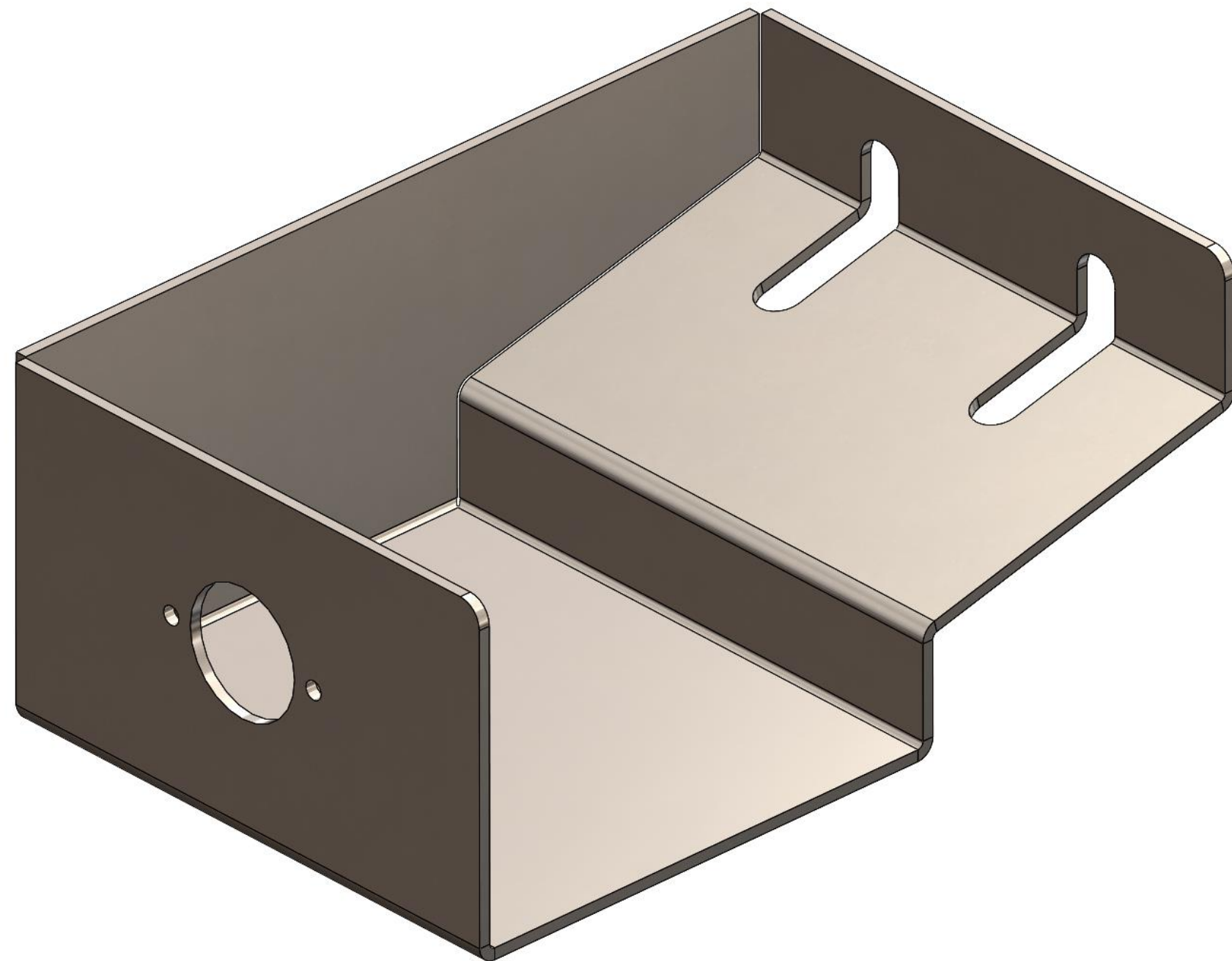


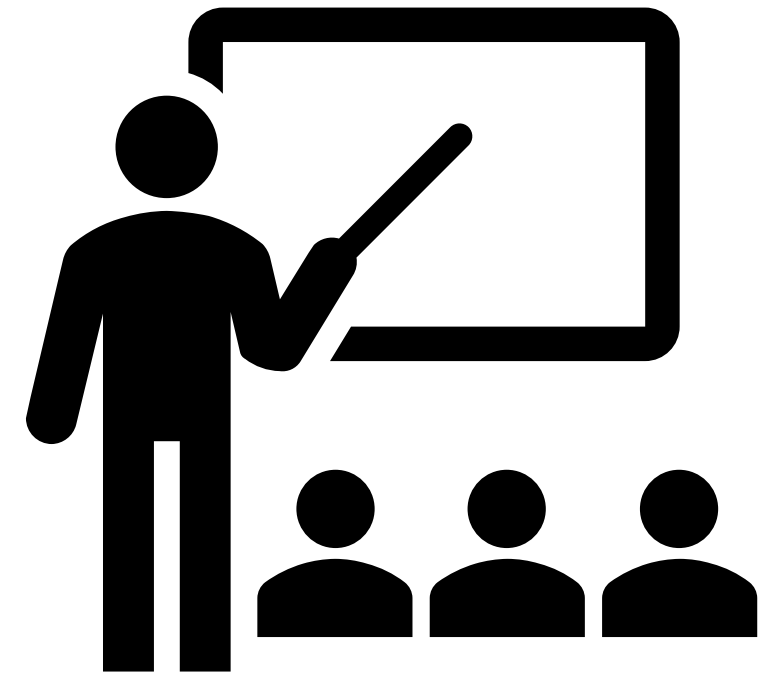
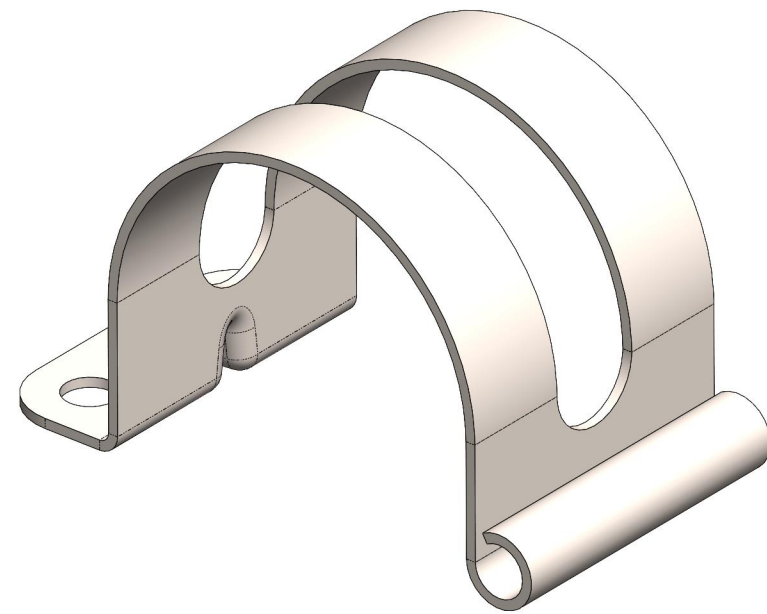


SOLIDWORKS SHEET METAL



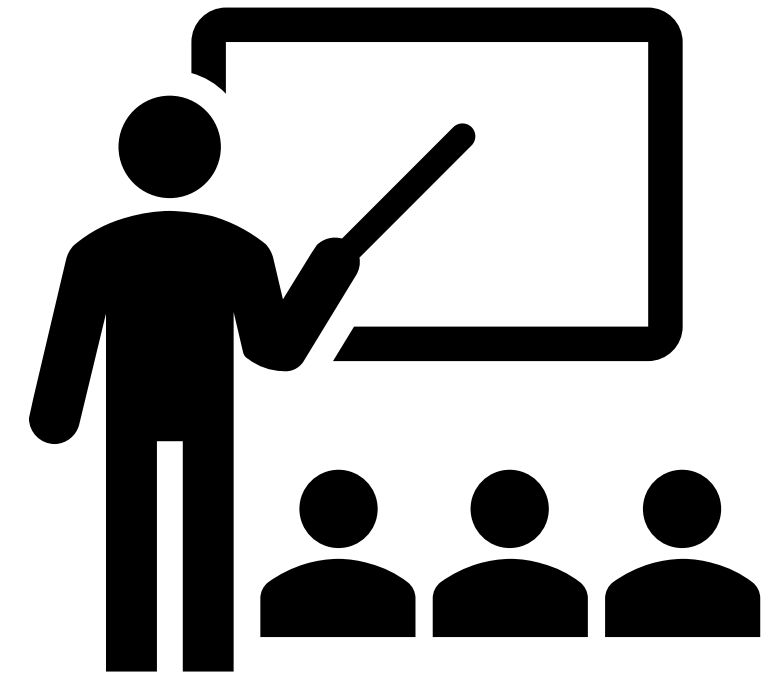
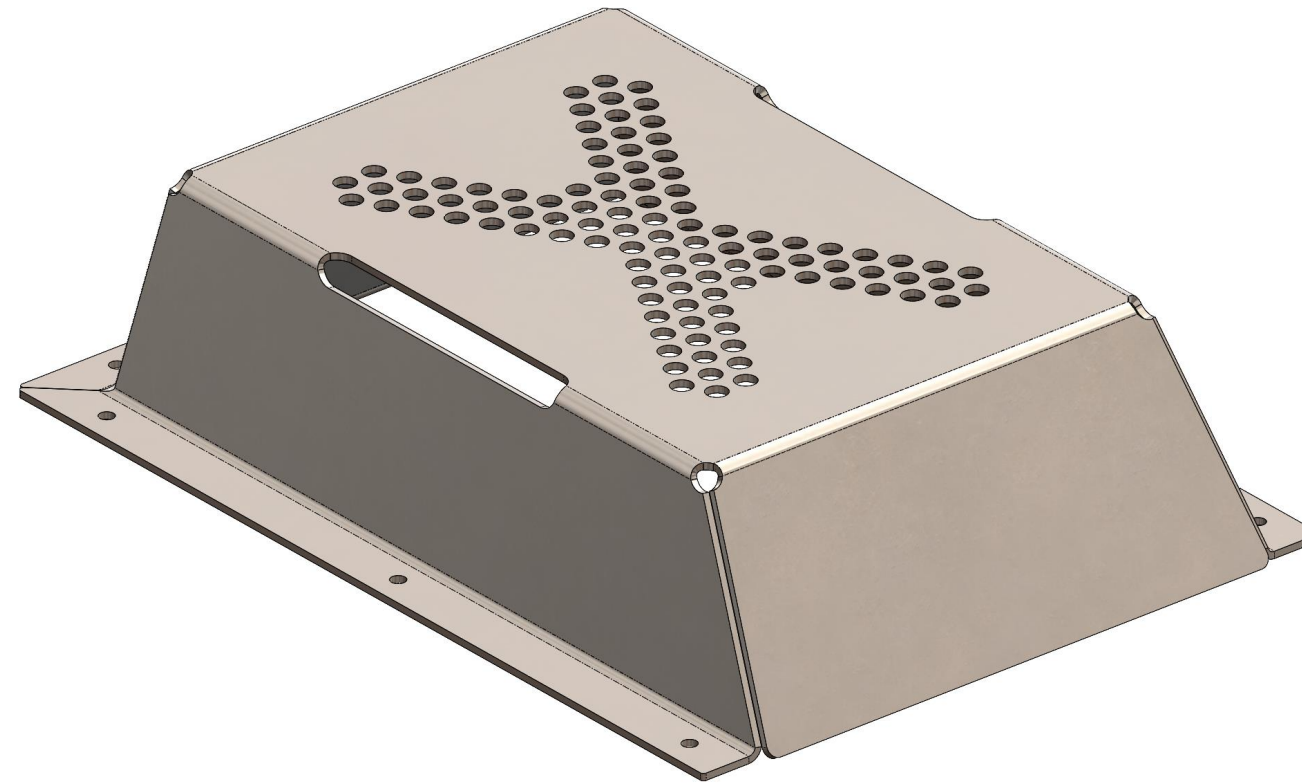
Sisältö (esitysajat videolla)

- **Johdanto (3:23)**
 - Mitä Sheet Metal -sovelluksella voidaan suunnitella?
 - Ohutlevysuunnittelussa huomioitavaa
 - Venymätaulukot
- **Levyosien mallinnusfilosofia (8:43)**
 - Base Flange/Tab, taivutusten luonti peruspiirteen yhteydessä
 - Edge Flange ja Sketched Bend, taivutusten lisääminen levyaihioon
 - Swept Flange, poikkileikkauksen pyyhkäisy käyrää pitkin
 - Lofted-Bend, kahden poikkileikkauksen välinen pinnoitus
 - Insert Bends, taivutusten lisääminen tilavuusmalliin
 - Convert to Sheet Metal, umpinaisen tilavuusmallin konvertointi levymalliksi
- **Projekti: Maastopyörän runko (19:55)**
- **Mallinnus 1: Putkipidin, Hands-on (21:43)**
 - Sheet Metal Toolbar (23:11)
 - Shortcut Bar (24:41)
 - Keyboard Shortcuts (28:35)
 - Mouse Gestures (29:05)
 - Save/Restore Settings (31:08)
 - Base Flange/Tab (34:25)
 - System Options → Sketch (35:07)
 - Bend Table (47:41)
 - Material Library (48:31)
 - Hem (54:30)
 - Sheet Metal Gusset (59:54)
 - Unfold (1:04:03)
 - Extruded Cut (1:05:04 ja 1:10:58)
 - Fold (1:07:58)
 - Break-Corner/Corner-Trim (1:09:02)
 - Flatten (1:13:12)
 - Export to DXF (1:13:35)



- **Mallinnus 2: Suojakansi, seuraten (1:21:20)**

- Base Flange/Tab (1:21:56)
- Miter Flange (1:23:53)
- Edge Flange (1:26:06)
- Closed Corner (1:28:53)
- Move Face (1:29:45)
- Break-Corner/Corner-Trim (1:31:48)
- Unfold (1:33:05)
- Extruded Cut (1:33:22 ja 1:36:33)
- Fold (1:34:41)
- Corner Relief (1:35:12)
- Linear Pattern (1:38:41)
- Mirror (1:40:41)
- Library Feature (1:41:38)
- Fill Pattern (1:43:31)
- Flatten (1:45:04)



- **Vinkkejä**

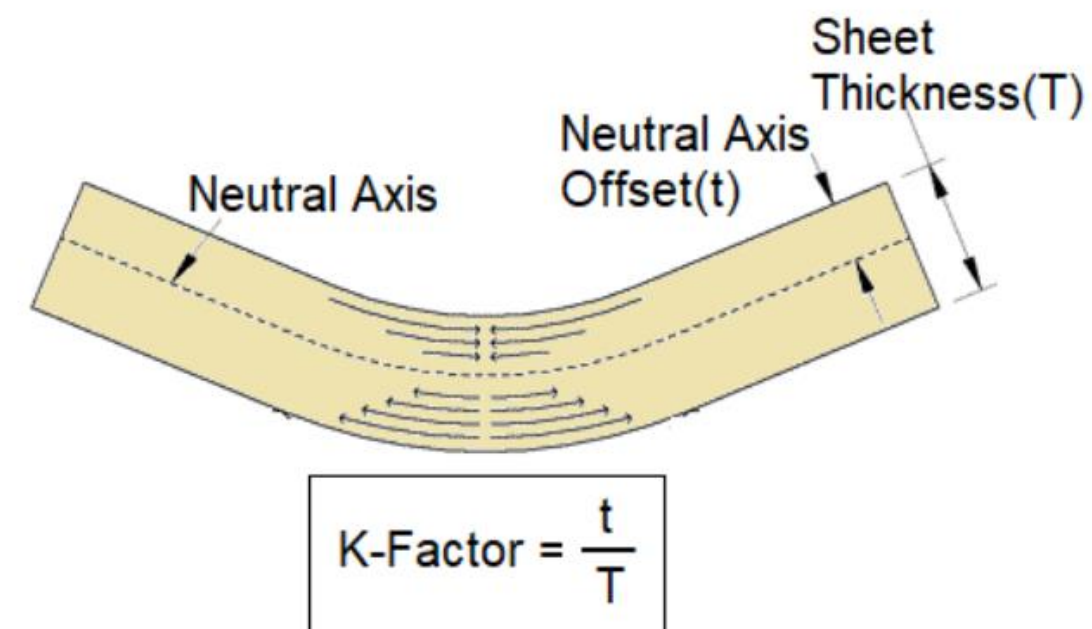
- Split, mallin jakaminen osiin (1:47:35)
- Tab and Slot, kohdistus kahden osan välille (1:48:49)

