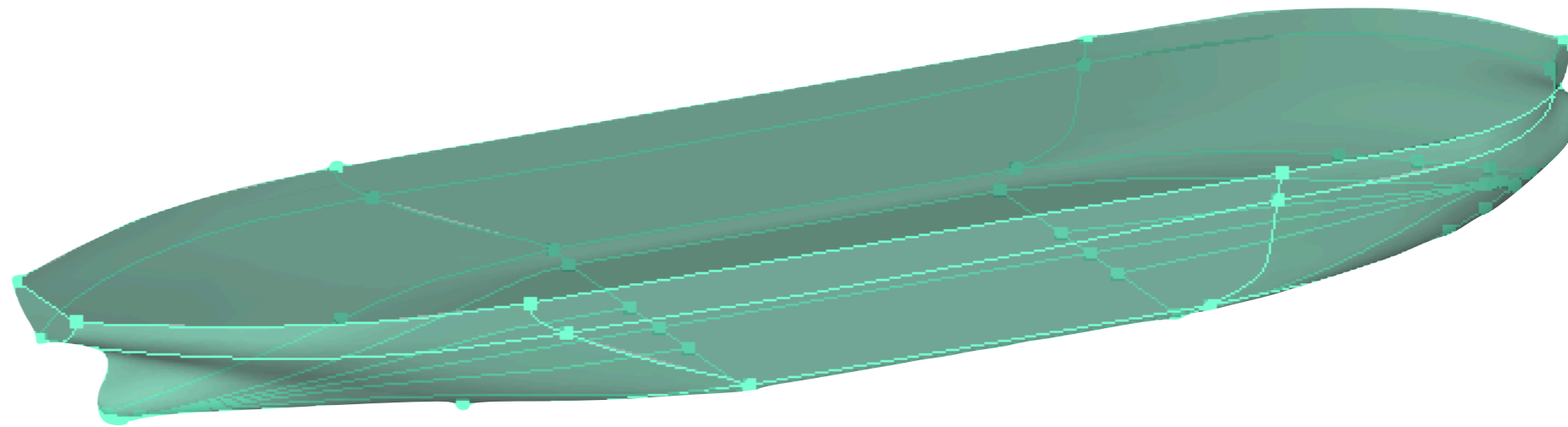
Max Surface Angle

Composite Bounding Curves

Keep Vertex ID(s)

Max Curve Angle

Virtual Geometry

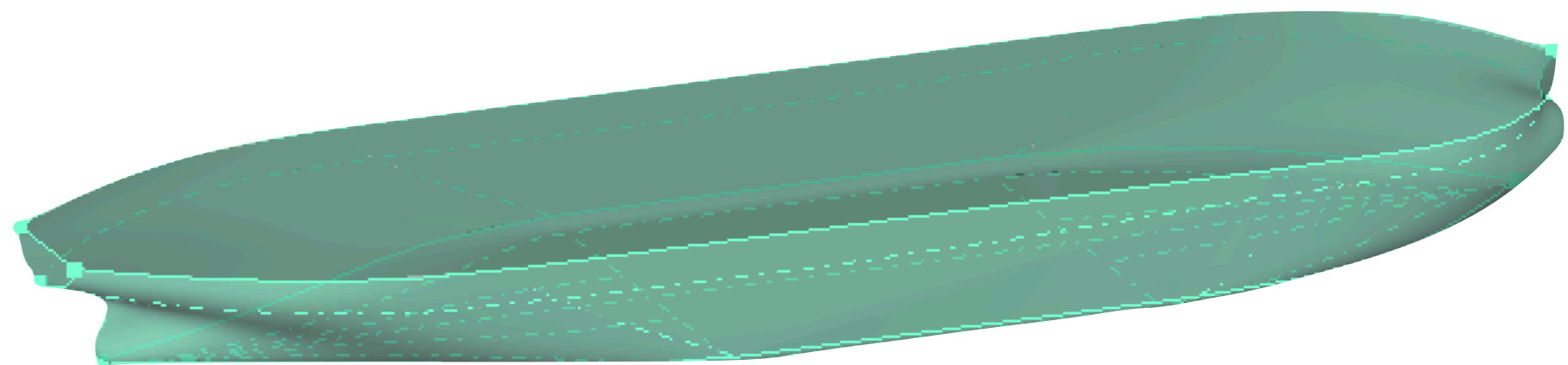


- Simplify
- Collapse
- Composite**
- Partition
- Remove

Surface ID(s)

Surface ID(s)

Surface ID(s)





Mode - Mesh

Entity - Surface

Action - Intervals

Approximate Size

Select Surfaces

Approximate Size 0.02

Preview

Check For Overlapping Surfaces

Apply Size Before Meshing

Apply Size

Mesh

Mode - Mesh

Entity - Surface

Action - Mesh

Trimesh

Select Surfaces

Deviation Angle 15

Minimum Size Optional

Global Surface Mesh Setting

Surface Gradation 1.0

Apply Scheme

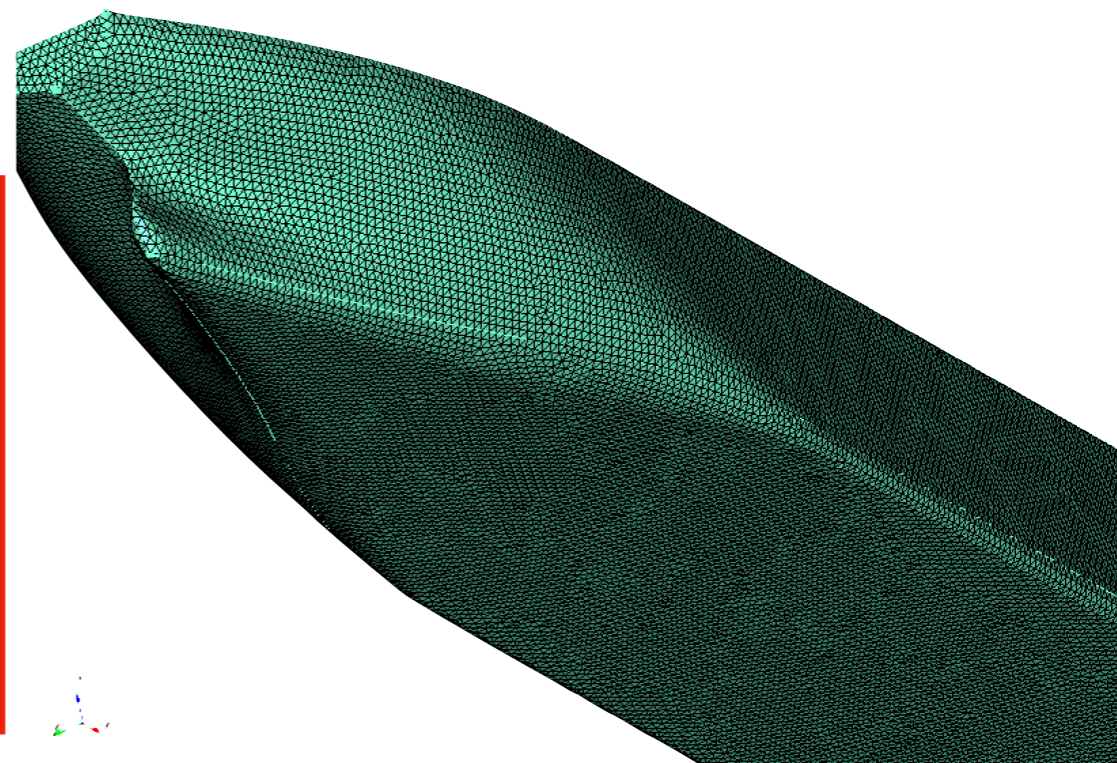
Check For Overlapping Surfaces

Apply Scheme Before Meshing

Scheme: Mesh

Select Surfaces

| Surface ID | Workflow |
|------------|-----------|
| 66 | 1 → 2 → 3 |
| 59 | 1 → 2 → 3 |
| 68 | 1 → 2 → 3 |
| 67 | 1 → 2 → 3 |
| 69 | 1 → 2 → 3 |



1

2

3



Mode - Mesh

Entity - Boundary Layers

Action - Create Boundary Layer

Boundary Layer ID

System Assigned ID 1

Settings Association

Curve Surface

Surface ID(s) 68 59 66 69 67

Volume ID 32

Add

Boundary Layer ID

System Assigned ID 1

Settings Association

Curve Surface

Surface ID(s)

Volume ID

Add

| Surface | Volume |
|---------|--------|
| 68 | 32 |
| 59 | 32 |
| 66 | 32 |
| 69 | 32 |
| 67 | 32 |