- **Mitä Sheet Metal -sovelluksella voidaan suunnitella?**

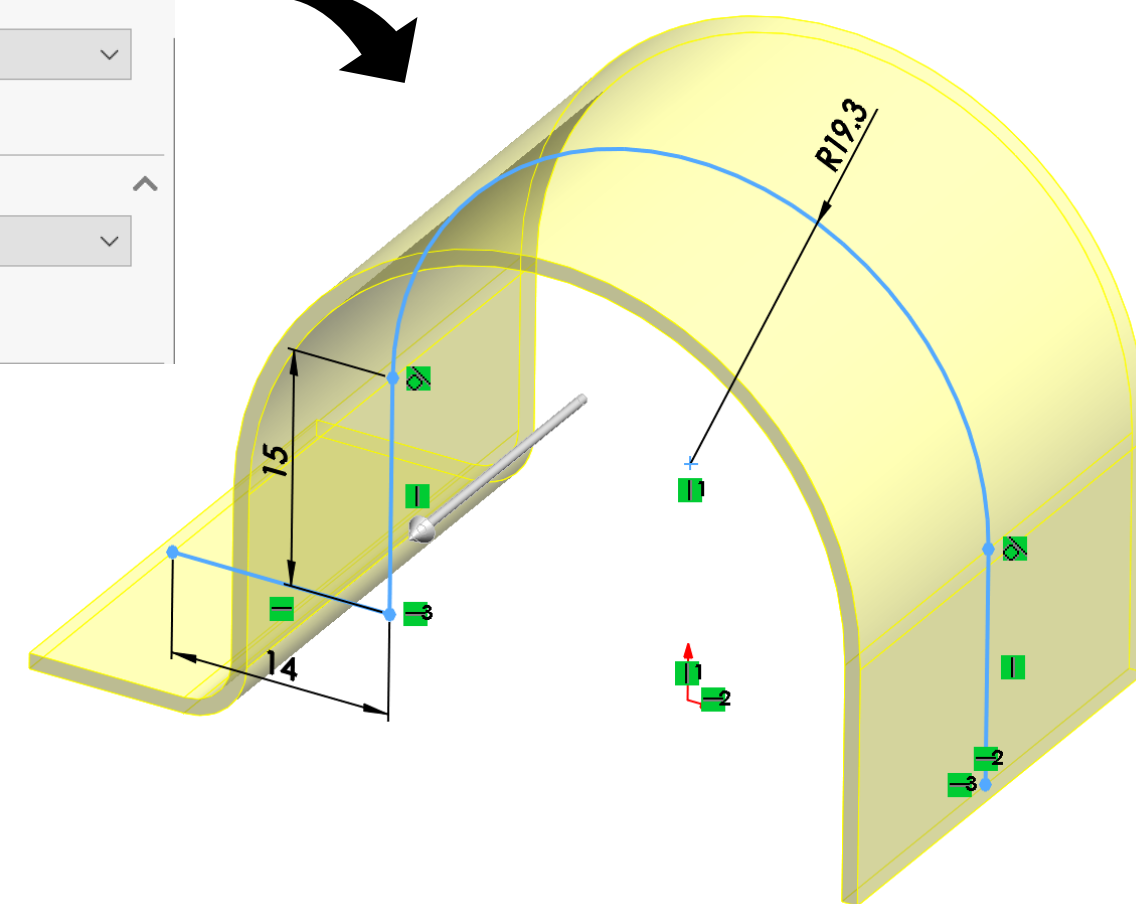
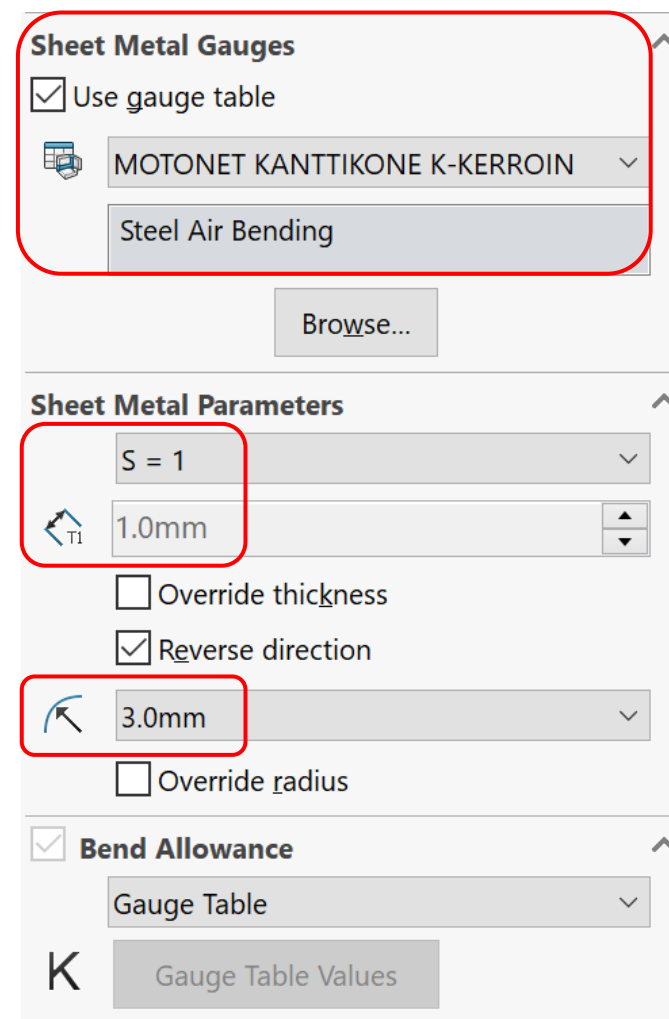
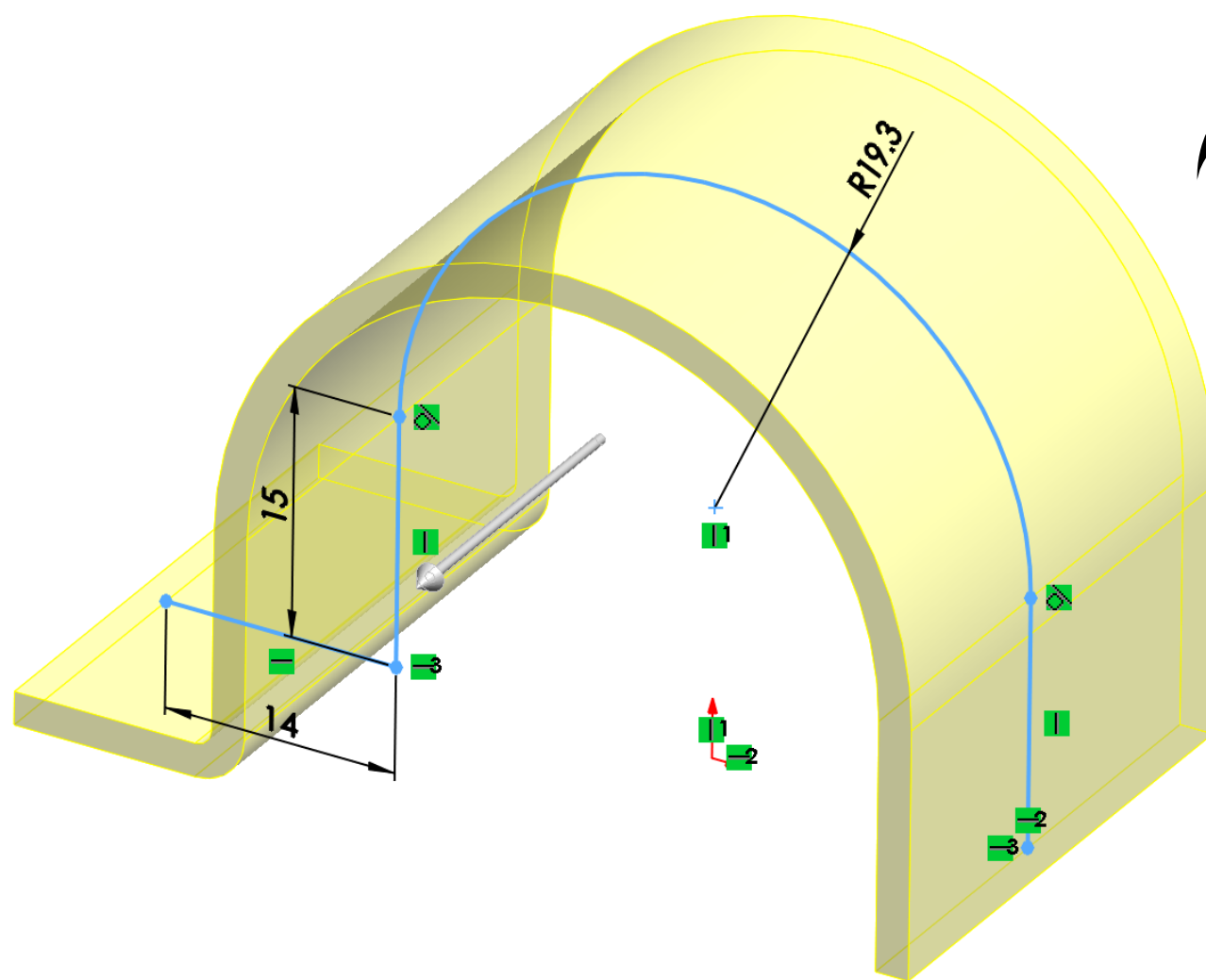
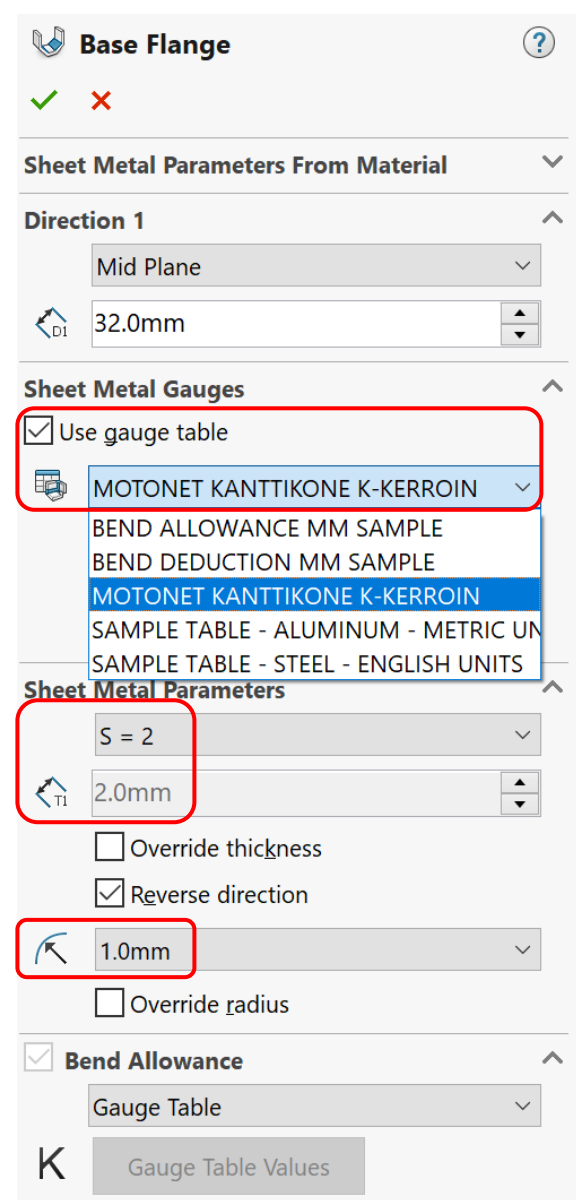
- Levystä leikatut muodot sisältäen rei'itykset sekä painintyökaluilla tehdyt muodot ja avaukset
- Levystä leikatut ja särmäämällä taivutetut osat huomioiden venymät taivealueilla

- **Ohutlevysuunnittelussa huomioitavaa**

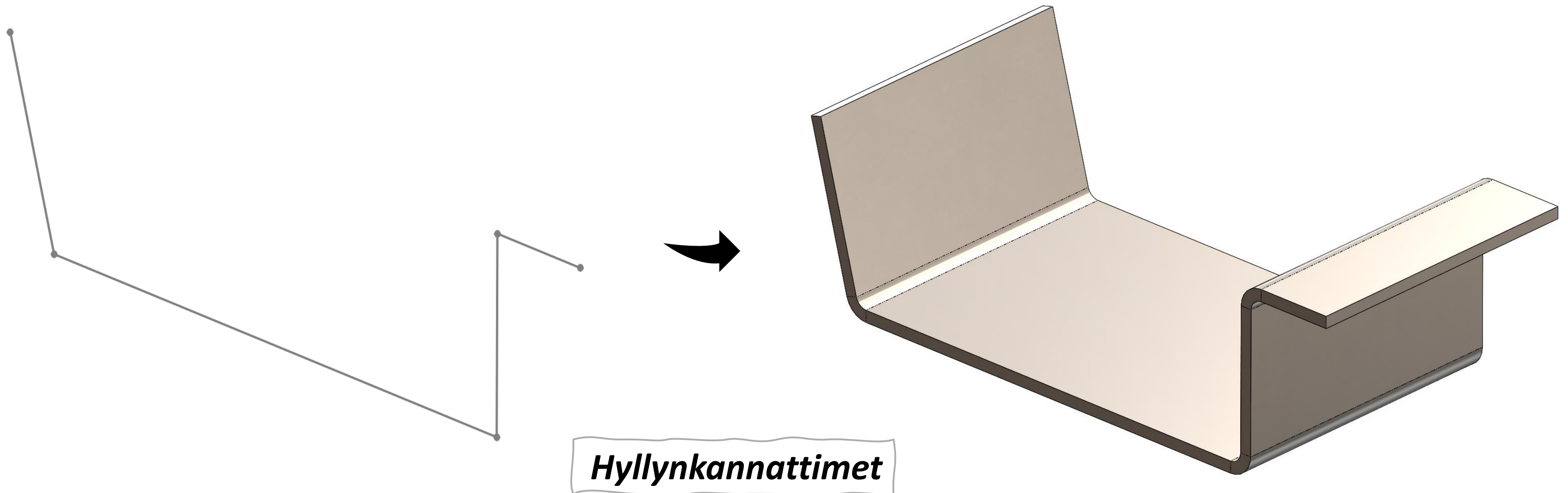
- Venymän laskenta ei perustu mihinkään tarkkaan teoriaan vaan on enemmän kokemusperäistä
- Materiaalin vaikutus venymään
- K-kertoimen arvon määrittäminen (SW oletusarvo 0,5) kokemusperäisesti tai testaamalla konekohtaisesti
- Taivutusten pituudet
- Useiden perättäisten taivutusten mahdolliset rajoitukset
- Reikien etäisyydet taivutuskohdista
- Kappaleiden laatikkomaiset muodot



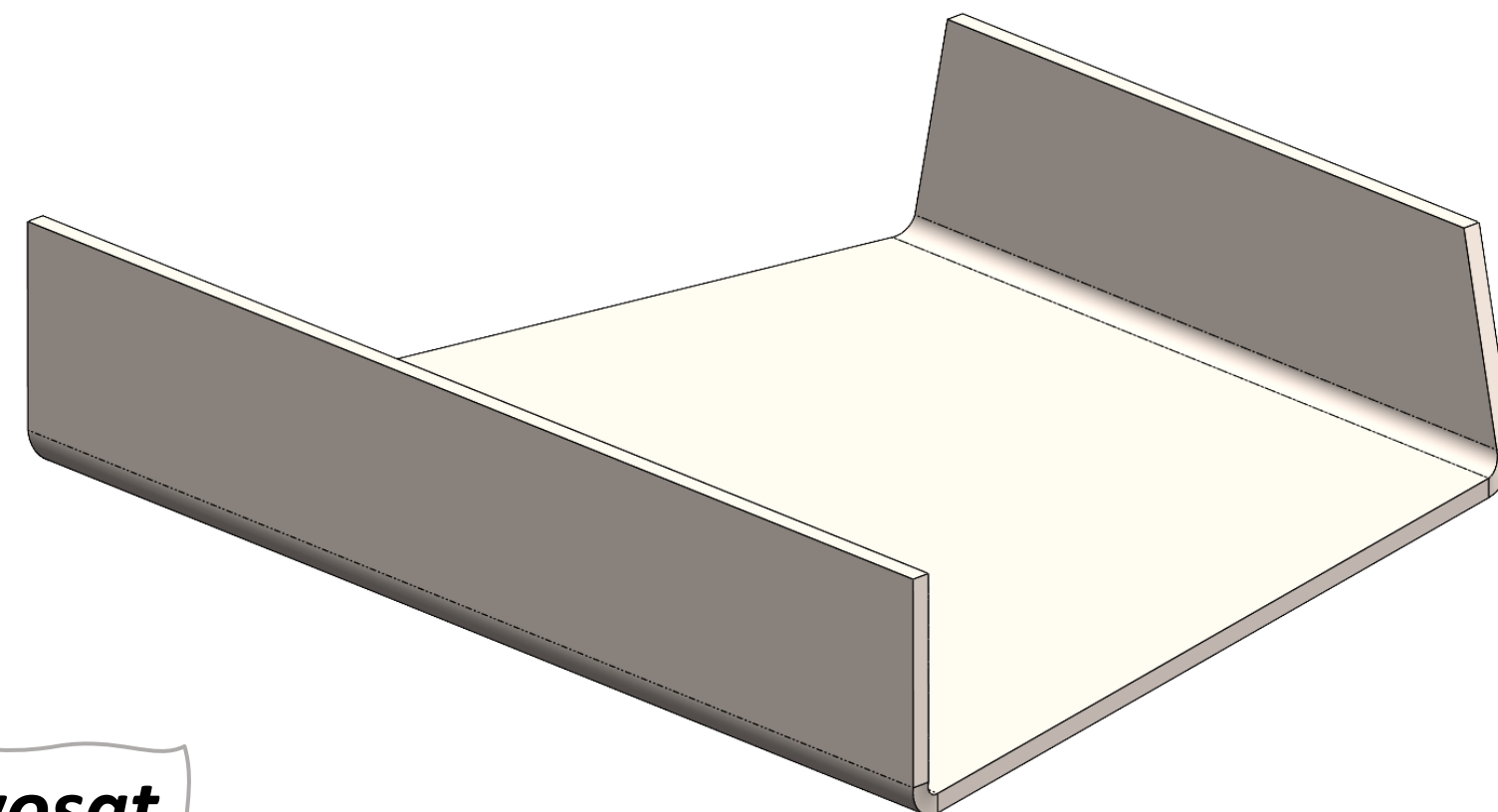
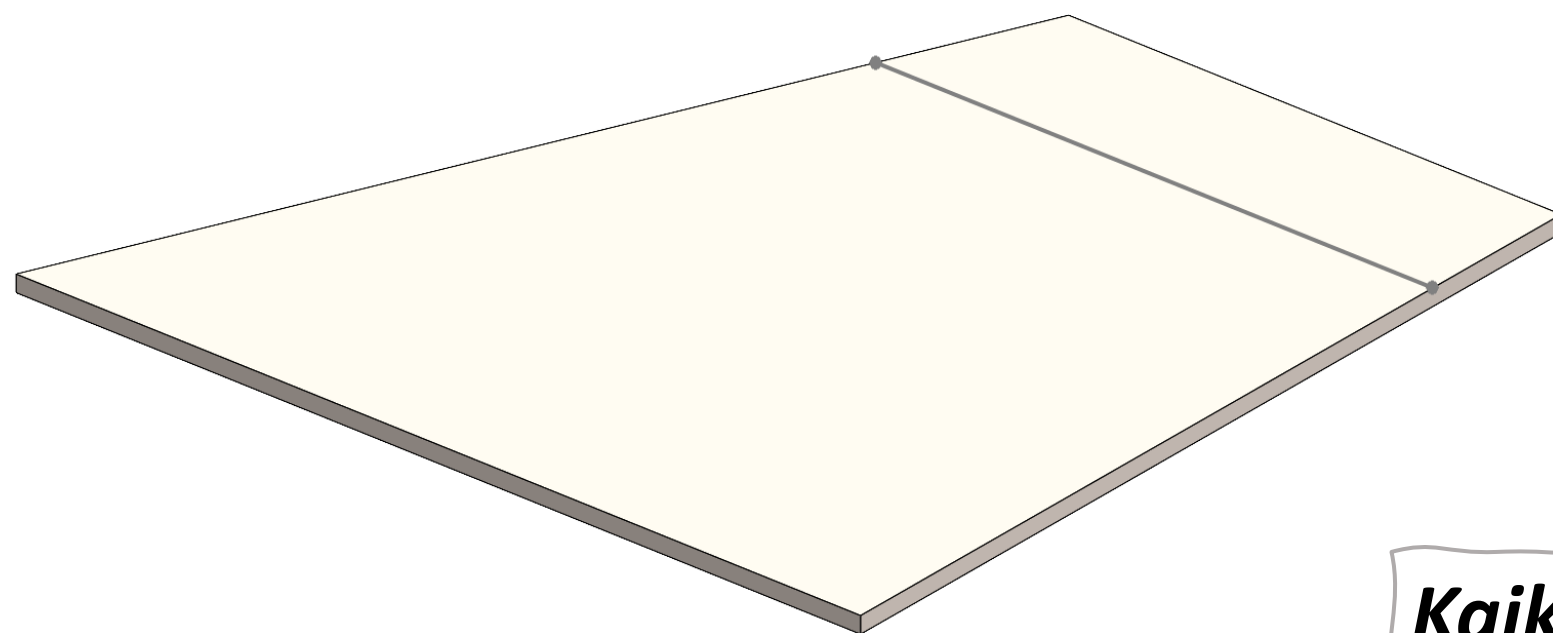
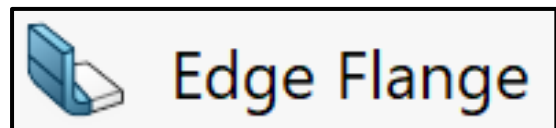
- Mallinnuksen alkuvaiheessa voit valita käytätkö venymätaulukkoa
- Luo oma taulukko oletuspohjien avulla
- Valitse haluttu levyvahvuus (S) ja taivutussäde (R)
- SW muuttaa levyn geometrian valintojen perusteella



Mallinnustapa 1: Taivutusten luonti peruspiirteen yhteydessä.

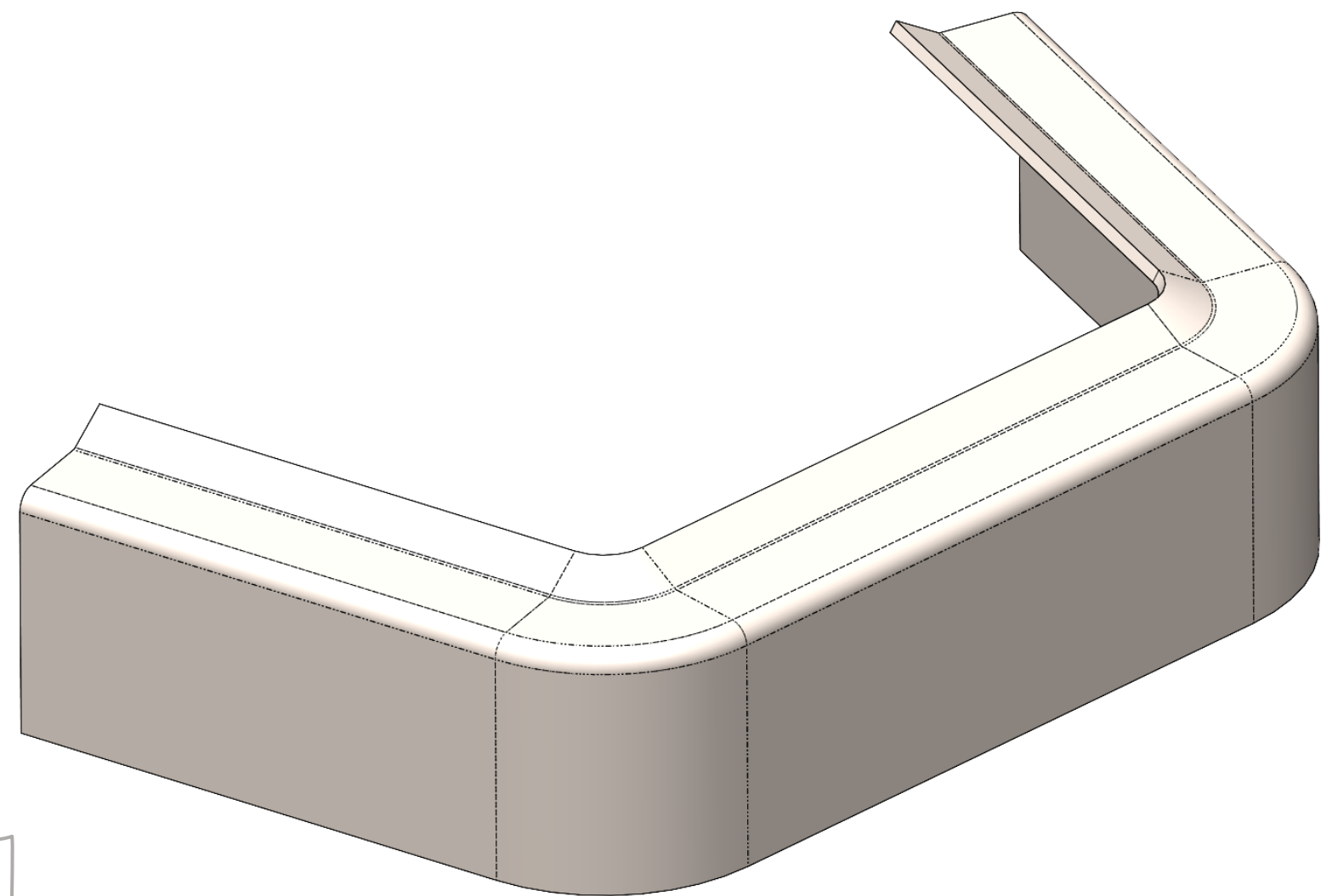
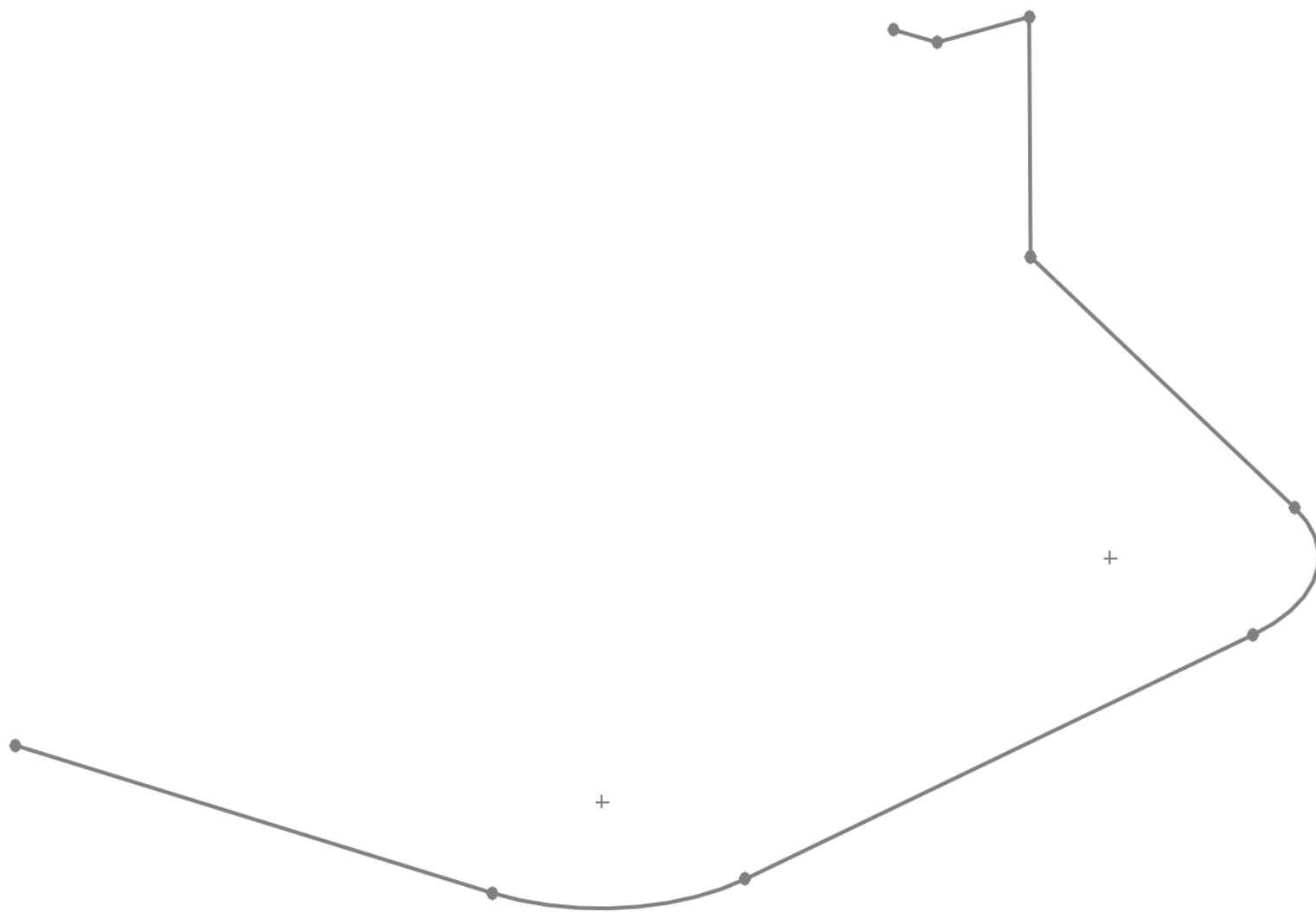


Mallinnustapa 2: Taivutusten lisääminen levyaihioon.



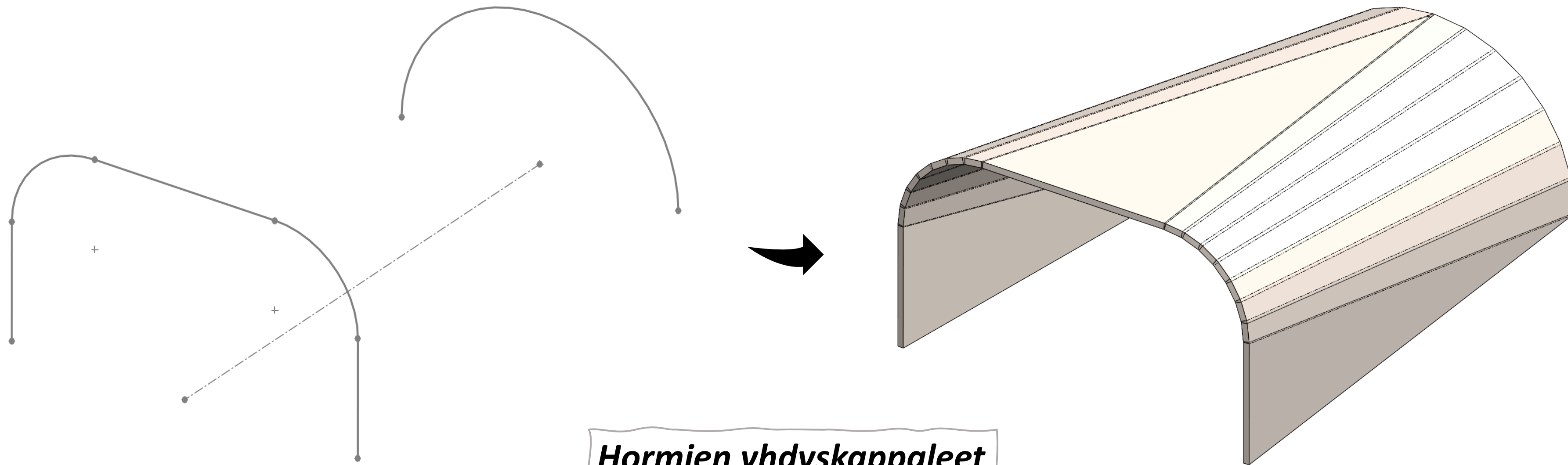
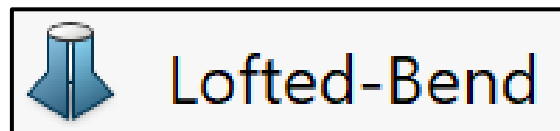
Kaikenlaiset levyosat

Mallinnustapa 3: Poikkileikkauksen pyyhkäisy käyrää pitkin.



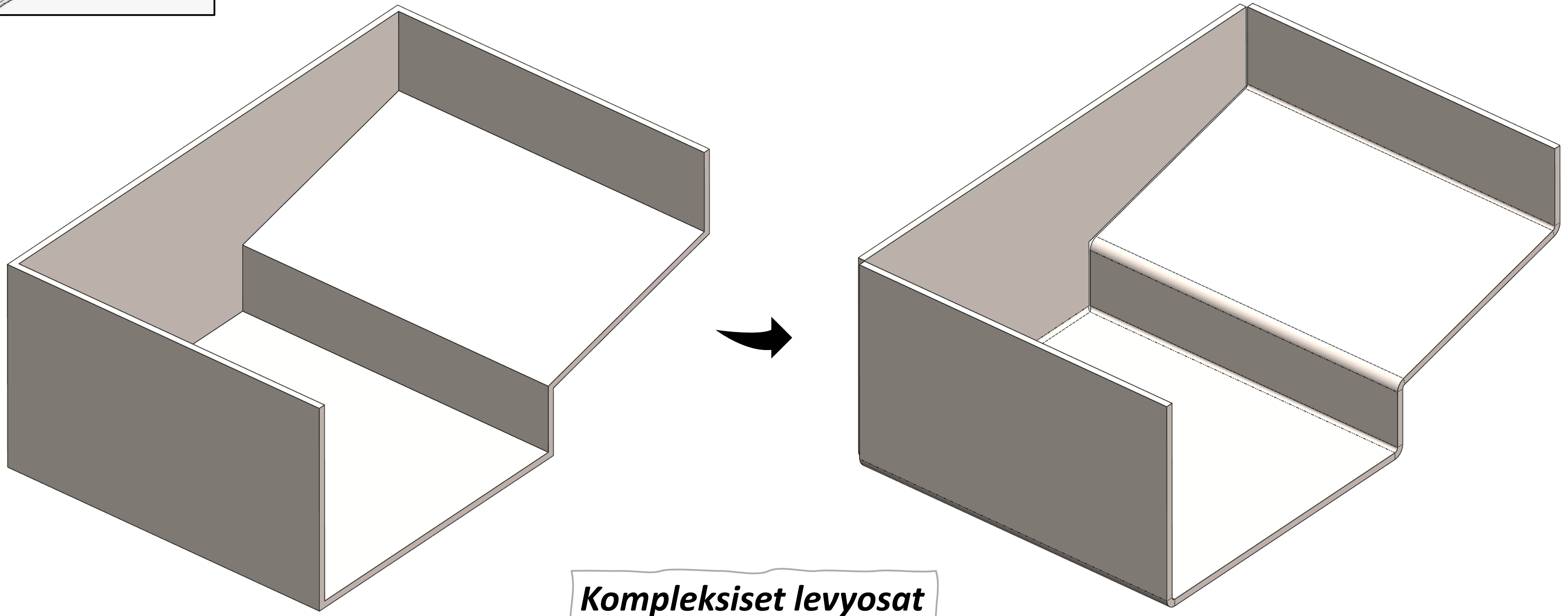
Reunalistat

Mallinnustapa 4: Kahden poikkileikkauksen välinen pinnoitus.