Settings Association

Show Diagram

Algorithm Uniform

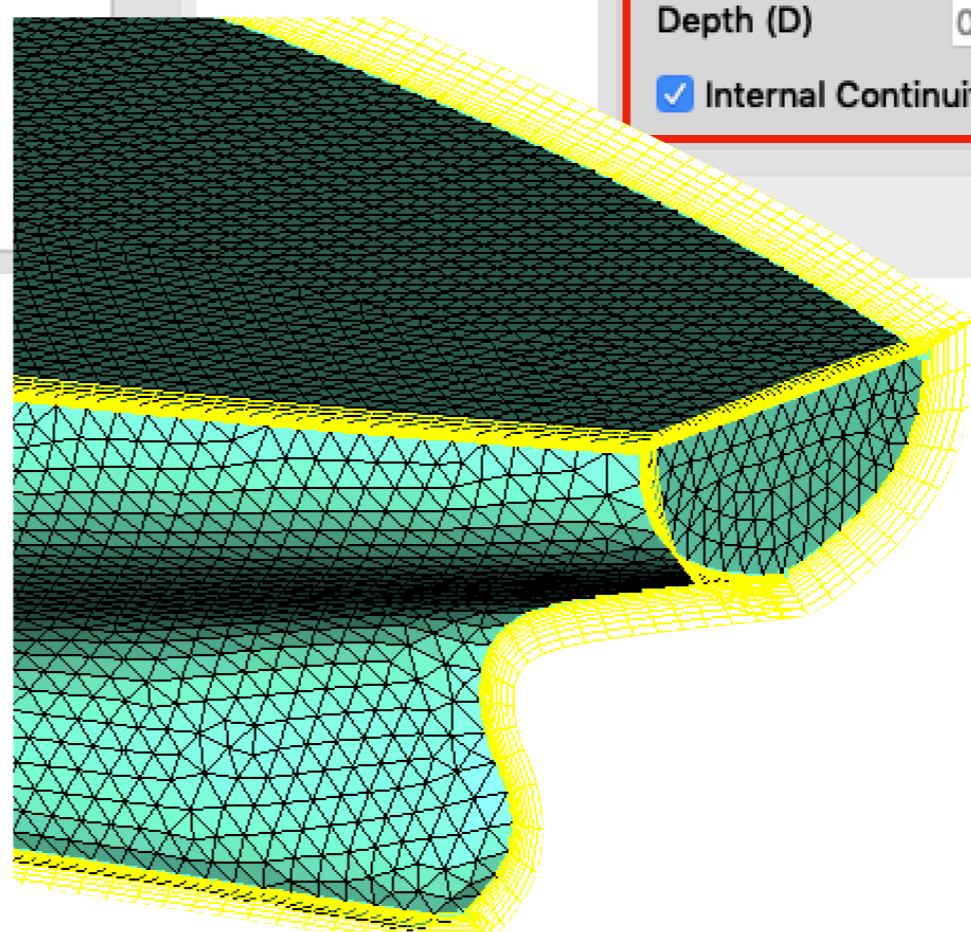
First row (a) 0.001

Growth Factor (b/) 1.2

Number of Layer 10

Depth (D) 0.0259587

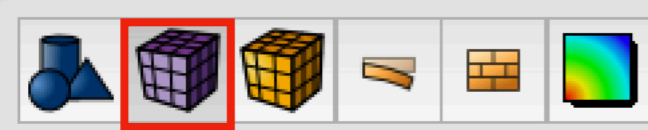
Internal Continuity



Create



Mode - Mesh



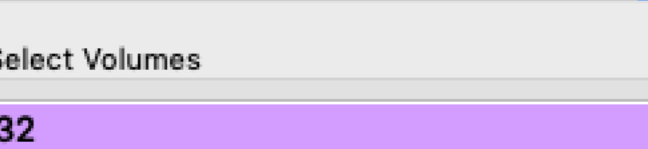
Entity - Volumes



Action - Intervals



Approximate Size



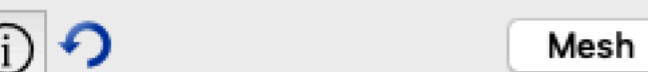
Approximate Size 3

Preview

1 Apply Size

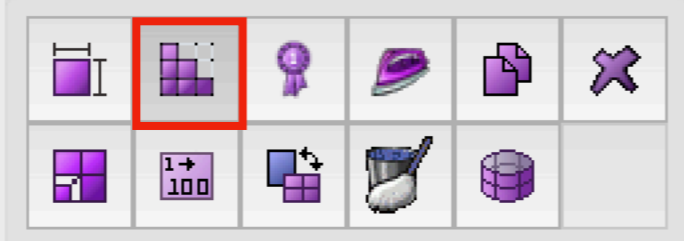
Check For Overlapping Surfaces

Apply Size Before Meshing



Mesh

Action - Mesh

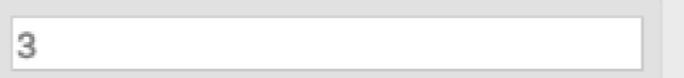


Tetmesh

Select Volumes



Number of Tets in Proximity



Deviation Angle 15

Use Geometric Sizing

Interior Growth Ratio 1.1

Global Surface Mesh Settings

Surface Gradation 1

Volume Gradation 1

Advanced

2 Apply Scheme



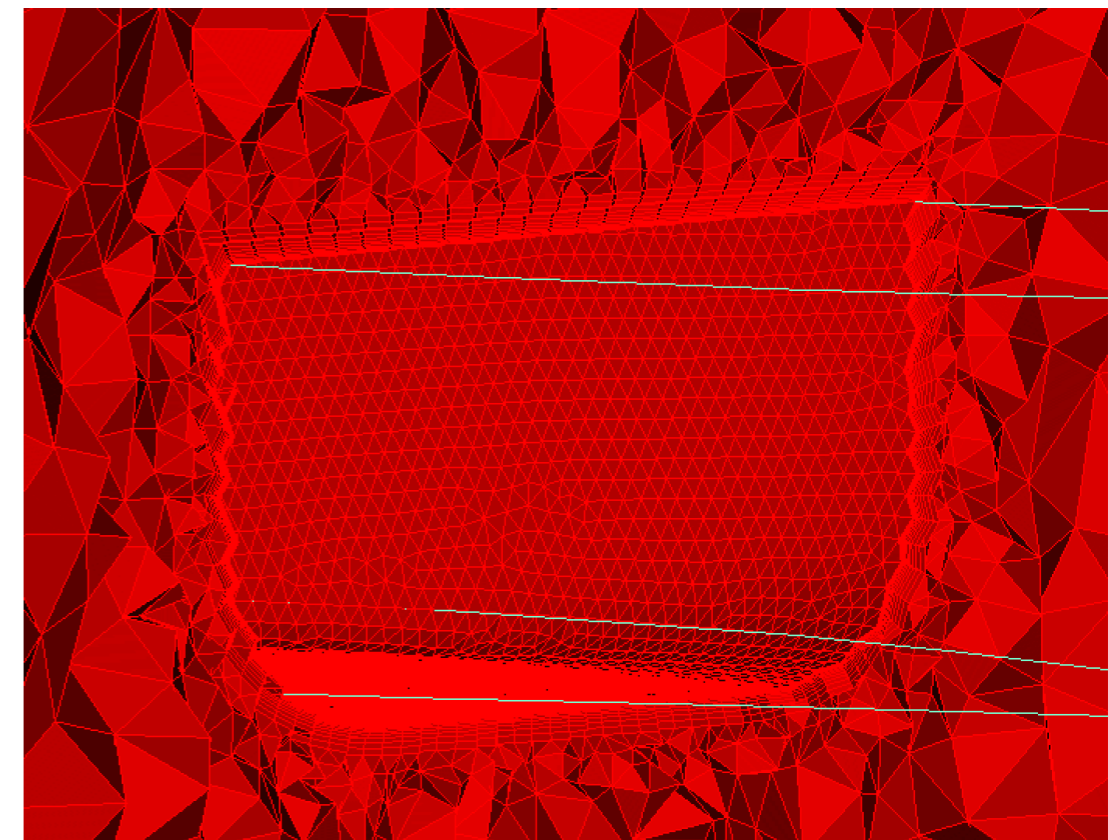
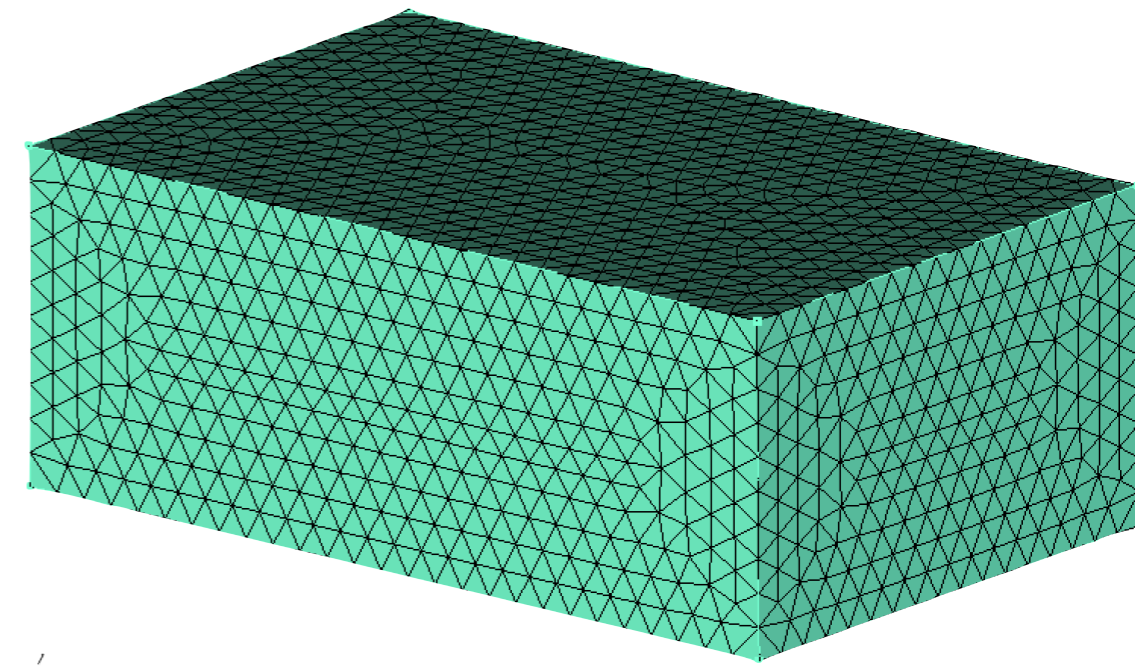
Check For Overlapping Surfaces