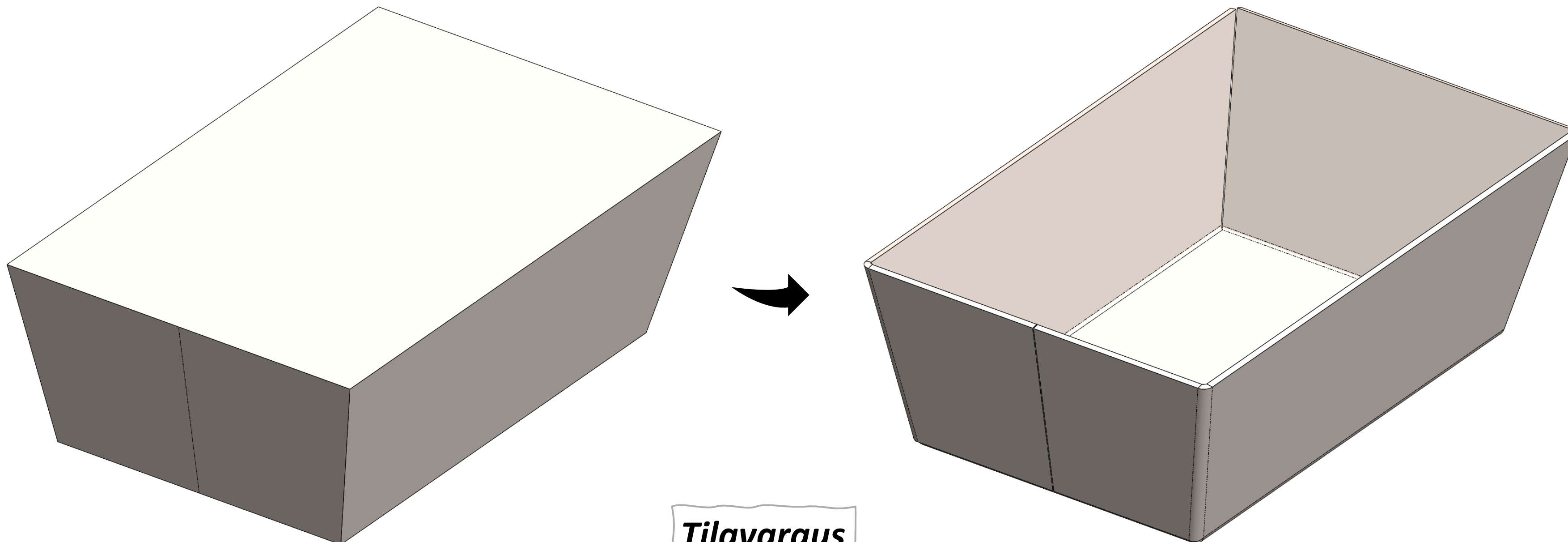
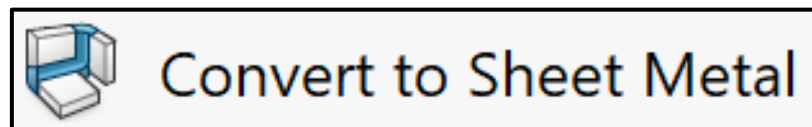
Hormien yhdyskappaleet

Mallinnustapa 5: Taivutusten lisääminen tilavuusmalliin.

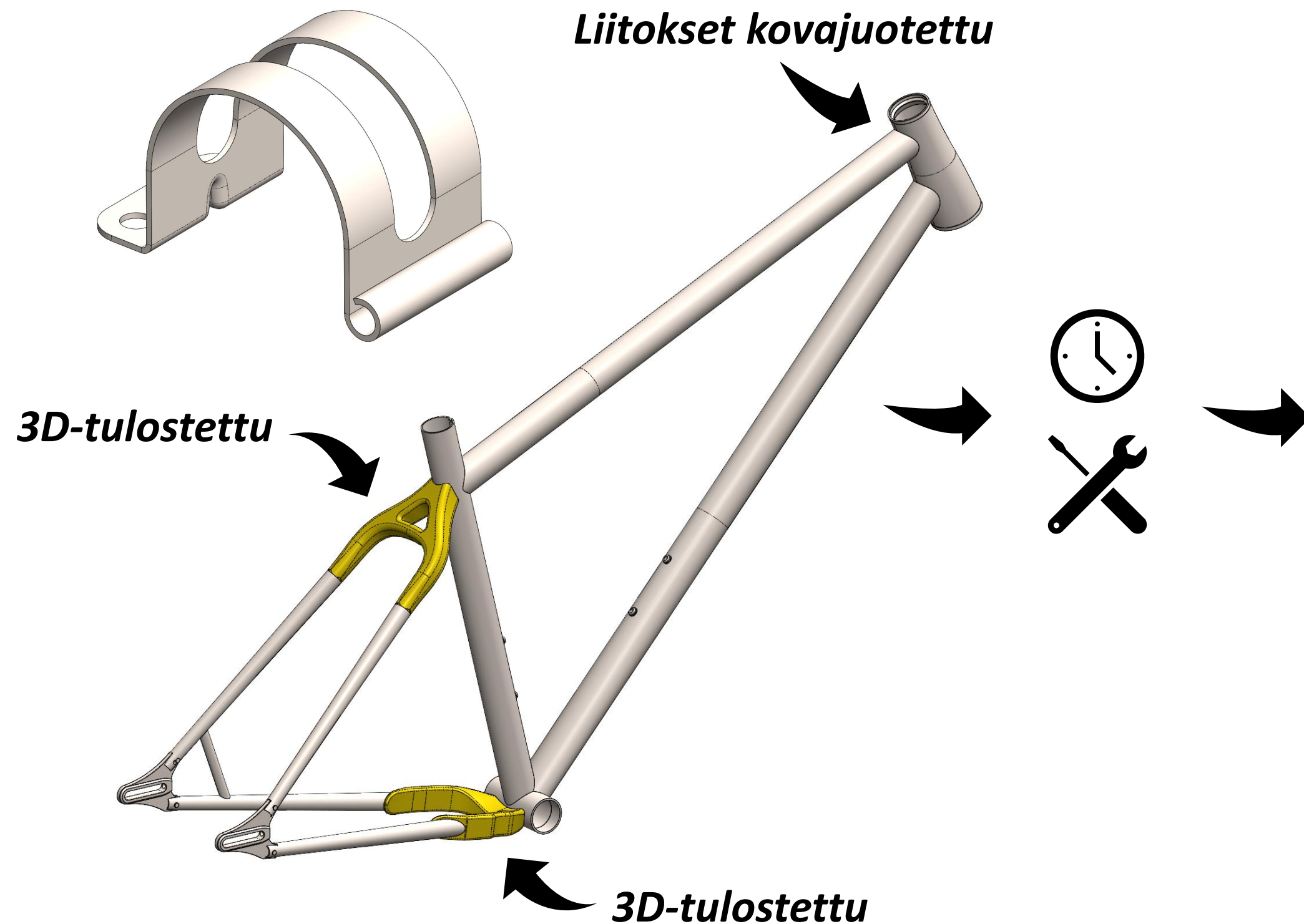


Kompleksiset levyosat

Mallinnustapa 6: Umpinaisen tilavuusmallin konvertointi levymalliksi.



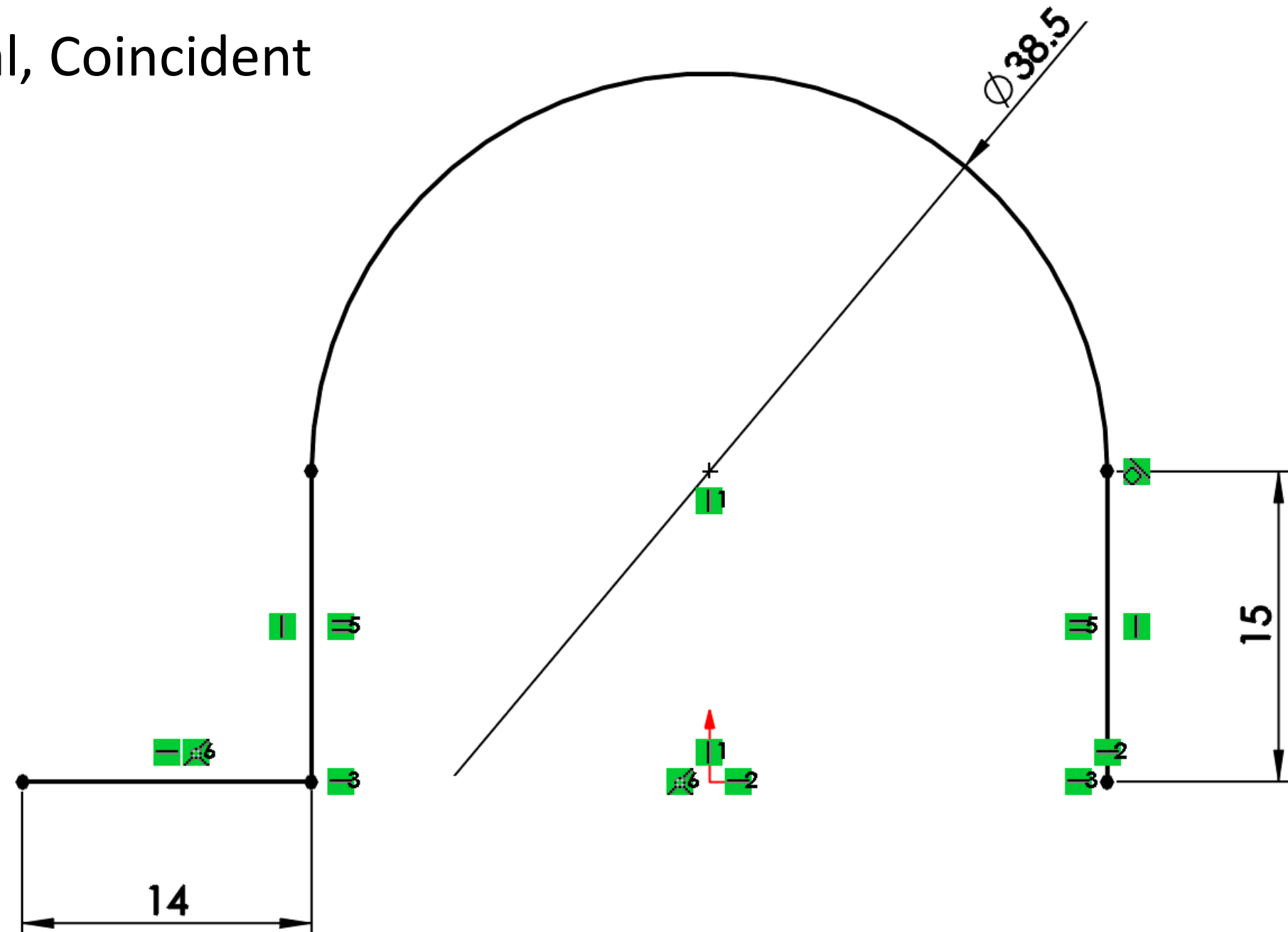
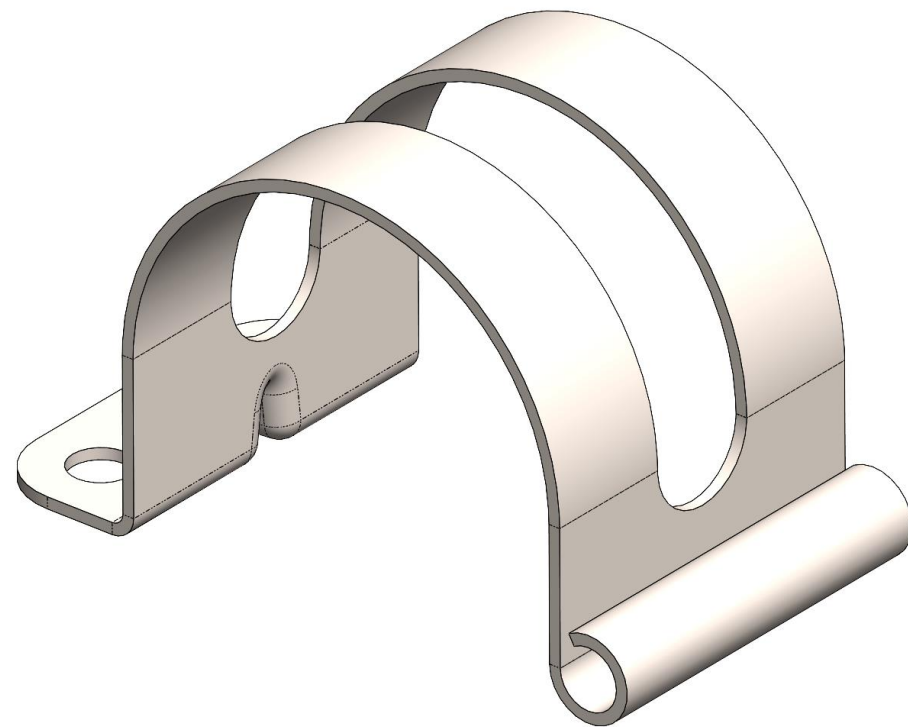
Putkipidintä (Mallinnus 1) käytettiin apuvälineenä fillarin runkoputkien sovittelussa Jigiin.