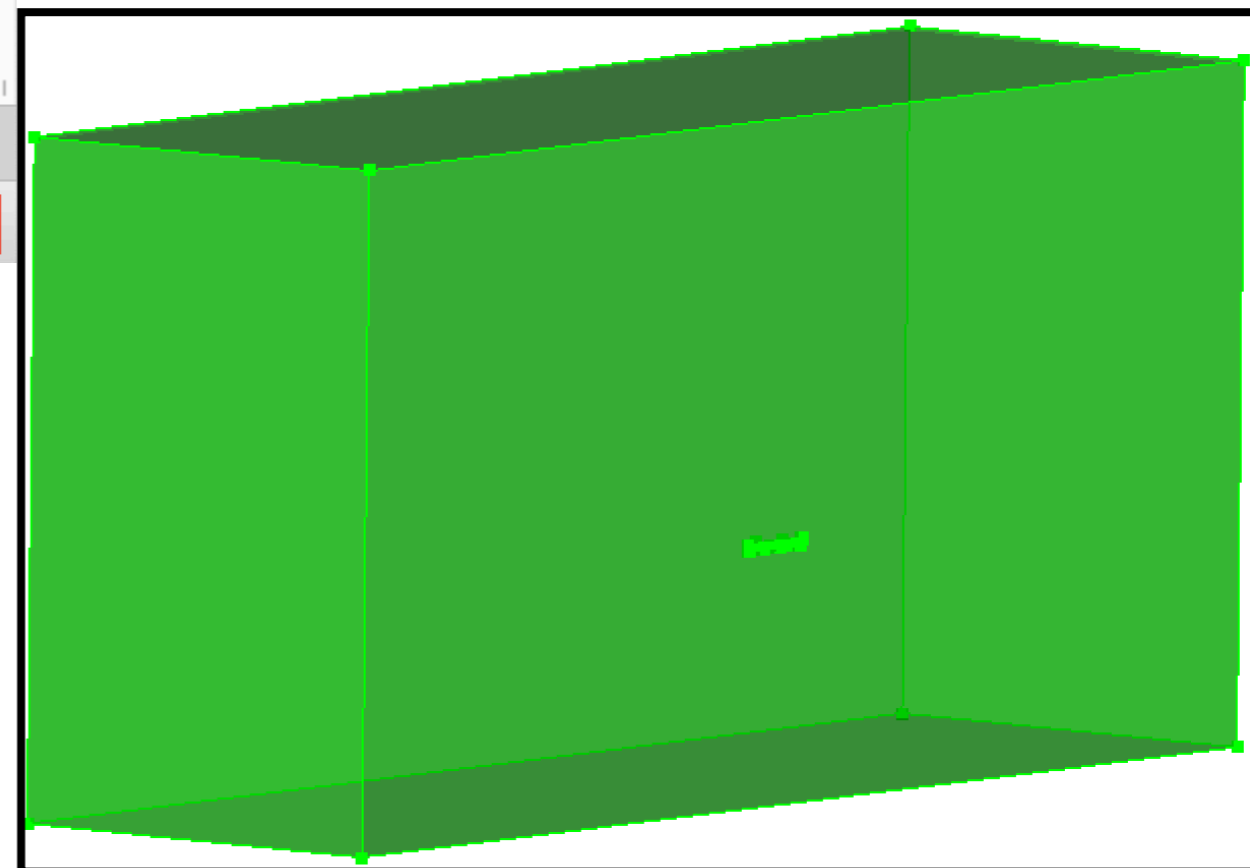
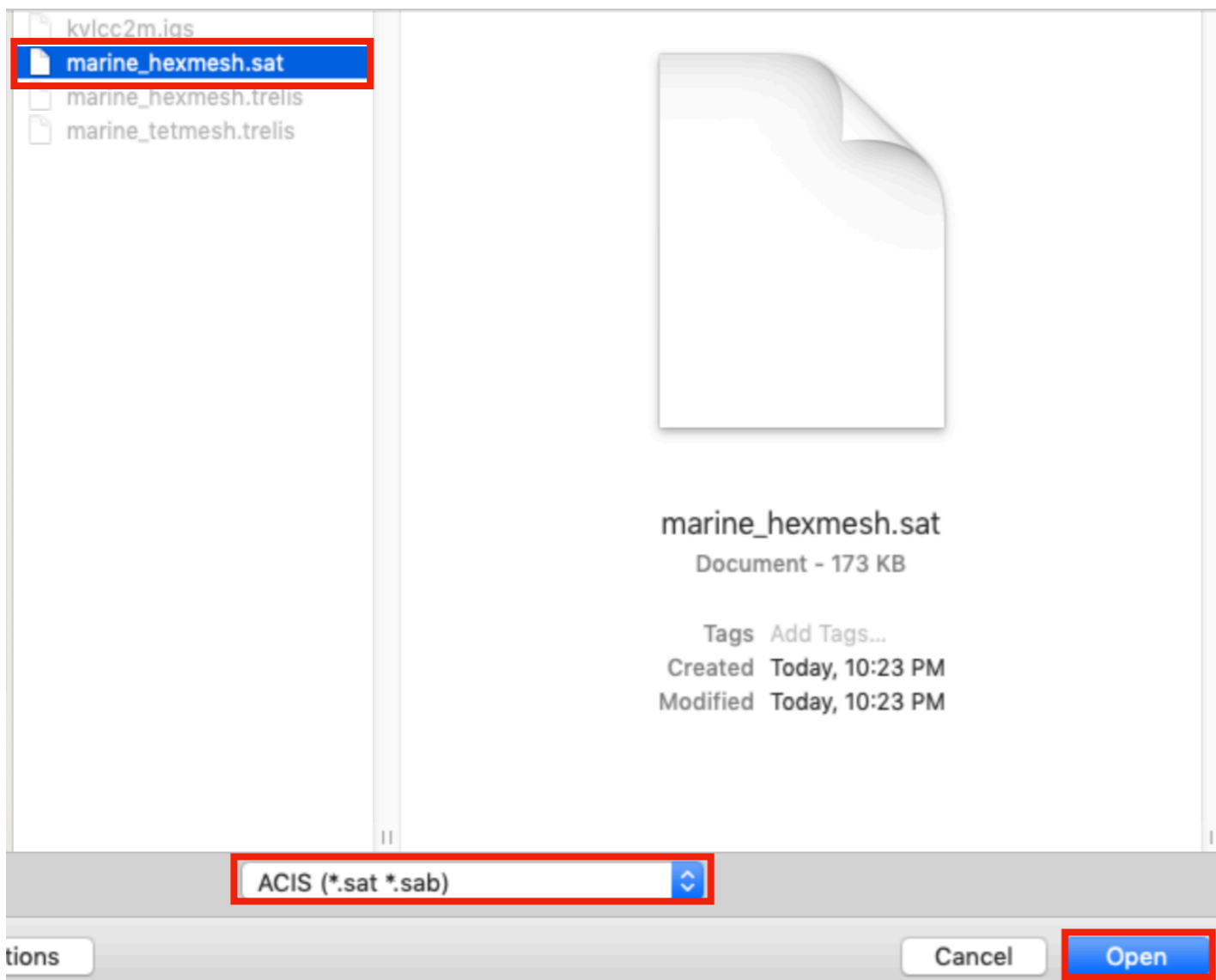
Apply Scheme Before Meshing

3

Scheme: tetmesh

Mesh







Mode - Geometry

Operation - Decompose Geometry

Entity - Volumes

Sweep Surface

Volume ID(s) 1

Surface ID 1

Direction

Vector Along Curve
 Rotate About Axis Perpendicular

Vector -1 0 0

Distance

End Conditions

Through All
 Through Next
 To Surface

Group Results

1

Preview Apply

Mode - Geometry

Operation - Decompose Geometry

Entity - Volumes

Coordinate Plane

Volume ID(s) all

YZ ZX XY

Offset Value 0.4

Rotate Plane
 Imprint
 Include Neighbors
 Merge
 Group Results

2

Preview Apply

Mode - Geometry

Operation - Decompose Geometry

Entity - Volumes

Coordinate Plane

Volume ID(s) all

YZ ZX XY

Offset Value 0.02

Rotate Plane
 Imprint
 Include Neighbors
 Merge
 Group Results

3

Preview Apply



Mode - Geometry

Operation - Imprint and Merge

Entity - Volumes

Imprint/Merge

Volume ID(s) all

Keep Originals

Group Results

Apply

Tasks

Import or Create Geometry

Setup FEA Model

Prepare Geometry

Mesh

Validate Mesh

Define BC's

Export Mesh

Prepare Geometry

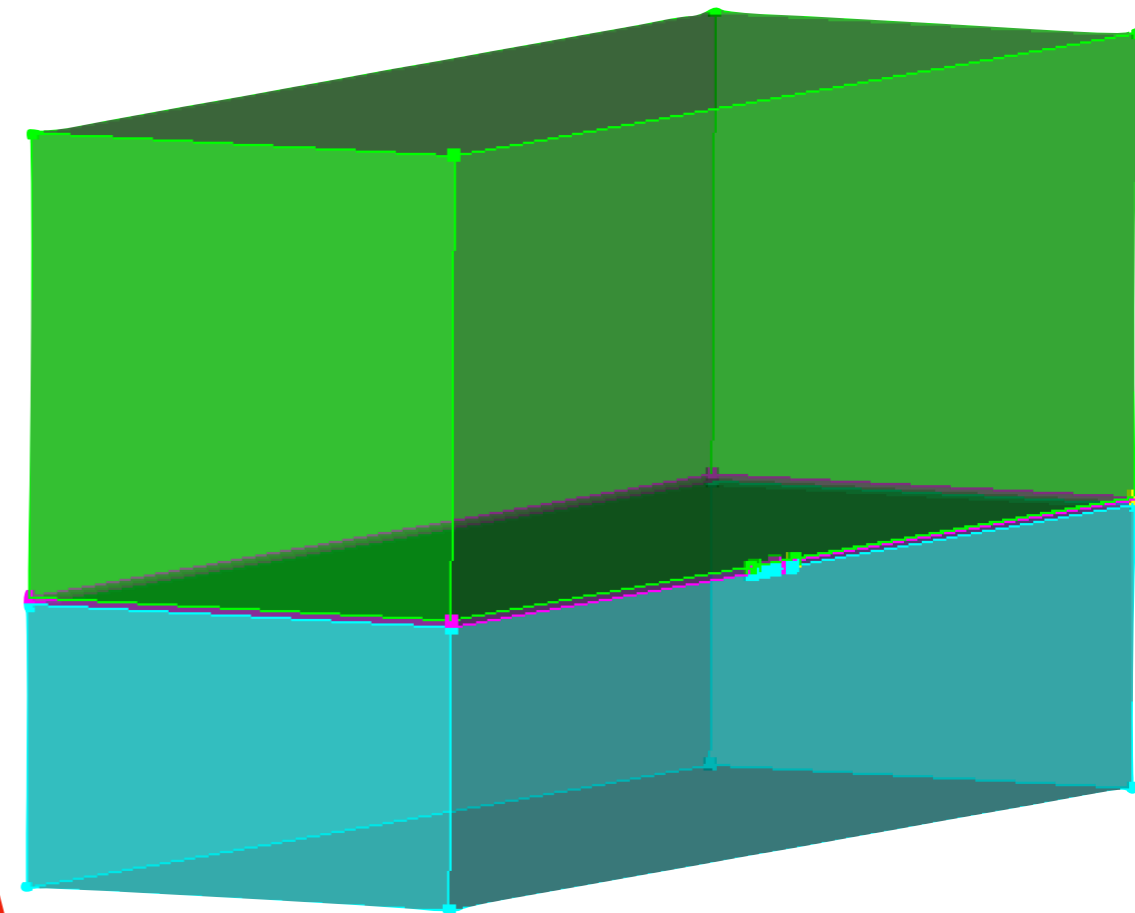
Follow the steps below to help prepare your geometry for meshing.

Run Checked Diagnostics

- Fix invalid topology
- Remove small features
- Connect volumes
- Build meshable topology

Set element sizes

Completing one geometry preparation phase can sometimes introduce problems in another phase. You may need to revisit some of the steps in this phase to complete the preparation.



Prepare Geometry

Follow the steps below to help prepare your geometry for meshing.

Run Checked Diagnostics

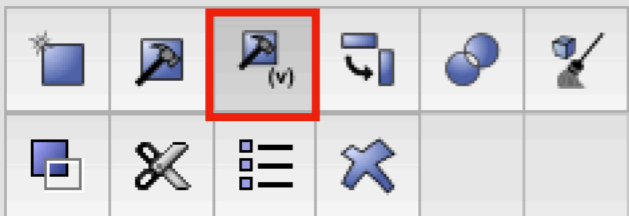
- Fix invalid topology
- Remove small features
- Connect volumes
- Build meshable topology



Mode - Geometry



Operation - Modify Virtual Geometry



Entity - Surfaces



Composite

Surface ID(s) 21 43 46 47 16 20 48 18 19

Select

Create Delete

Max Surface Angle

Composite Bounding Curves

Keep Vertex ID(s)

Max Curve Angle 15

Virtual Geometry

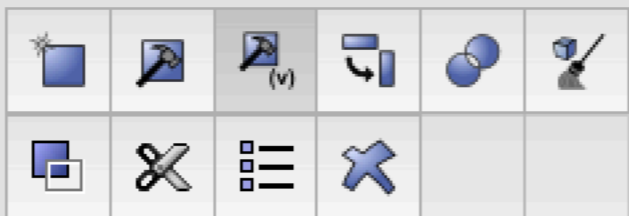


Apply

Mode - Geometry



Operation - Modify Virtual Geometry



Entity - Surfaces



Composite

Surface ID(s) 53 54 57 12 10 9 11 8 51

Select

Create Delete

Max Surface Angle

Composite Bounding Curves

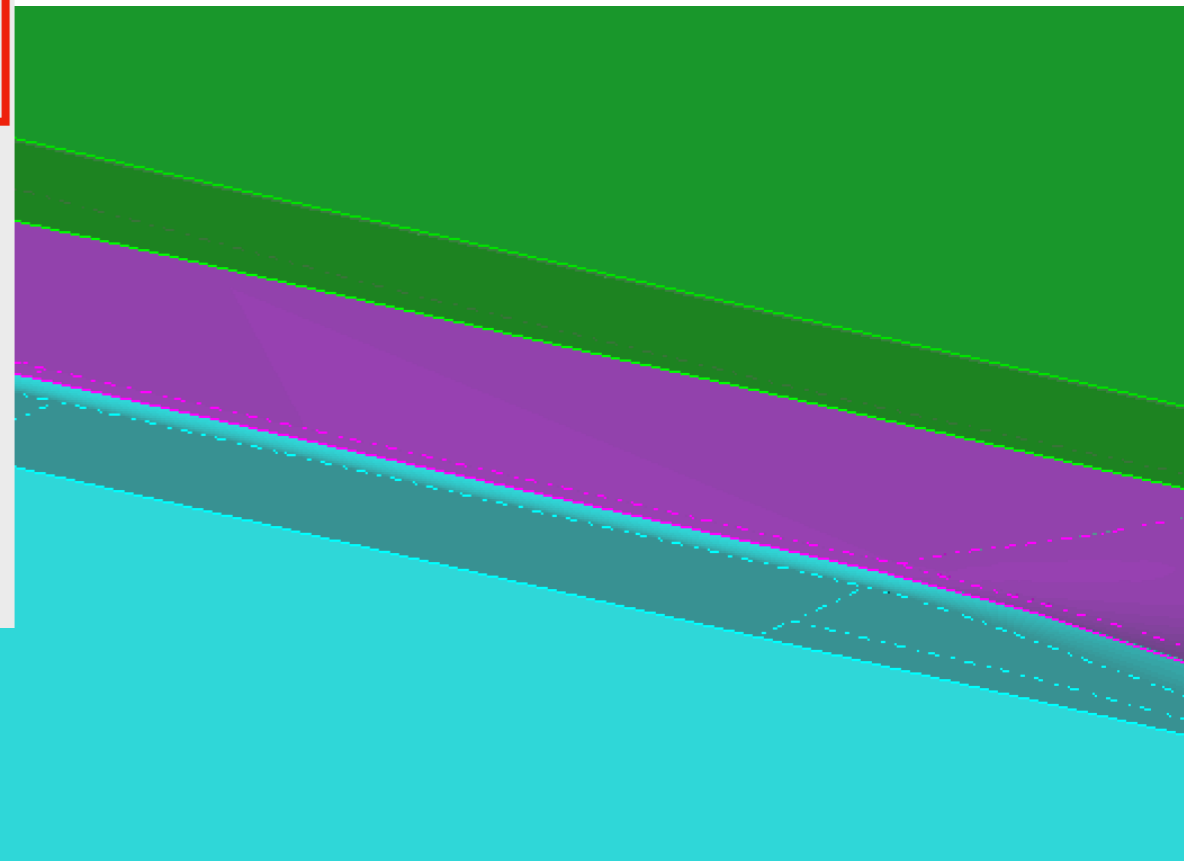
Keep Vertex ID(s)

Max Curve Angle 15

Virtual Geometry



Apply





Mode - Mesh

Entity - Curves

Action - Mesh

1

Select Curves

128

Get Settings For Curve 1:

Bias

Intervals & Bias

Change Interval Count

Interval Count 50

Dual Bias

Bias Factor 0.98

Bias Factor 0.95

2

Select Curves

3

Get Settings For Curve 3

Bias

Intervals & Bias

Change Interval Count

Interval Count 10

Dual Bias

Bias Factor 1.1

Bias Factor

Start Vertex ID 1

3

Select Curves

131 129

Get Settings For Curve 1:

Bias

Intervals & Bias

Change Interval Count

Interval Count 100

Dual Bias

Bias Factor 1.02

Bias Factor 1.02



Mode - Mesh

Entity - Curves

Action - Copy/Morph

Mode - Mesh

Entity - Surface

Action - Mesh

Mode - Mesh

Entity - Surface

Action - Smooth

Source Curve ID(s) 3 128

Target Curve ID(s) 130

Optional Data

Start Node ID

End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 3

Separate Combine

Vertex ID(s) 8

Mesh Apply Scheme

Map

Select Surfaces

61

Allow 1 Triangle

Advanced

Define Vertex Types for Mapping

Show Vertex Types

End

Side

Reversal

Corner

Reset Apply

Apply Scheme

Check For Overlapping Surfaces

Apply Scheme Before Meshing

Scheme: map

Mesh

Winslow

Surface ID(s) 61

Include Boundary Nodes

Apply

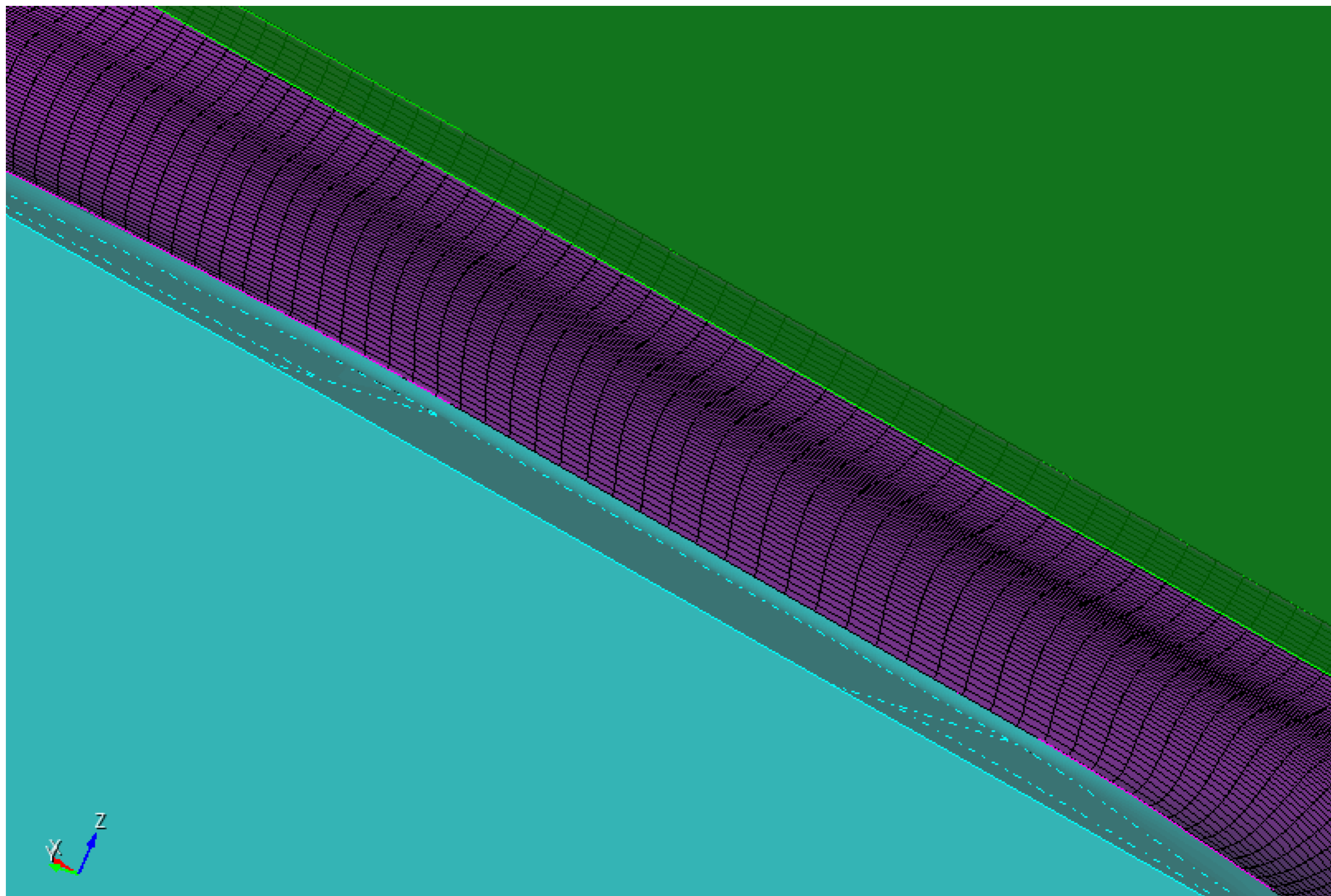
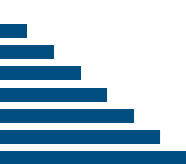
2

1

3

4

5





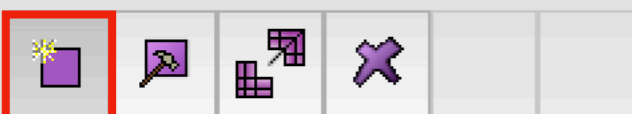
Mode - Mesh



Entity - Boundary Layers



Action - Create Boundary Layer



Settings

Association

Curve Surface

Curve ID(s)

Surface ID

Add

| Curve | Surface |
|-------|---------|
| 130 | 42 |
| 3 | 23 |
| 128 | 44 |

System Assigned ID 1

Settings

Association

Show Diagram



Algorithm

First row (a)

Growth Factor (b/i)

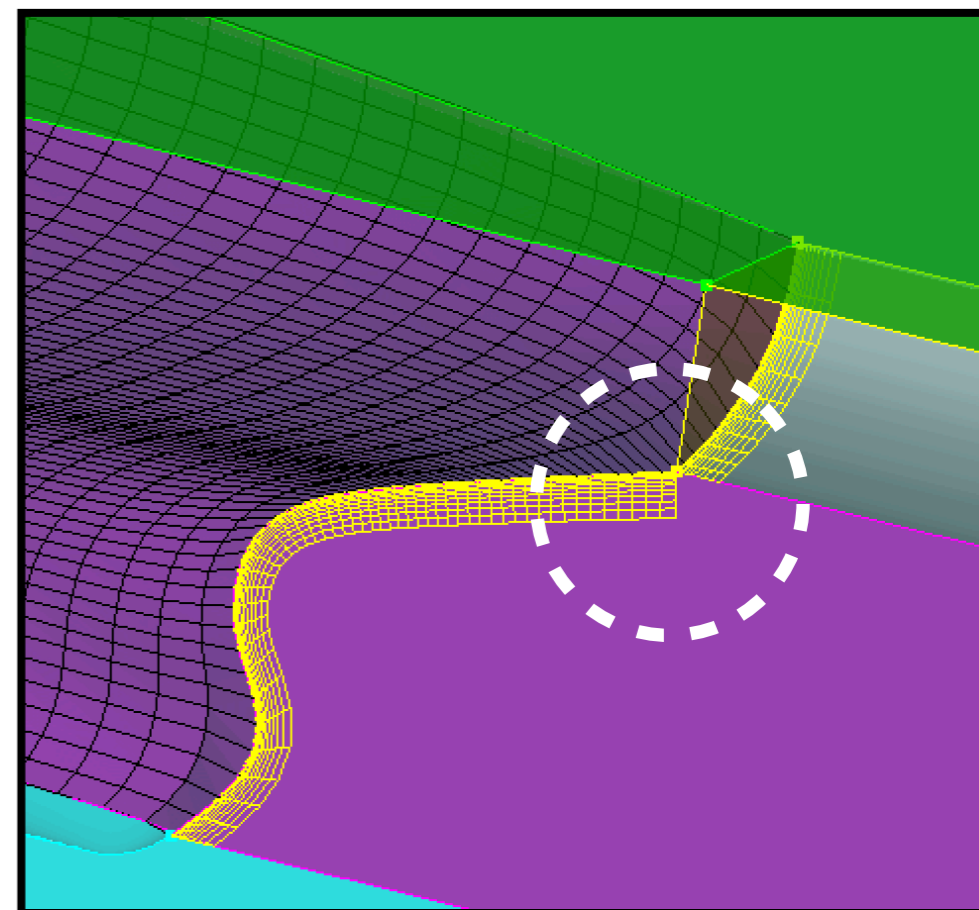
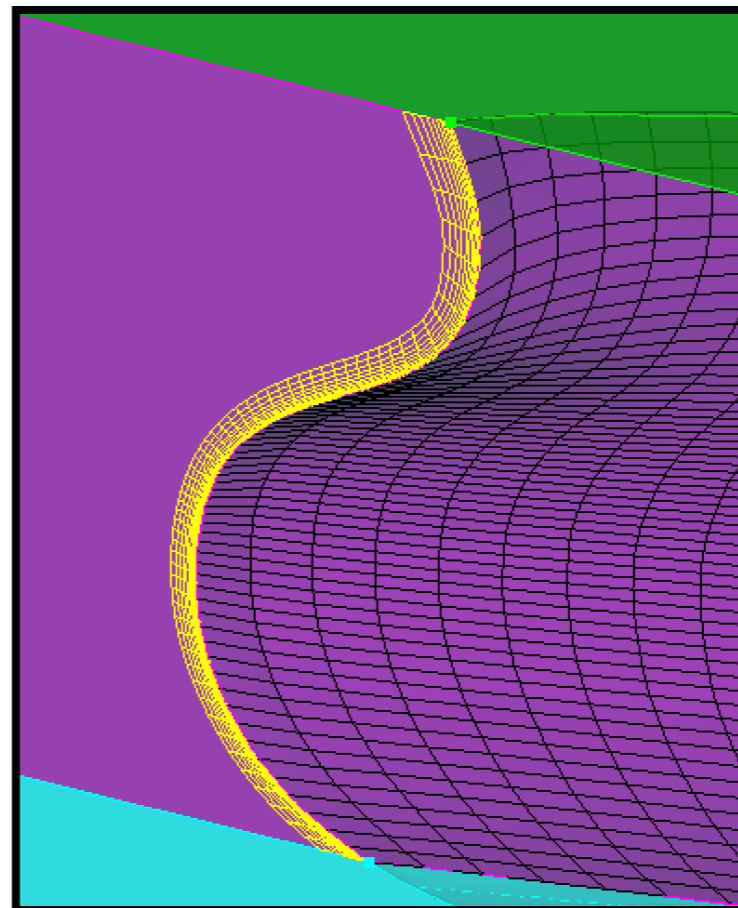
Number of Layer