Mallinnus 1: Putkipidin

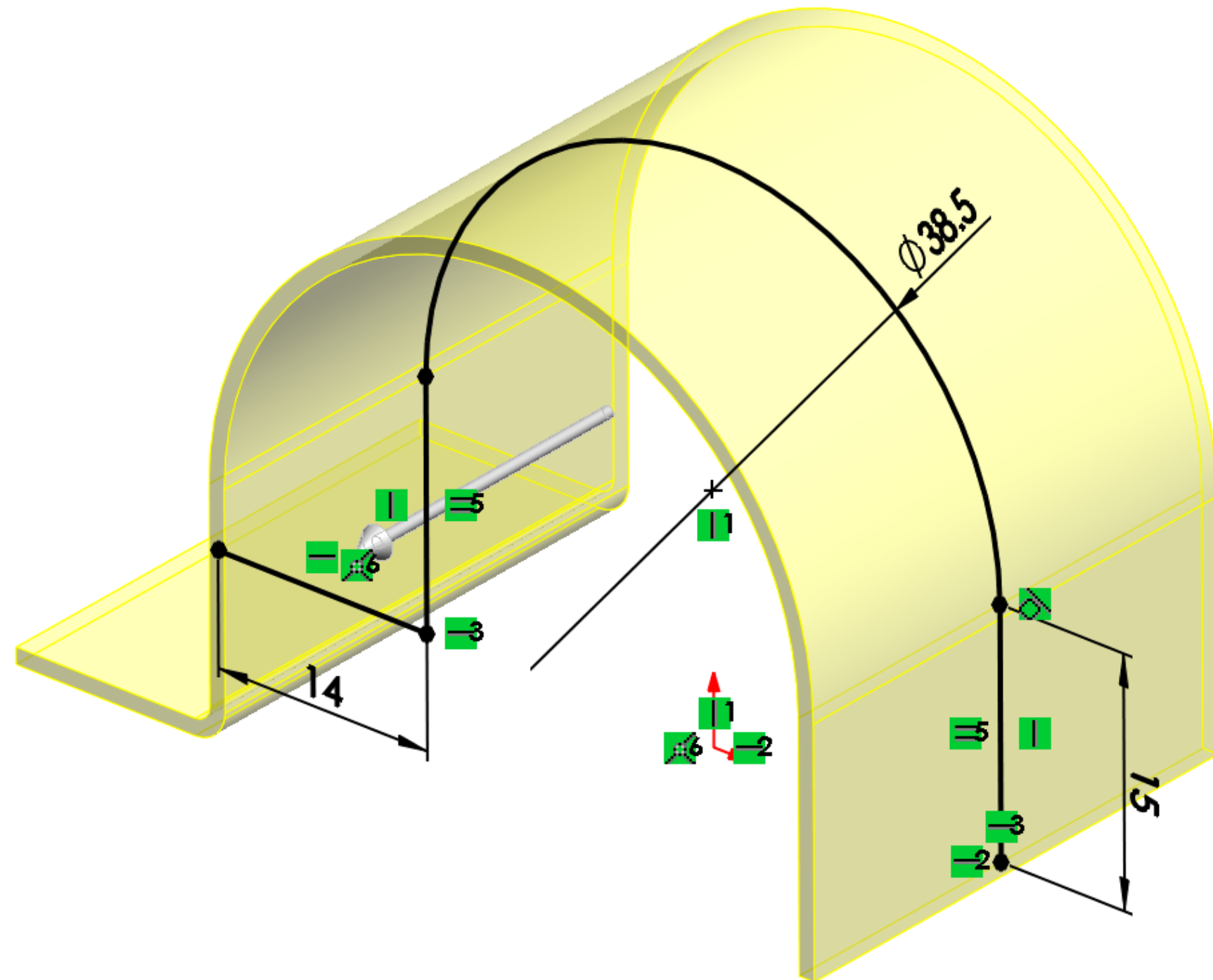
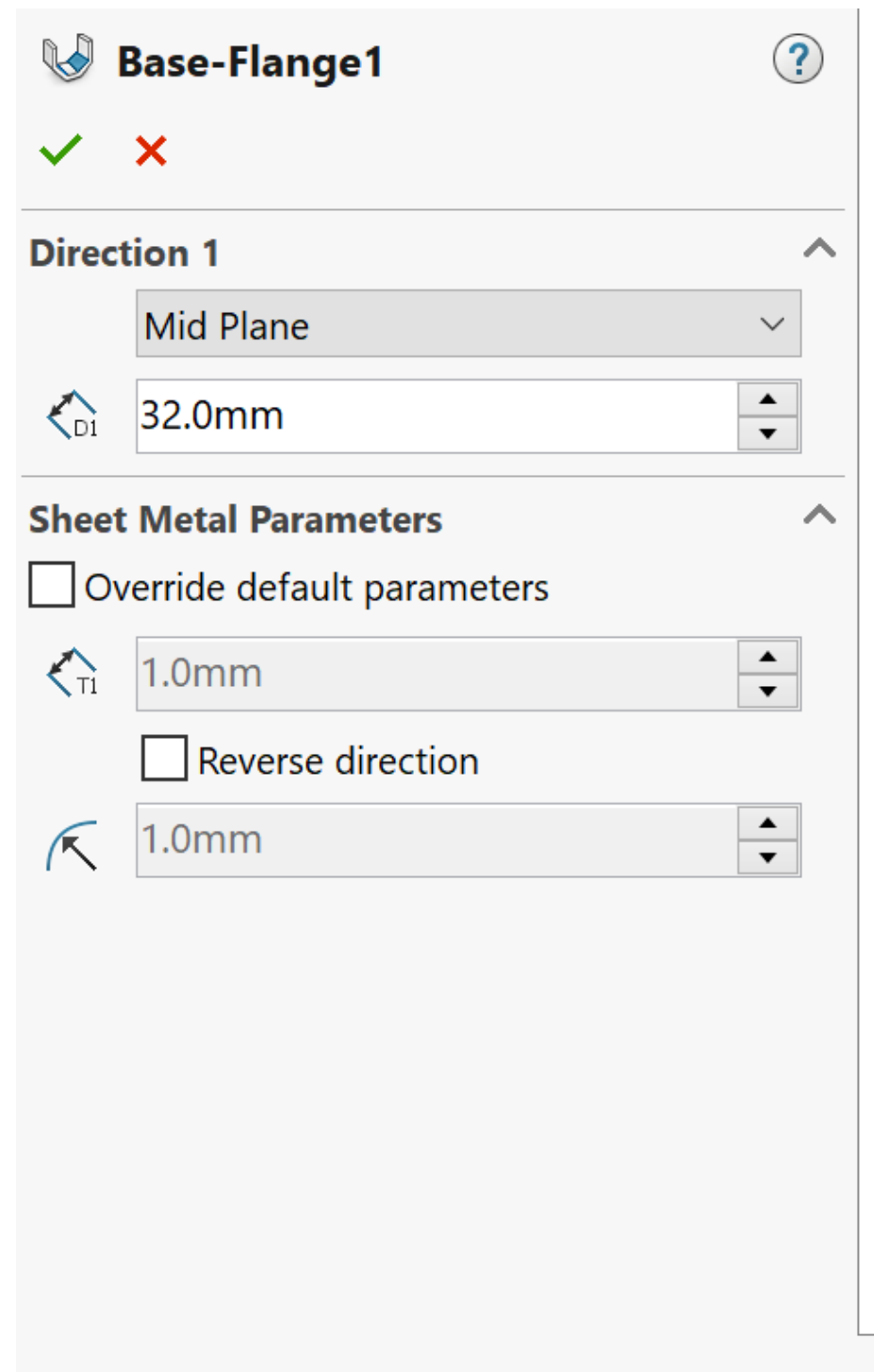


- Base Flange/Tab → Front Plane
- Sketch Entities → Line, Arc
- Add Relation → Horizontal, Vertical, Equal, Coincident
- Smart Dimension
- Exit Sketch



Mallinnus 1: Putkipidin

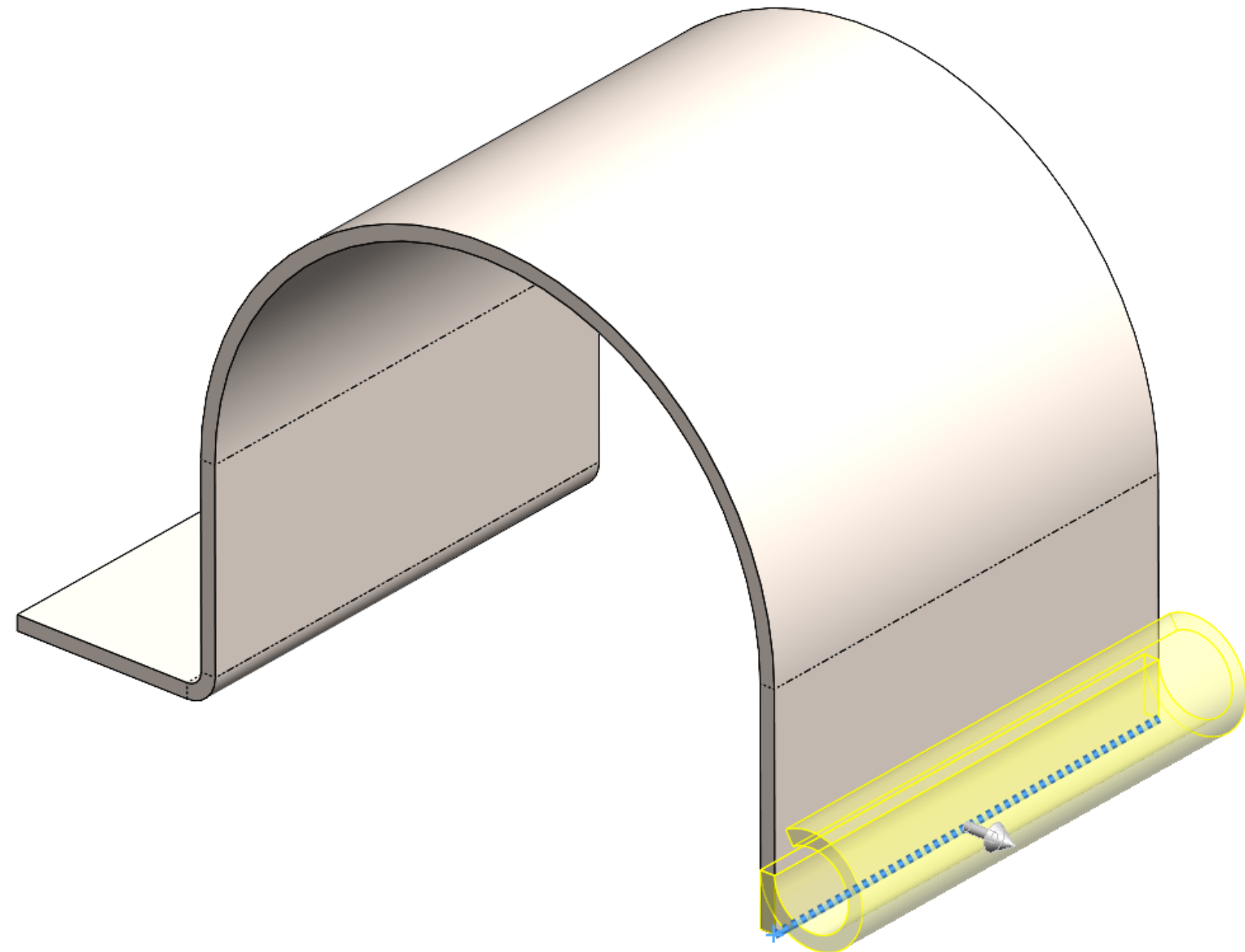
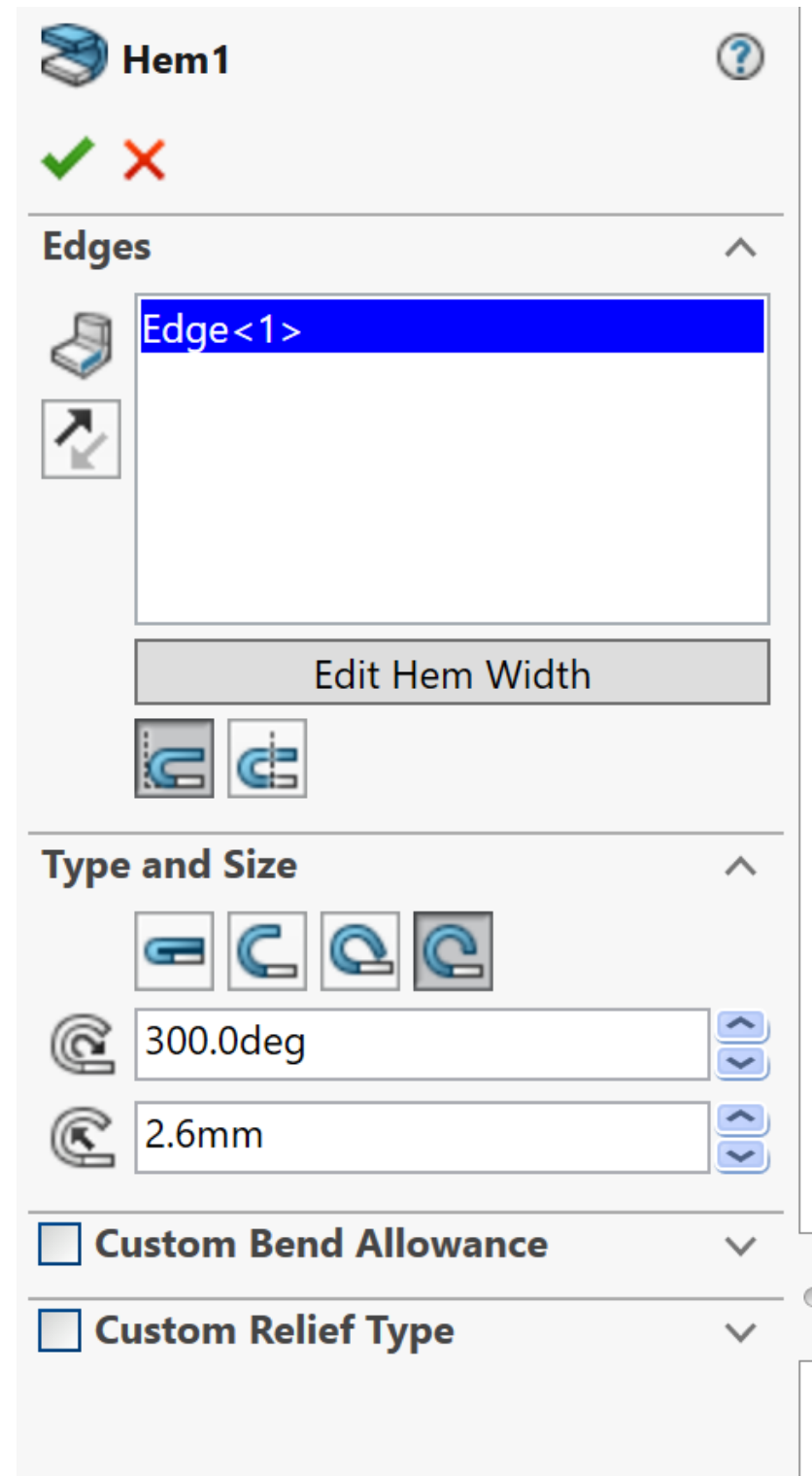
- Base Flange Properties → Mid Plane (32)
- S=1, R=1