Depth (D)

Internal Continuity



Create

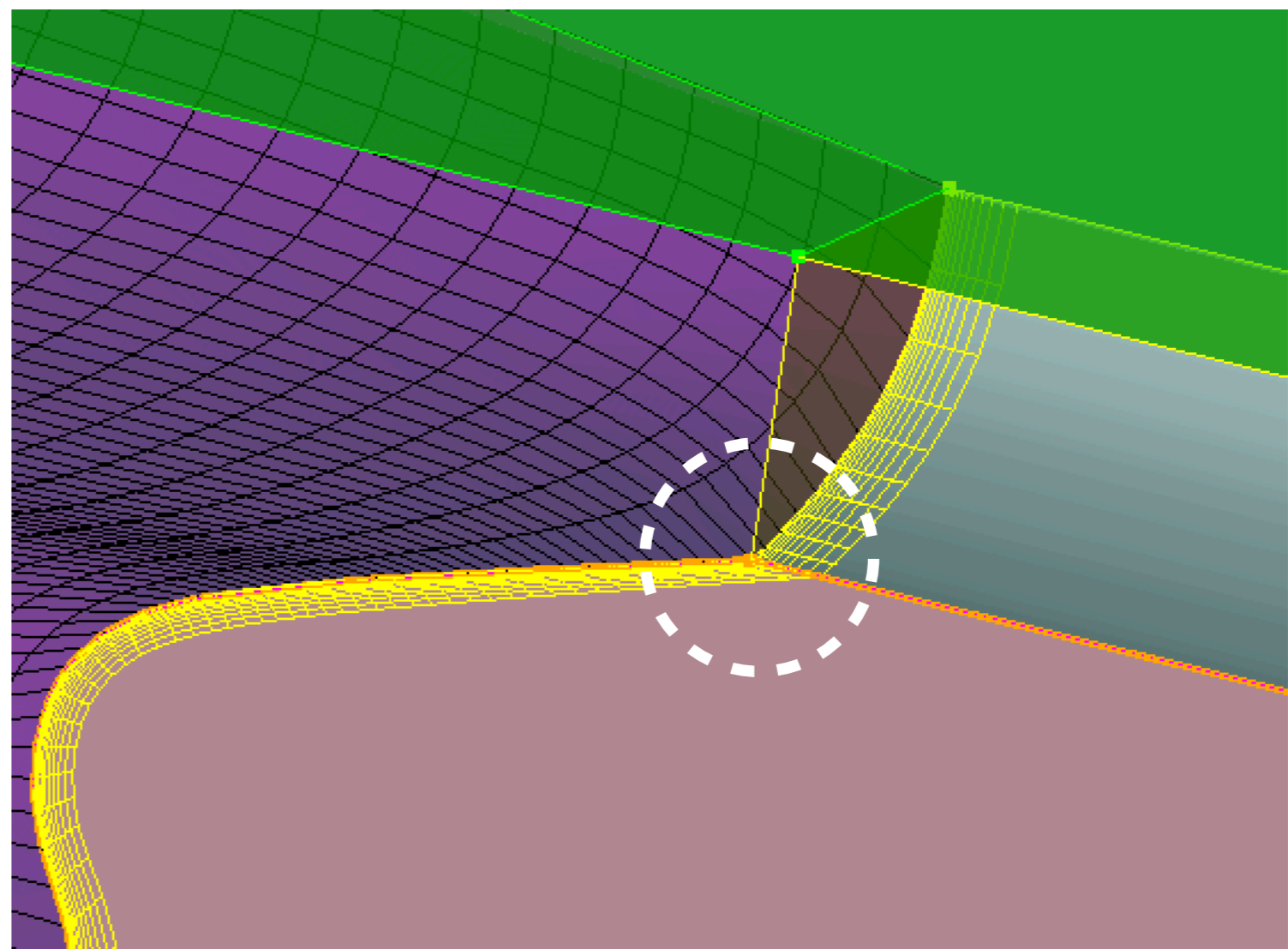




Mode - Mesh

Entity - Boundary Layers

Action - Intersection Types



Association

Vertex Curve

Vertex ID(s)

Surface ID

Type

Add

| Vertex | Surface | Type |
|--------|---------|------|
| 1 | 44 | End |

Apply



Mode - Mesh

Entity - Curves

Action - Mesh

Source Curve ID(s) 3

Target Curve ID(s) 56

Optional Data

Start Node ID

End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 3

Separate Combine

Vertex ID(s) 37

Action - Copy/Morph

Select Curves

88

Get Settings For Curve 88

Bias

First Size & Bias

Dual Bias

First Size 0.005

Bias Factor 1.1

1 Mesh

Source Curve ID(s) 88

Target Curve ID(s) 57 64 58

Optional Data

Start Node ID

End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 58

Separate Combine

Vertex ID(s) 3 2 1

3 Mesh 2

5 Mesh 4

Source Curve ID(s) 128

Target Curve ID(s) 96

Optional Data

Start Node ID

End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 1

Separate Combine

Vertex ID(s) 38

7 Mesh 6



Mode - Mesh

Entity - Surface

Action - Intervals

Approximate Size

Select Surfaces

1

Approximate Size 0.015

Preview

Check For Overlapping Surfaces

Apply Size Before Meshing

1 Apply Size

Mesh

Action - Mesh

Pave

Select Surfaces

1

Allow 1 Triangle

Paver Cleanup

On Off Extend

2 Apply Scheme

Check For Overlapping Surfaces

Apply Scheme Before Meshing

Scheme: triprimitive

3 Mesh

Action - Mesh

Map

Select Surfaces

29 26 44 23

Allow 1 Triangle

Advanced

Define Vertex Types for Mapping

Show Vertex Types

End

Side

Reversal

Corner

Reset Apply

4 Apply Scheme

Check For Overlapping Surfaces

Apply Scheme Before Meshing

Scheme: map

5 Mesh



Mode - Mesh

Entity - Curves

Action - Mesh

Select Curves

84

Get Settings For Curve

Bias

First Size & Bias

Dual Bias

First Size

Bias Factor

<< >>

Start Vertex ID

Modify Curve Sense

Preview

Apply Size Before Meshing

1

Action - Copy/Morph

Source Curve ID(s)

Target Curve ID(s)

Optional Data

Start Node ID

End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s)

Separate Combine

Vertex ID(s)

3 **2**

Source Curve ID(s)

Target Curve ID(s)

Optional Data

Start Node ID

End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s)

Separate Combine

Vertex ID(s)

5 **4**



Mode - Mesh

Entity - Surface

Action - Mesh

Map

Select Surfaces

42

Allow 1 Triangle
 Advanced
 Define Vertex Types for Mapping
 Show Vertex Types
 End:
 Side:
 Reversal:
 Corner:

Check For Overlapping Surfaces
 Apply Scheme Before Meshing
 Scheme: map

1

2

Mode - Mesh

Entity - Boundary Layers

Action - Create Boundary Layer

Settings Association

Curve Surface
 Curve ID(s): 57 129 76
 Surface ID: 34

| Curve | Surface |
|-------|---------|
| 57 | 34 |
| 129 | 34 |
| 76 | 34 |

3

Boundary Layer ID

System Assigned ID 2

Settings Association

Show Diagram

Algorithm: Uniform

First row (a): 0.001
 Growth Factor (b/i): 1.2
 Number of Layer: 10
 Depth (D): 0.0259587
 Internal Continuity

4



Mode - Mesh

Entity - Curves

Action - Copy/Morph

Mode - Mesh

Entity - Curves

Action - M

Select Curves

73

Get Settings For Curve 73

Bias

First Size & Bias

Dual Bias

First Size 0.001

Bias Factor 1.2

<< >>

Start Vertex ID 47

Modify Curve Sense

Preview

Apply Size Before Meshing

1

Source Curve ID(s) 73

Target Curve ID(s) 85 77 87

Optional Data

Start Node ID

End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 47

Separate Combine

Vertex ID(s) 54 37 57

3 **2**

Action - Mesh

Select Curves

70

Get Settings For Curve 70

Bias

Intervals & Bias

Change Interval Count

Interval Count 239

Dual Bias

Bias Factor 0.975

<< >>

Bias Factor 0.98

<< >>

4



Mode - Mesh

Entity - Surface

SubMap

Select Surfaces

34

Smooth
 Advanced

Define Vertex Types for Mapping

Show Vertex Types

End:
Side:
Reversal:
Corner:

Reset Apply

1

Apply Scheme

Check For Overlapping Surfaces
 Apply Scheme Before Meshing

Scheme: submap

2

Mesh

Mode - Mesh

Entity - Curves

Action - Copy/Morph

Source Curve ID(s) 93

Target Curve ID(s) 91 92

Optional Data

Start Node ID
End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 47

Separate Combine

Vertex ID(s) 46 45

Source Curve ID(s) 70

Target Curve ID(s) 86

Optional Data

Start Node ID
End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 46

Separate Combine

Vertex ID(s) 55

4

Mesh

3

Apply Scheme

6

Mesh

5

Apply Scheme



Mode - Mesh

Entity - Surface

Action - Mesh

Map

Select Surfaces

41 40 45

Allow 1 Triangle

Advanced

Define Vertex Types for Mapping

Show Vertex Types

End

Side

Reversal

Corner

Reset Apply

1 Apply Scheme

Check For Overlapping Surfaces

Apply Scheme Before Meshing

Scheme: map

2 Mesh

Mode - Mesh

Entity - Volumes

Action - Mesh

Sweep

Select Volumes

3

Specify Source and Target

Auto Select Source and Target

Source Surface ID(s) 34

Target Surface ID 39

Default Extrude Advanced

Transform Method Translate

Redistribute Nodes

Propagate Bias

Parallel Meshing Enabled

Automatically Smooth the Target Surface

4 Apply Scheme

5 Mesh



Mode - Mesh

Entity - Surface

Action - Intervals

Approximate Size

Select Surfaces

62 58

Approximate Size 0.03

Preview

Check For Overlapping Surfaces

Apply Size Before Meshing

1 Apply Size

Mesh

Mode - Mesh

Entity - Surface

Action - Mesh

Pave

Select Surfaces

62 58

Allow 1 Triangle

Paver Cleanup

On Off Extend

2 Apply Scheme

Check For Overlapping Surfaces

Apply Scheme Before Meshing

Scheme: pave

3 Mesh

Mode - Mesh

Entity - Curves

Action - Mesh

Select Curves

109 110 114 117

Get Settings For Curve 109 **Get Settings**

Bias

First Size & Bias

Dual Bias

First Size 0.001

Bias Factor 1.2

Start Vertex ID 57 56 54 55

Modify Curve Sense

Preview

4 Apply Size

Apply Size Before Meshing

4 Mesh



Mode - Mesh

Entity - Curves

Action - Copy/Morph

Source Curve ID(s) 88 132 84
Target Curve ID(s) 15

Optional Data

Start Node ID
End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 57

Separate Combine

Vertex ID(s) 11

Source Curve ID(s) 70
Target Curve ID(s) 17 6

Optional Data

Start Node ID
End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 45

Separate Combine

Vertex ID(s) 12 6

Source Curve ID(s) 87
Target Curve ID(s) 13 7 16

Optional Data

Start Node ID
End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 56

Separate Combine

Vertex ID(s) 12 7 14

Source Curve ID(s) 64 122 76
Target Curve ID(s) 4

Optional Data

Start Node ID
End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 39

Separate Combine

Vertex ID(s) 5

2

1

6

5

4

3

8

7



Mode - Mesh

Entity - Curves

Action - Copy/Morph

Source Curve ID(s) 77 62

Target Curve ID(s) 5

Optional Data

Start Node ID

End Node ID

Auto

Percentage

Separate Combine

Vertex ID(s) 45

Separate Combine

Vertex ID(s) 6

2 1

Mode - Mesh

Entity - Curves

Action - Mesh

Select Curves

61 69 74 71

Get Settings For Curve 61

Bias

First Size & Bias

Dual Bias

First Size 0.001

Bias Factor 1.2

<< >>

Start Vertex ID 39 45 47 46

Modify Curve Sense

Preview

Apply Size Before Meshing

3



Mode - Mesh

Entity - Surface

Map

Select Surfaces

30 33 52 50 31 56 32 55

Action - Mesh

Allow 1 Triangle

Advanced

Define Vertex Types for Mapping

Show Vertex Types

End

Side

Reversal

Corner

Reset Apply

Apply Scheme

Check For Overlapping Surfaces

Apply Scheme Before Meshing

Scheme: map

Mesh

1

2

Mode - Mesh

Entity - Volumes

Sweep

Select Volumes

1

Specify Source and Target

Auto Select Source and Target

Source Surface ID(s) 58 26 34

Target Surface ID 2

Default Extrude Advanced

Transform Method Translate

Redistribute Nodes

Propagate Bias

Parallel Meshing Enabled

Automatically Smooth the Target Surface

Apply Scheme

3

4



Mode - Mesh

Entity - Volumes

Action - Mesh

Sweep

Select Volumes

4

Specify Source and Target
 Auto Select Source and Target

Source Surface ID(s) 39 62

Target Surface ID 5

Default Extrude Advanced

Transform Method Translate

Redistribute Nodes
 Propagate Bias
 Parallel Meshing Enabled
 Automatically Smooth the Target Surface

1 **Apply Scheme**

2 **Mesh**

Sweep

Select Volumes

2

Specify Source and Target
 Auto Select Source and Target

Source Surface ID(s) 1

Target Surface ID 28

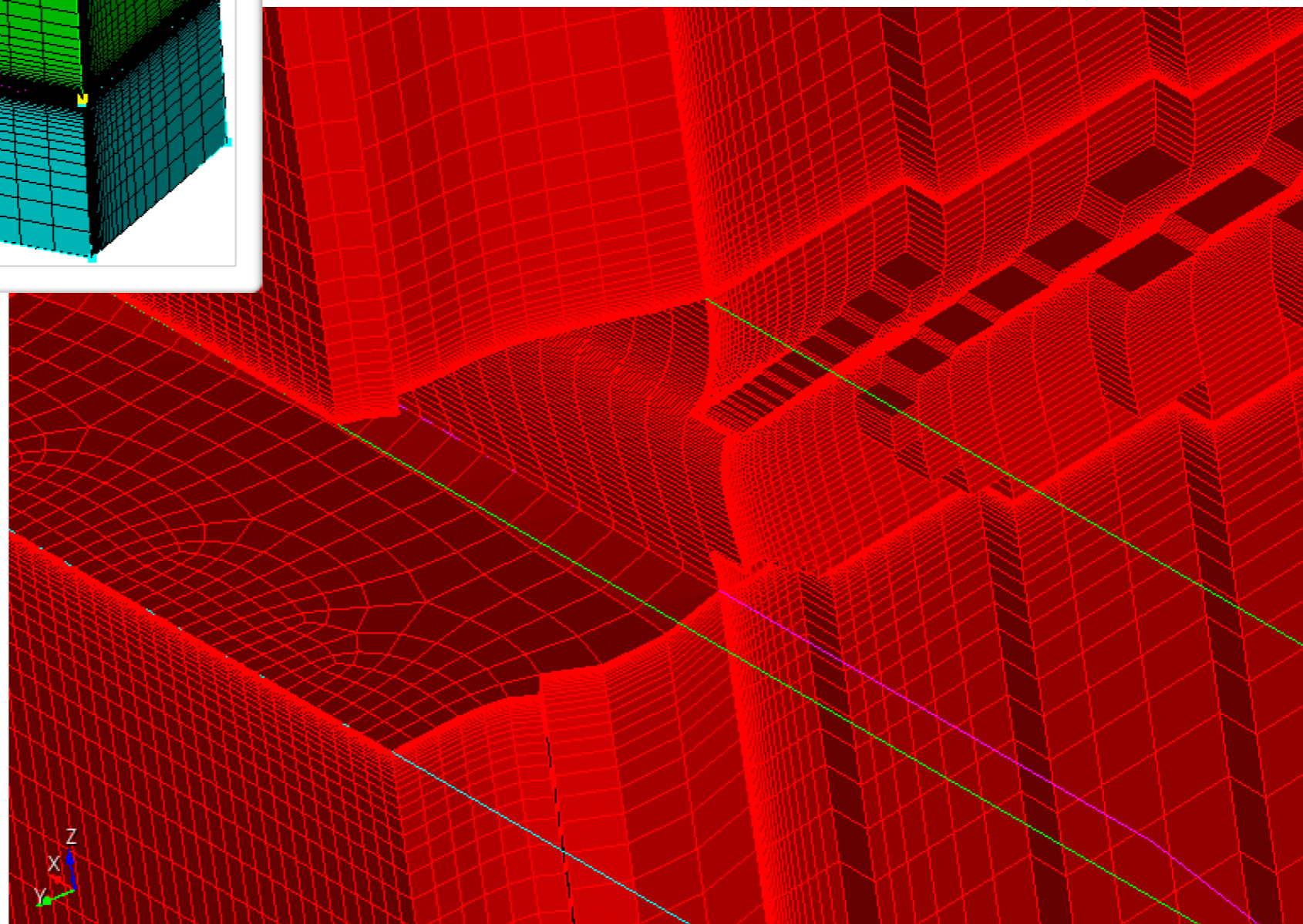
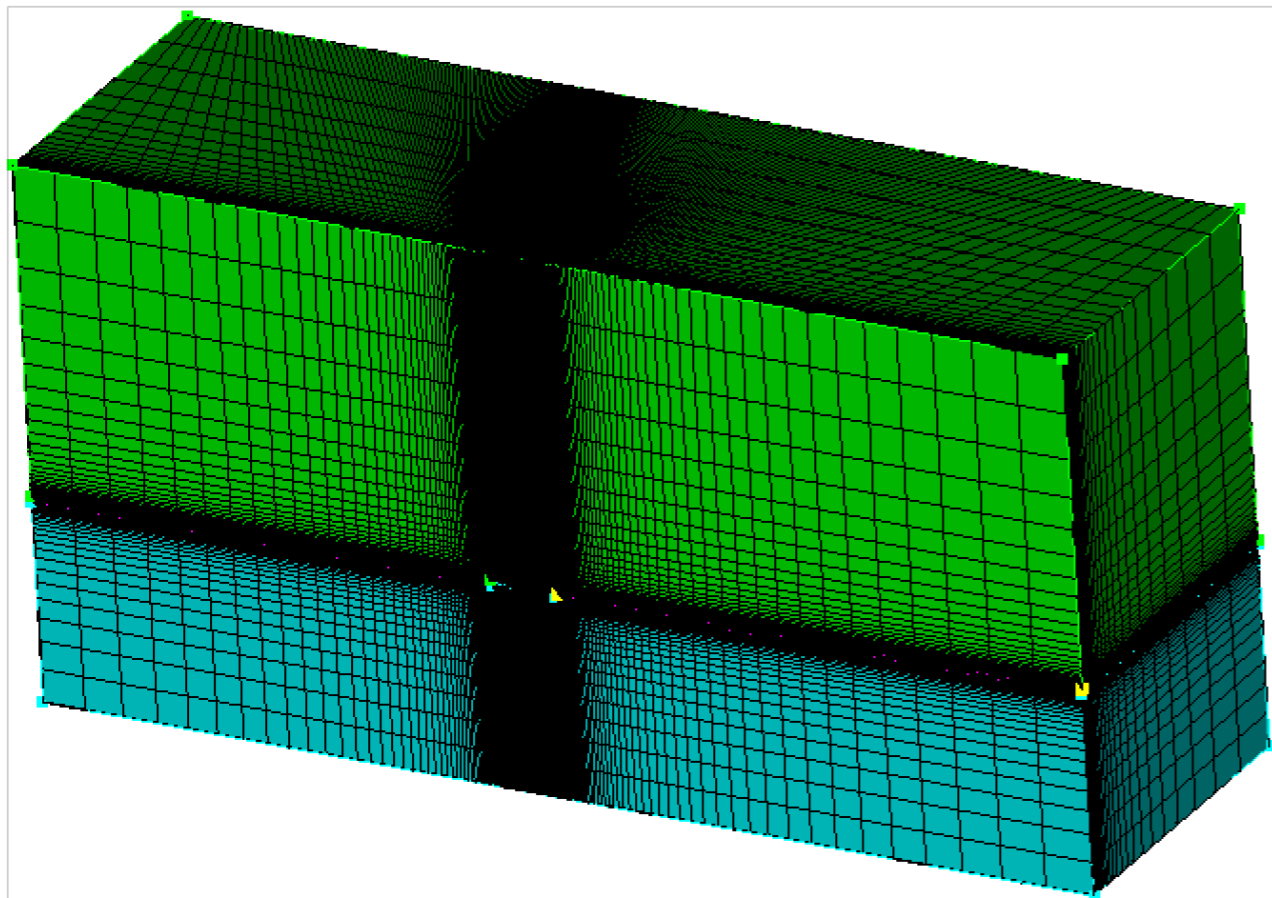
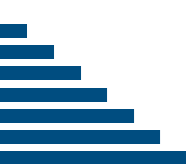
Default Extrude Advanced

Transform Method Translate

Redistribute Nodes
 Propagate Bias
 Parallel Meshing Enabled
 Automatically Smooth the Target Surface

3 **Apply Scheme**

4 **Mesh**





Mode - Geometry

Operation - Create Geometry

Entity - Volumes

Copy and Transform

Volume ID(s)

Transform Copied Volumes

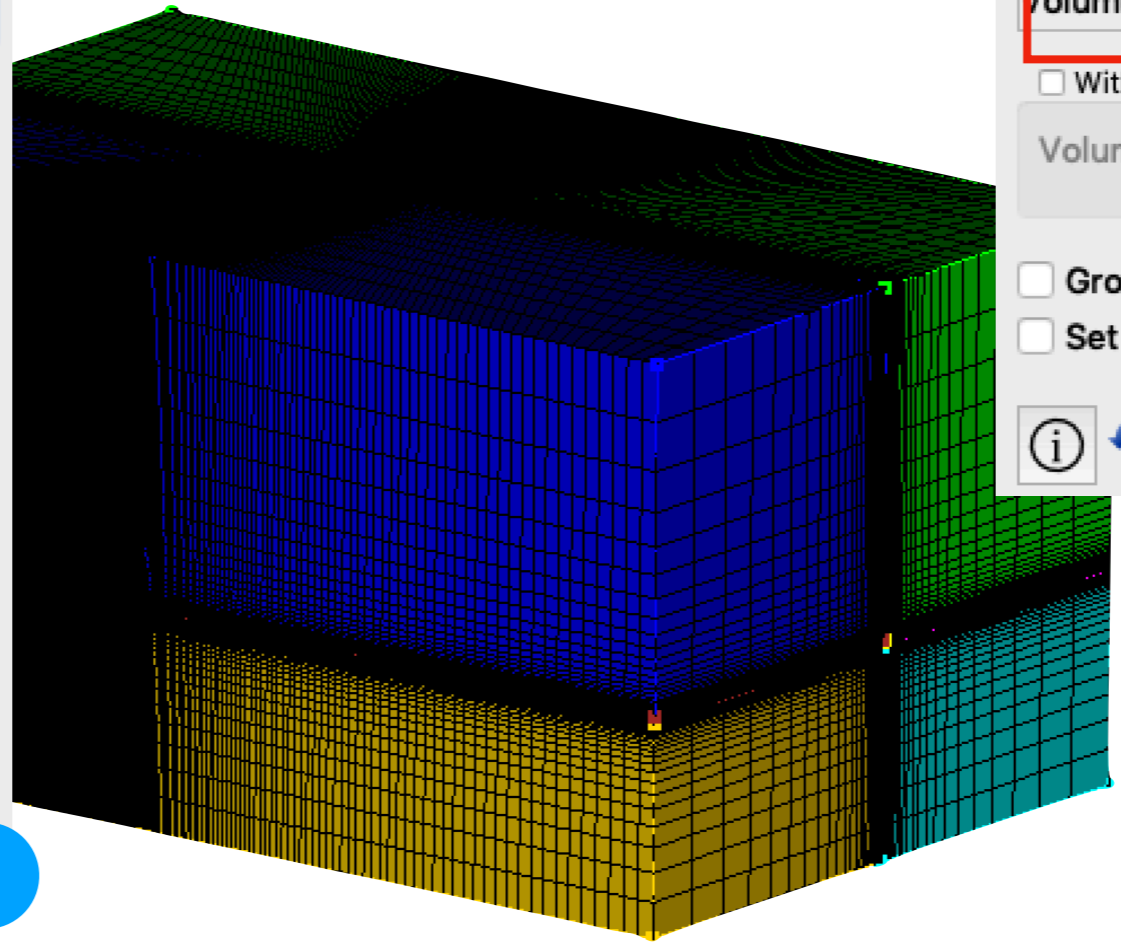
Move Reflect Rotate Scale

Reflect Using

YZ Plane Vertex Pair XZ Plane Curve XY Plane Define Plane

Group Results Copy Mesh Copy Boundary Conditions

1



Mode - Geometry

Operation - Imprint and Merge

Entity - Volumes

Merge Volumes

Volume ID(s)

With

Volume ID(s)

Group Results Set Tolerance

2



Mode - CFD BCs

Operation - Create CFD BCs

Entity

ID/Name

New ID

Name

System Assigned ID

Surface ID(s)

Curve ID(s)

Sideset ID

| Type | Id | Name |
|------|----|------|
|------|----|------|

1

ID/Name

New ID

Name

System Assigned ID

Surface ID(s)

Curve ID(s)

Sideset ID

2

| Type | Id | Name |
|------|----|-------------|
| wall | 2 | outer_wall |
| wall | 1 | marine_wall |

ID/Name

New ID

Name

System Assigned ID

Surface ID(s)

Curve ID(s)

Sideset ID

| Type | Id | Name |
|---------------|----|-------|
| velocityinlet | 3 | inlet |

3

ID/Name

New ID

Name

System Assigned ID

Surface ID(s)

Curve ID(s)

Sideset ID

| Type | Id | Name |
|---------------|----|--------|
| pressureou... | 4 | outlet |

4



Mode - Analysis Groups and Materials

Entity - Blocks

Action - Create

Create block

Block ID 1

Select

- Group
- Volume
- Surface
- Curve
- Vertex
- Hex
- Tet
- Face
- Tri
- Edge
- Node

ID(s) all

Allow Blocks to Contain Duplicate Elements

Reset All Blocks Reset

Apply

1

Mode - Analysis Groups and Materials

Entity - Material/Media

Action - Add material/media

Name: fluid

Description:

Set ID <requested id>

Copy Material Default-Steel

Property Group: Cubit-CFD

| Property | Value |
|----------------|-------|
| CFD Media Type | 0 |

Apply

2

Mode - Analysis Groups and Materials

Entity - Material/Media

Action - Assign material/media

Block ID(s) 1

Assign Material

Assign Media

Available Materials

No Materials Defined

Available Media

fluid

Reset All Blocks Reset

Apply

3