Mallinnus 1: Putkipidin

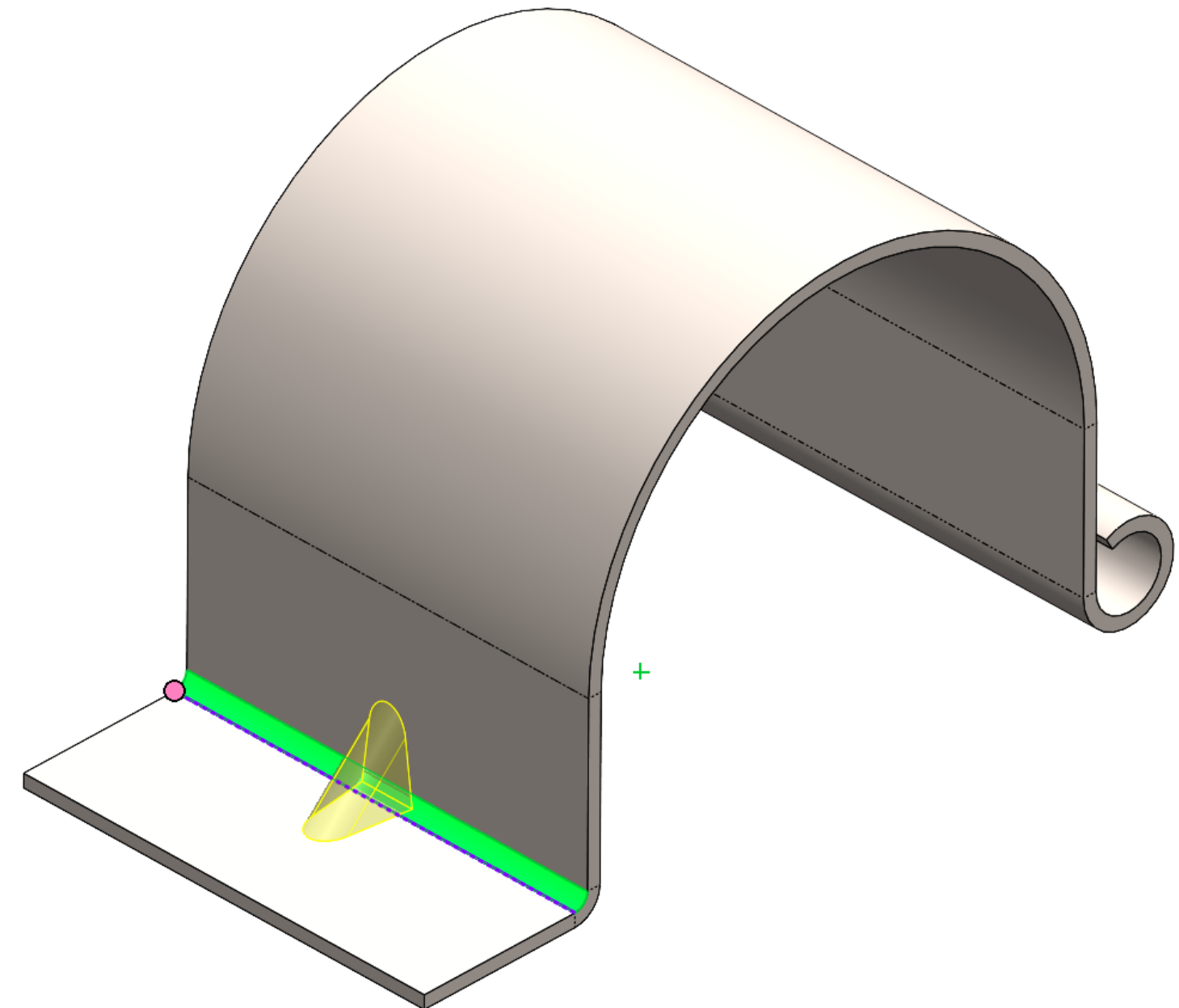
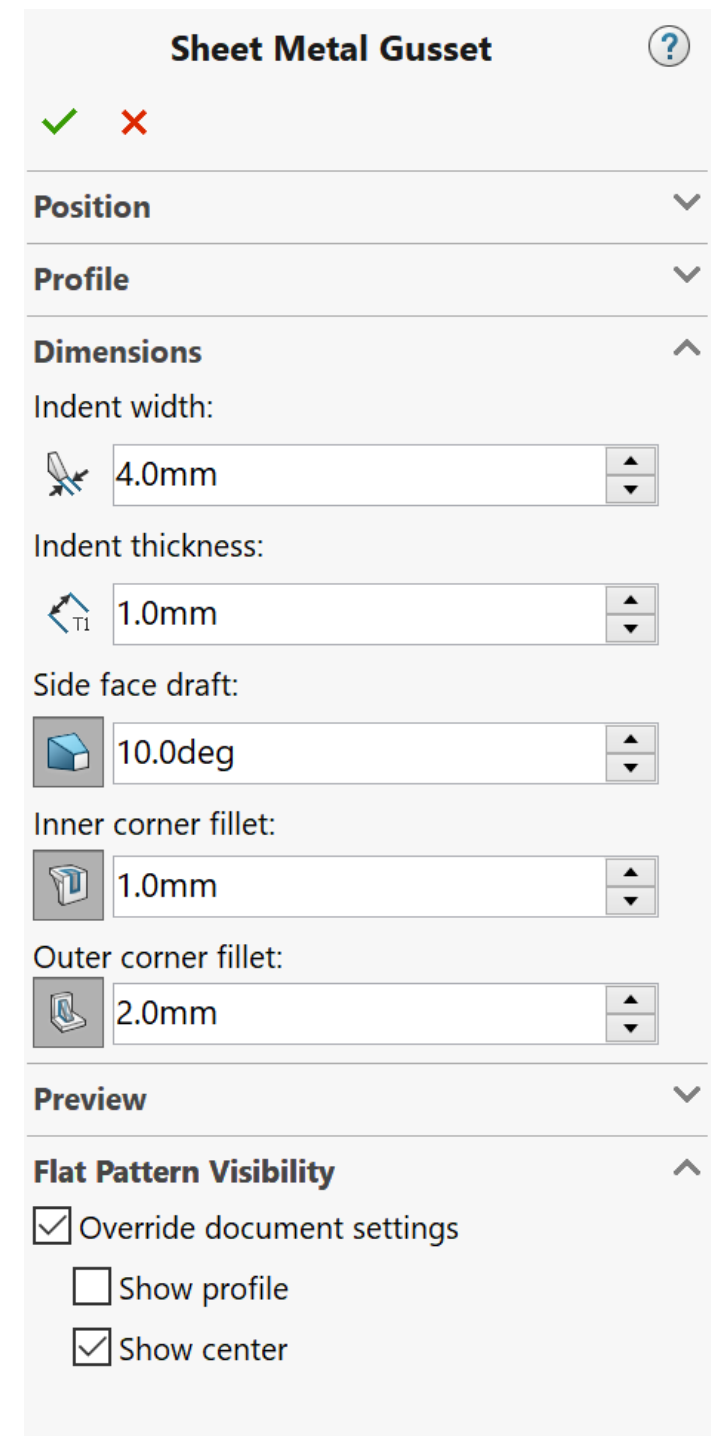
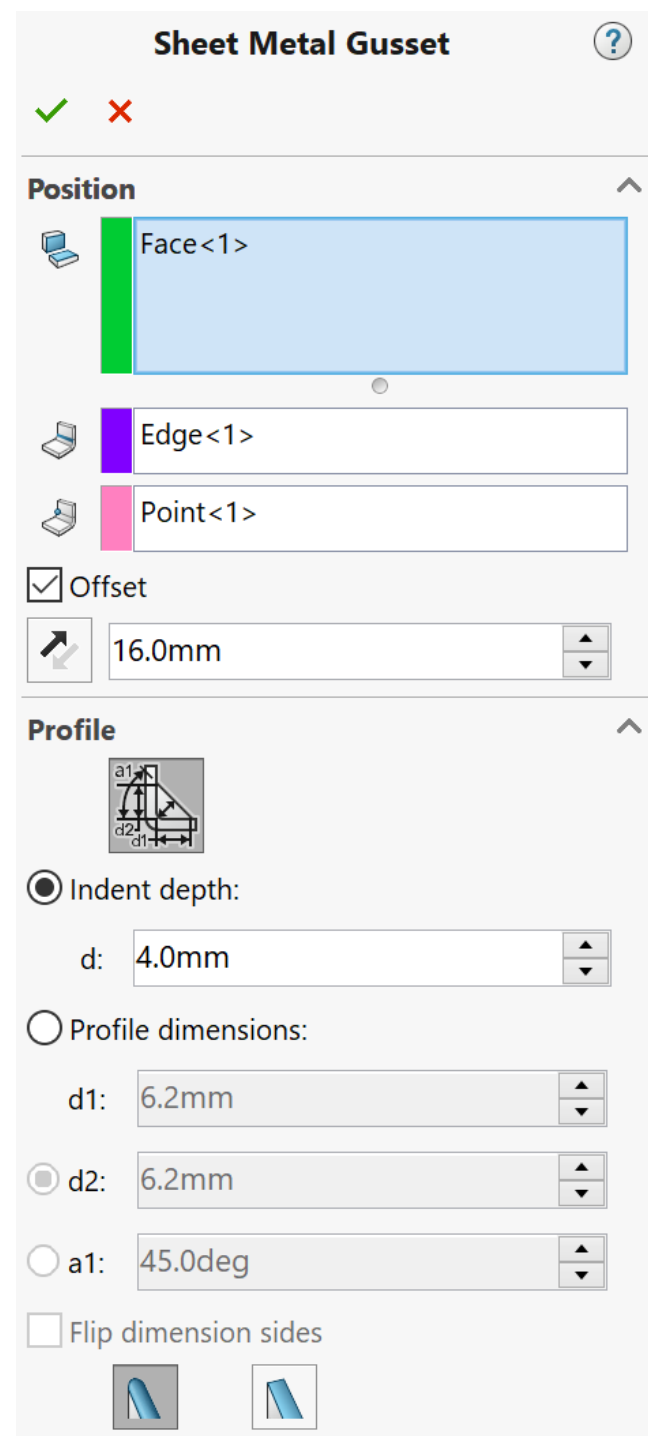


- Hem → Material Inside → Rolled
- A=300°, R=2.6

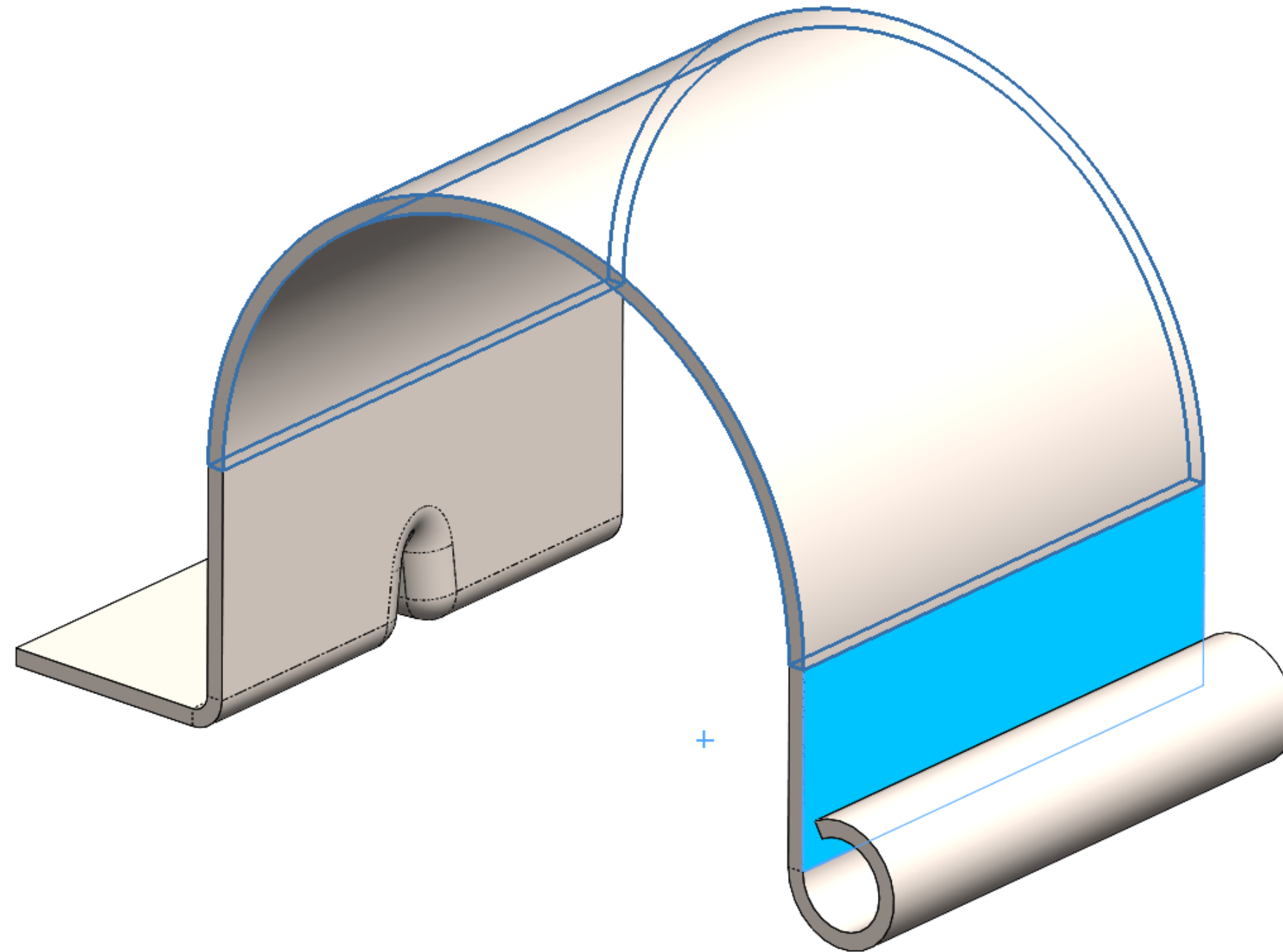
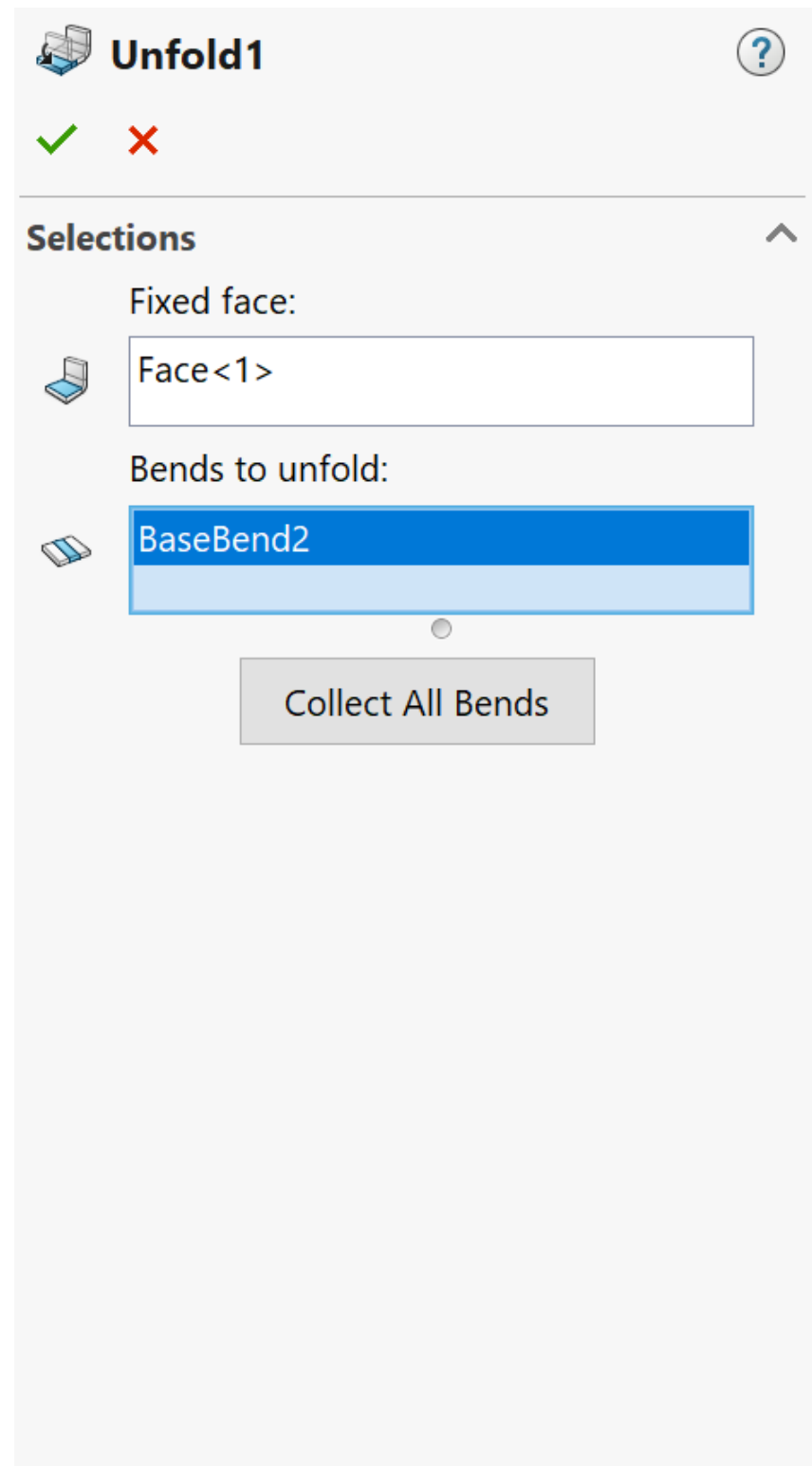


Mallinnus 1: Putkipidin

- Sheet Metal Gusset → Offset (16) → Indent depth (4) → Rounded gusset
- Indent width (4) → Indent thk (1) → Side face draft (10°) → Inner/Outer corner fillet (1/2)



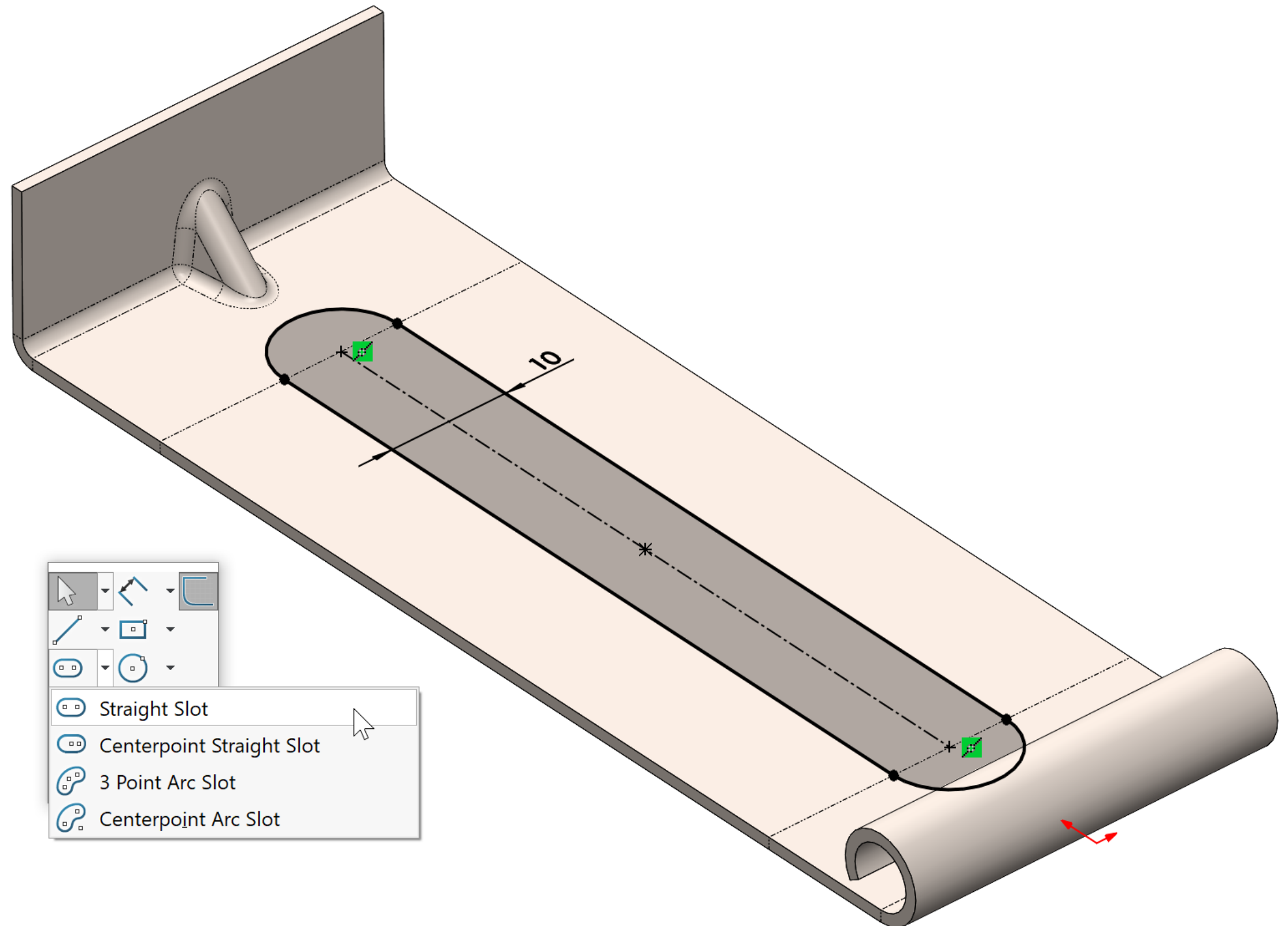
Unfold → Fixed face → Bends to unfold



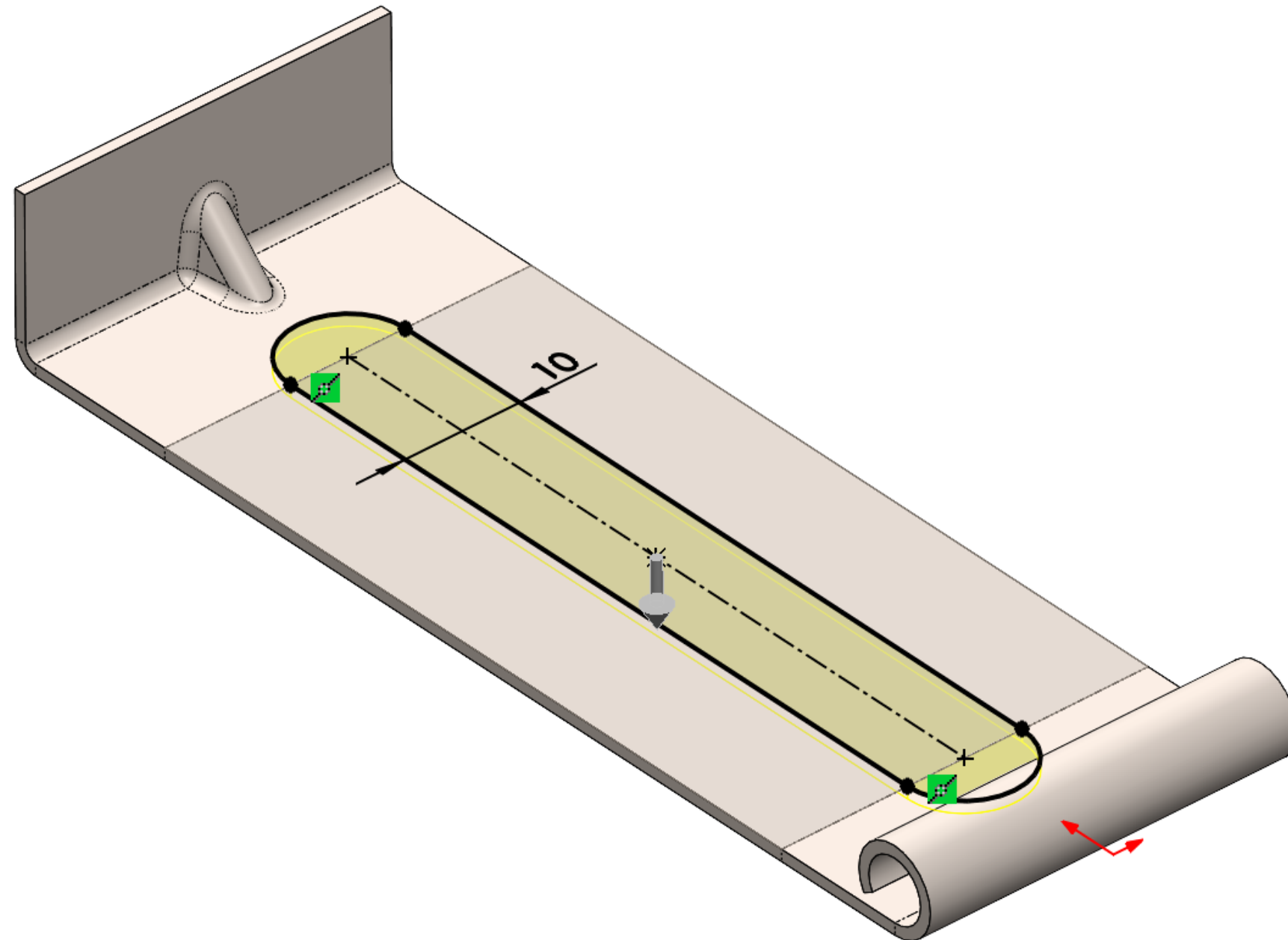
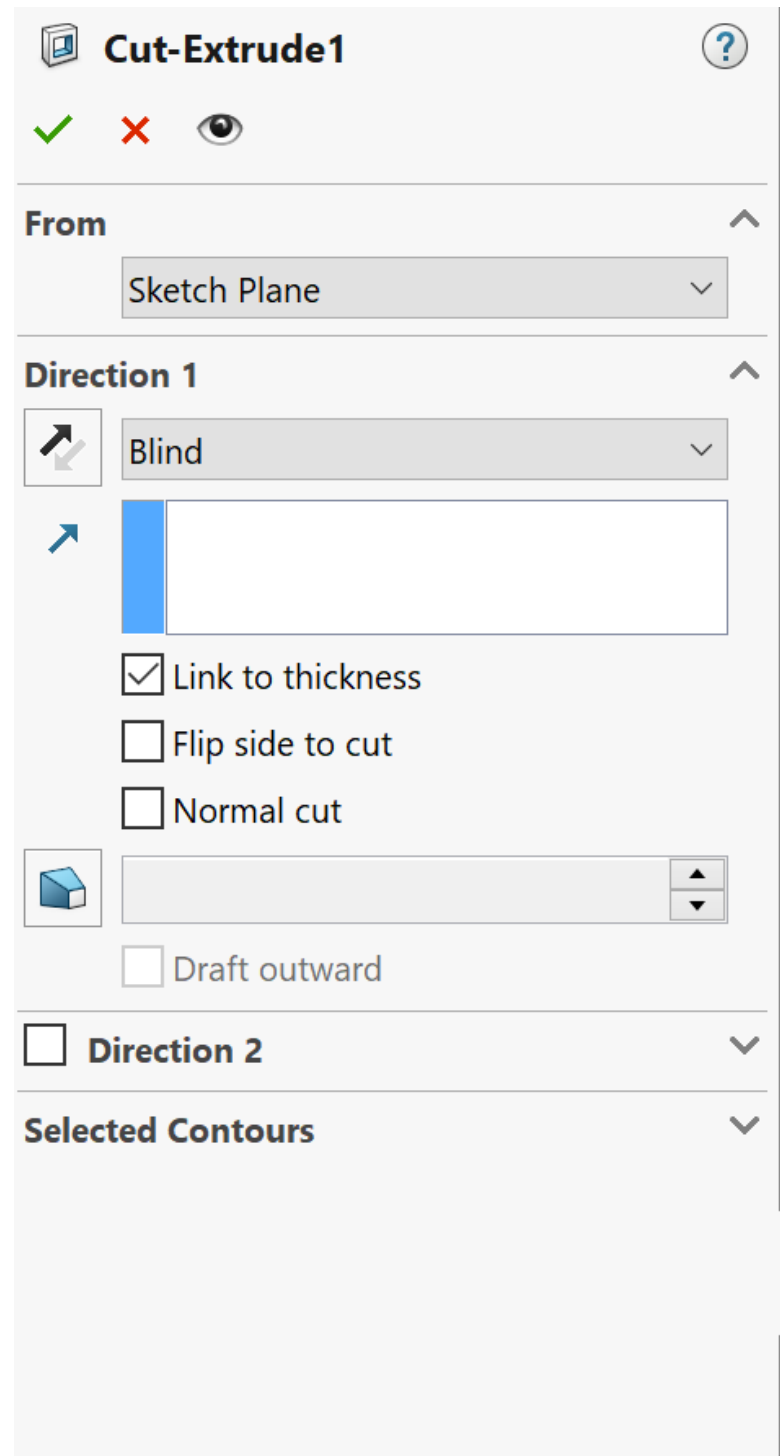
Mallinnus 1: Putkipidin



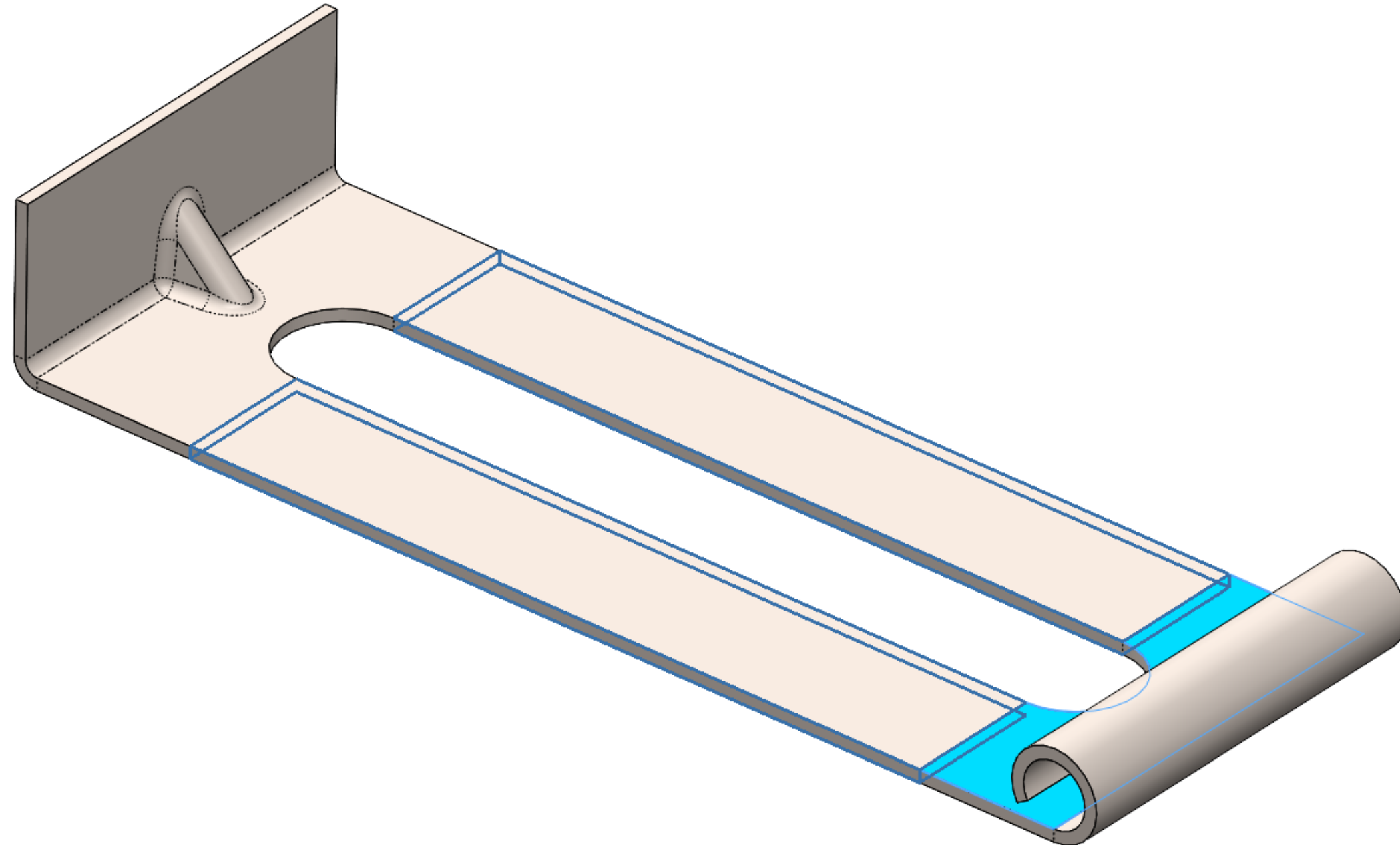
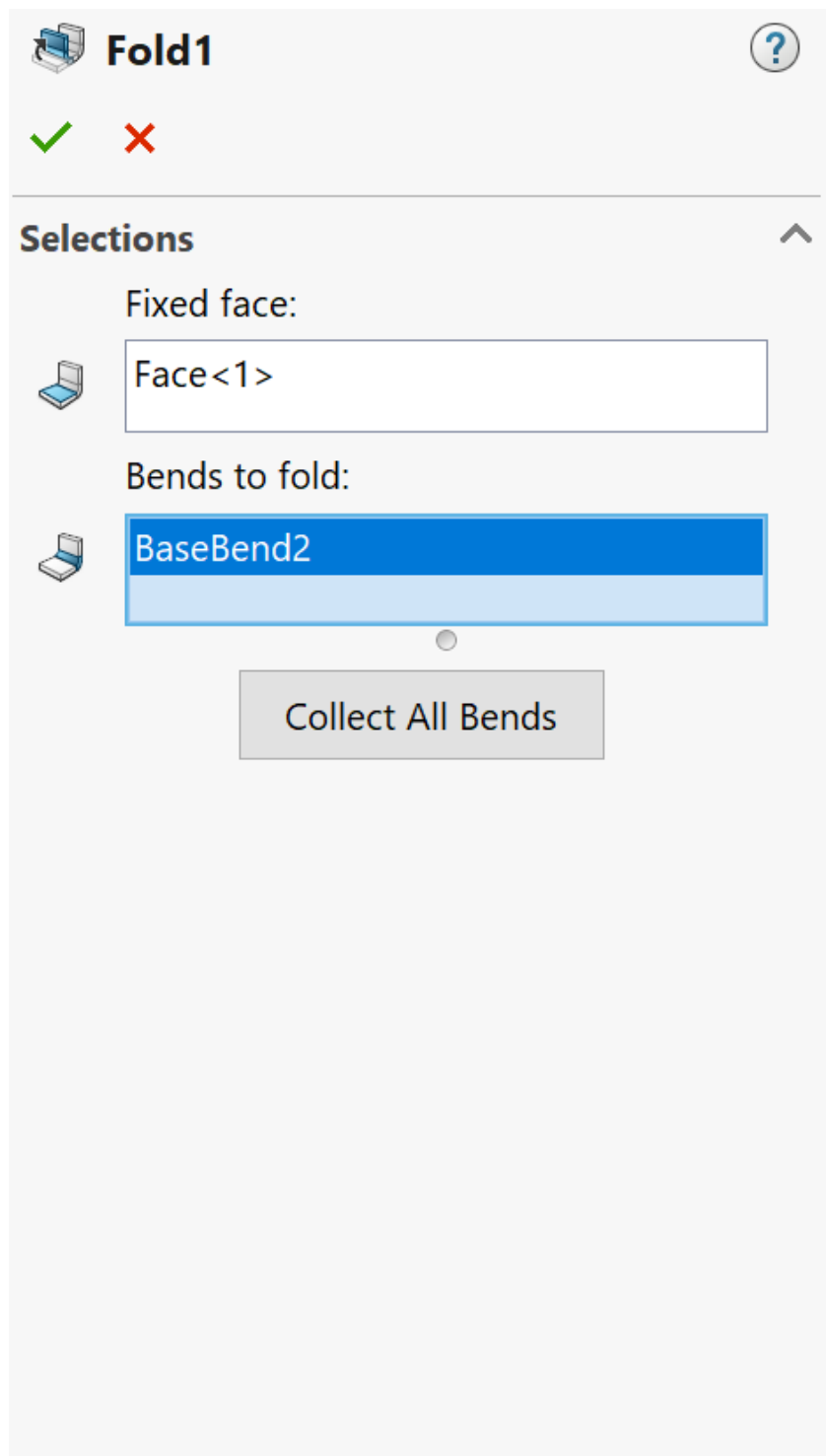
- Extruded Cut → Valitse pinta
- Sketch Entities → Straight Slot
- Smart Dimension → Width (10)
- Exit Sketch



Extruded Cut Properties → Blind → Link to thickness

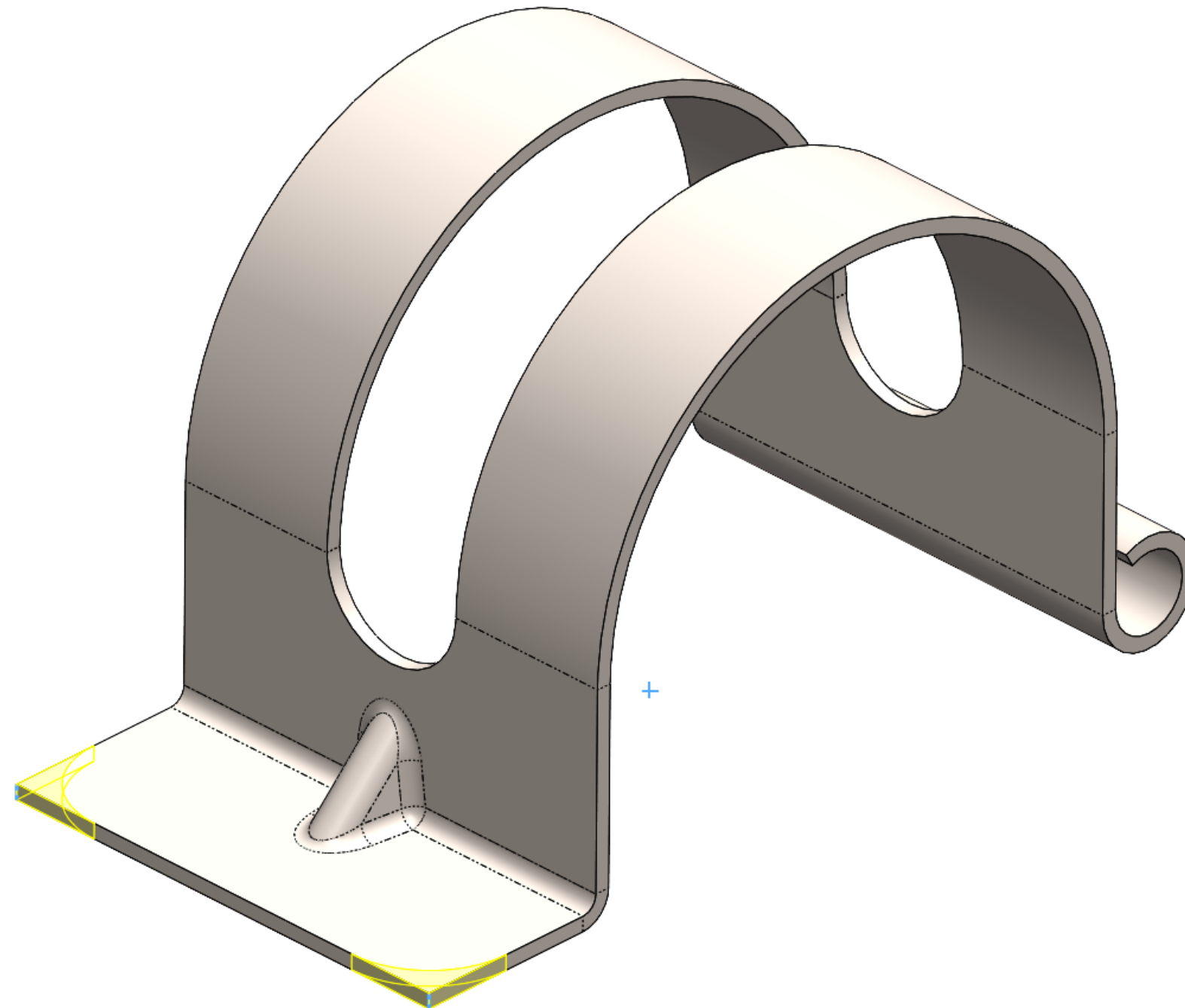
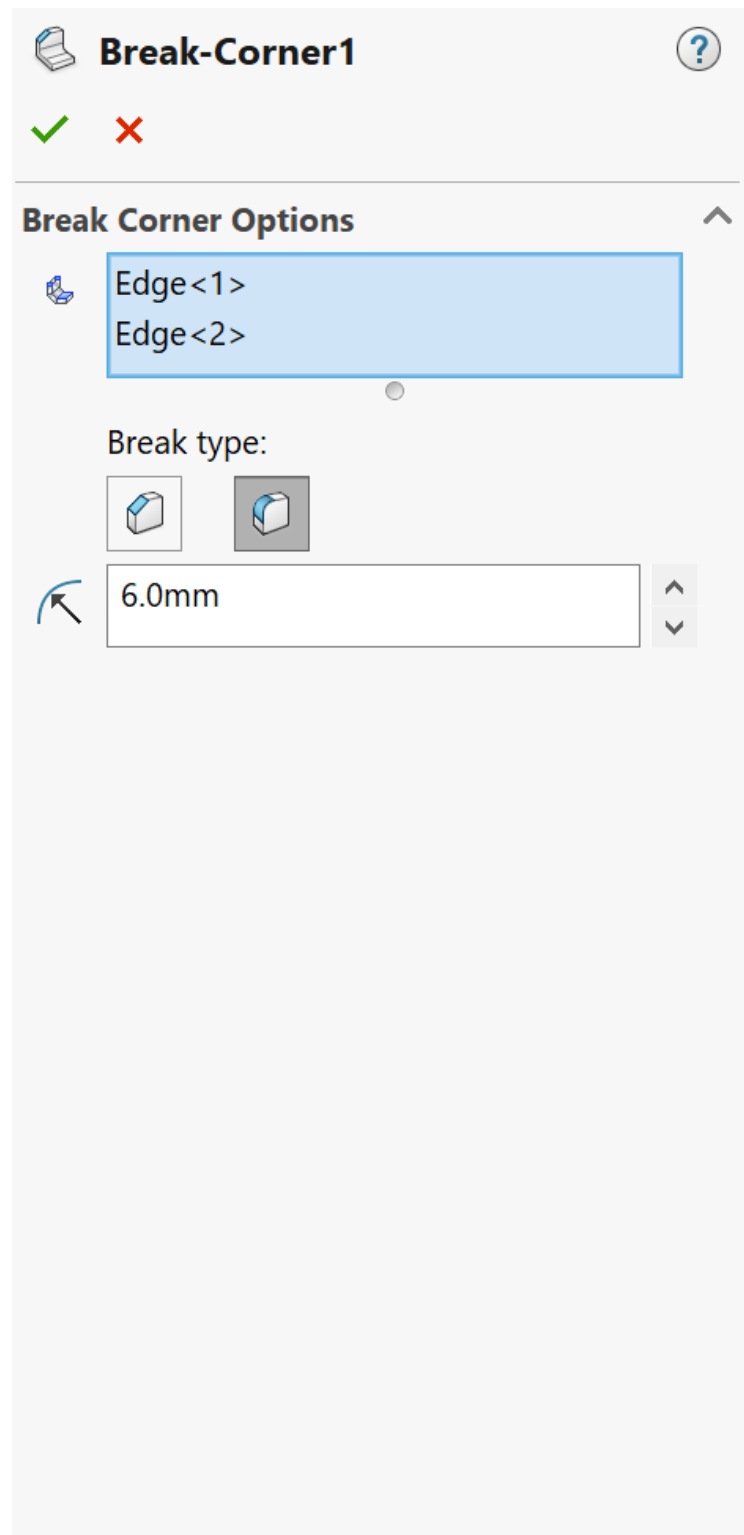


Fold → Fixed face → Bends to fold



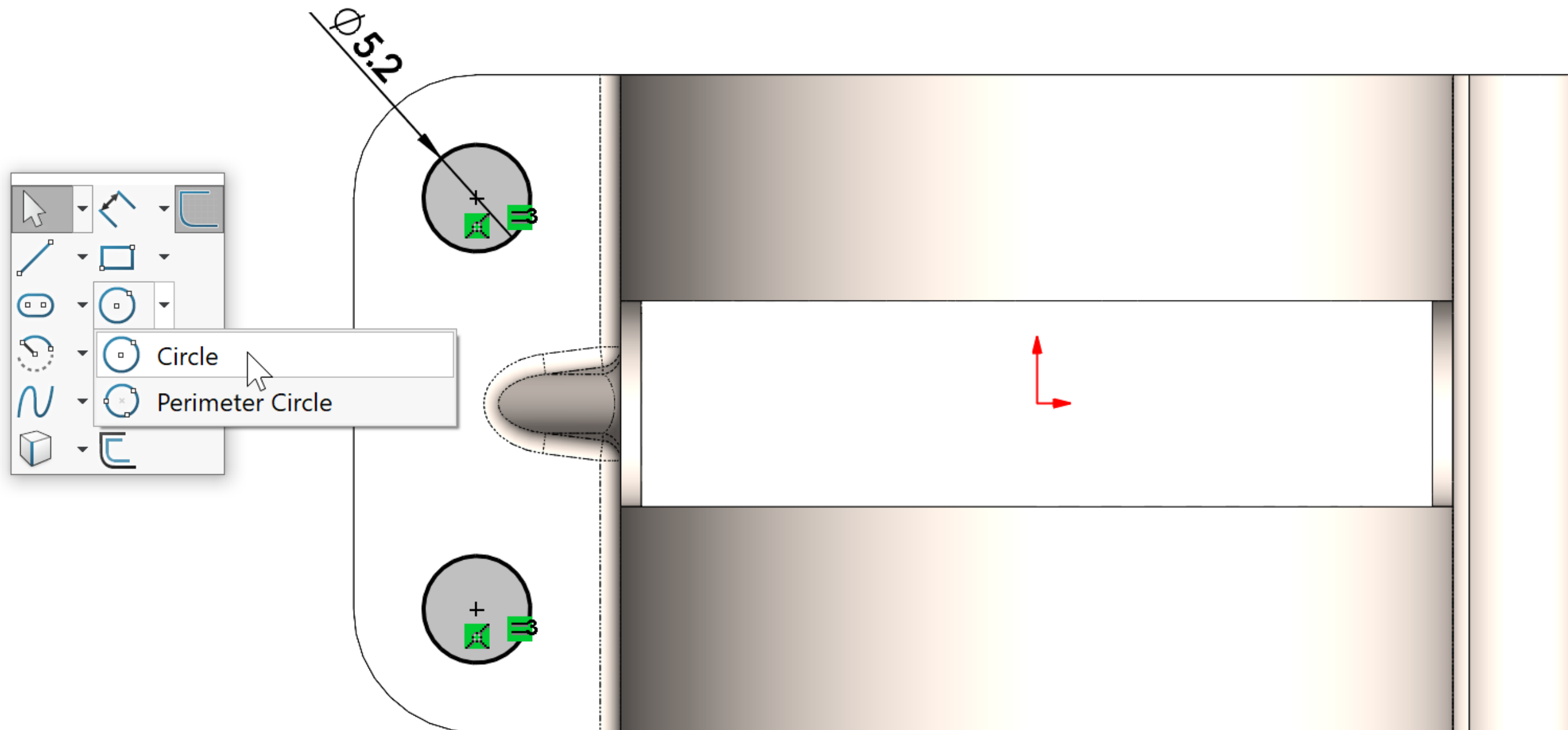


Break-Corner → Fillet (6)



Mallinnus 1: Putkipidin

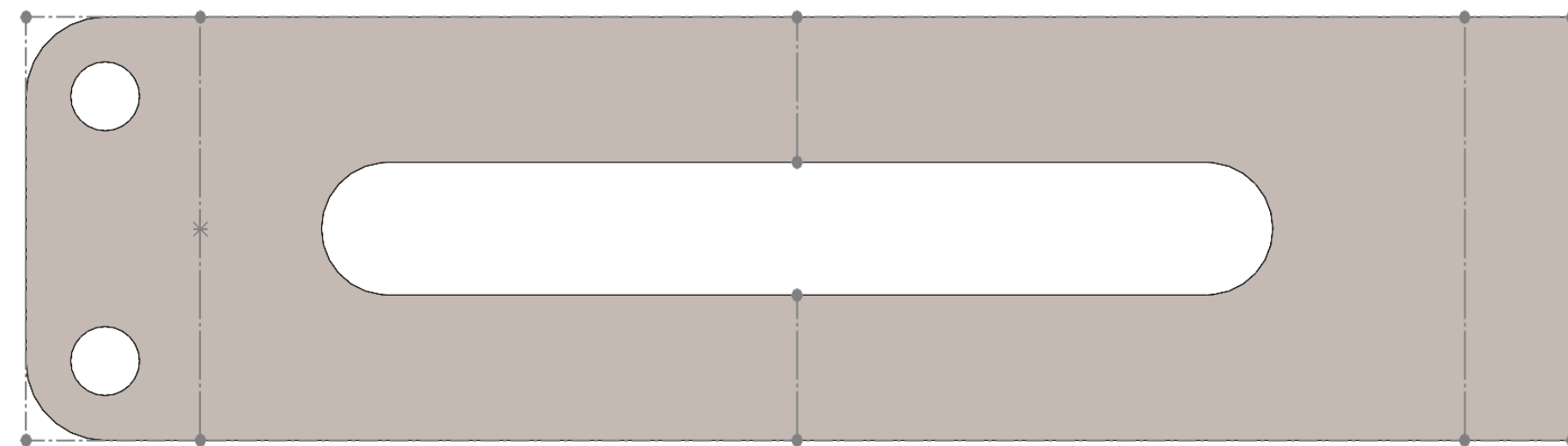
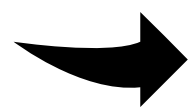
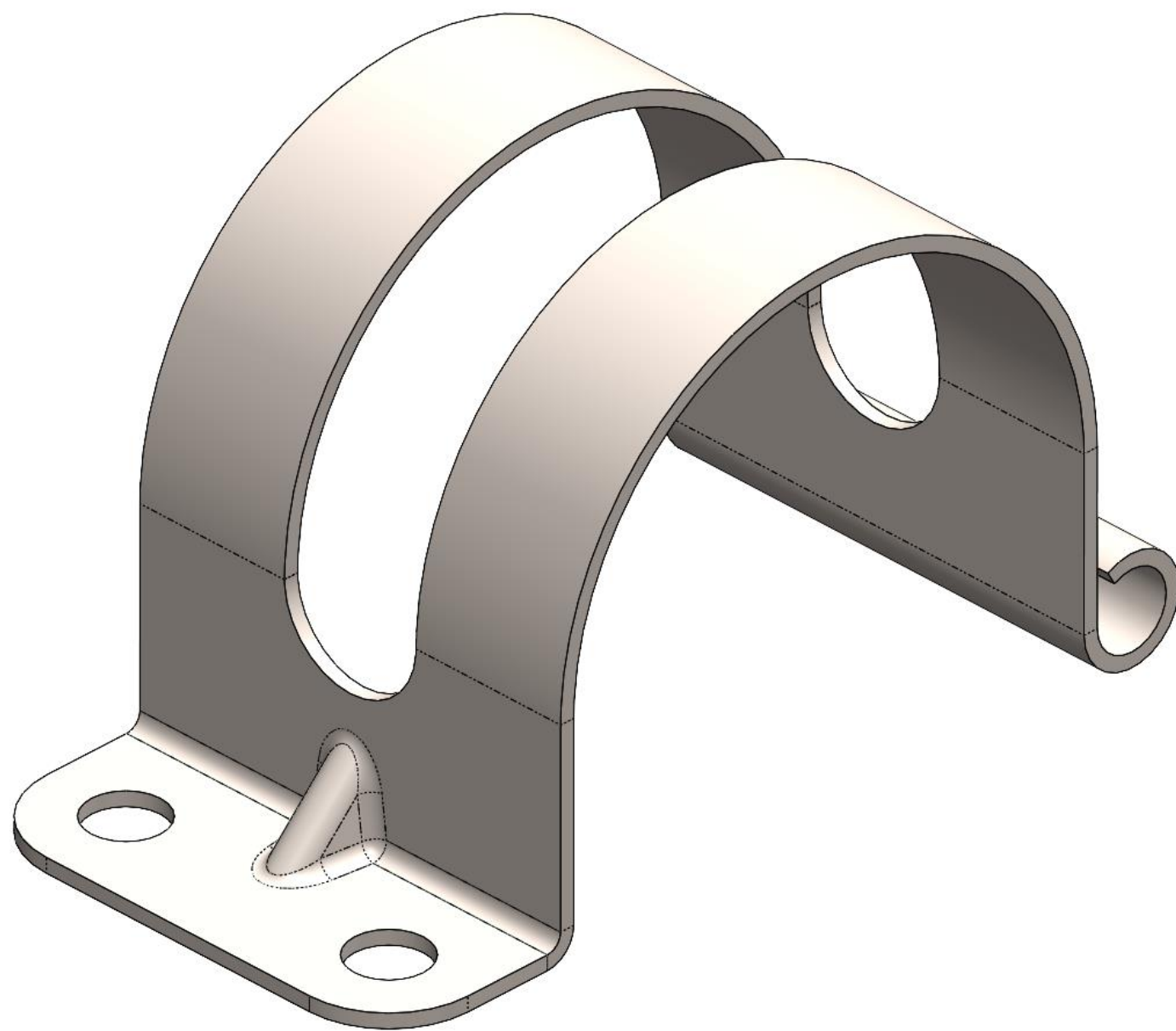
- Extruded Cut → Valitse pinta → Circle (5.2)
- Add Relation → Equal
- Exit Sketch



Mallinnus 1: Putkipidin



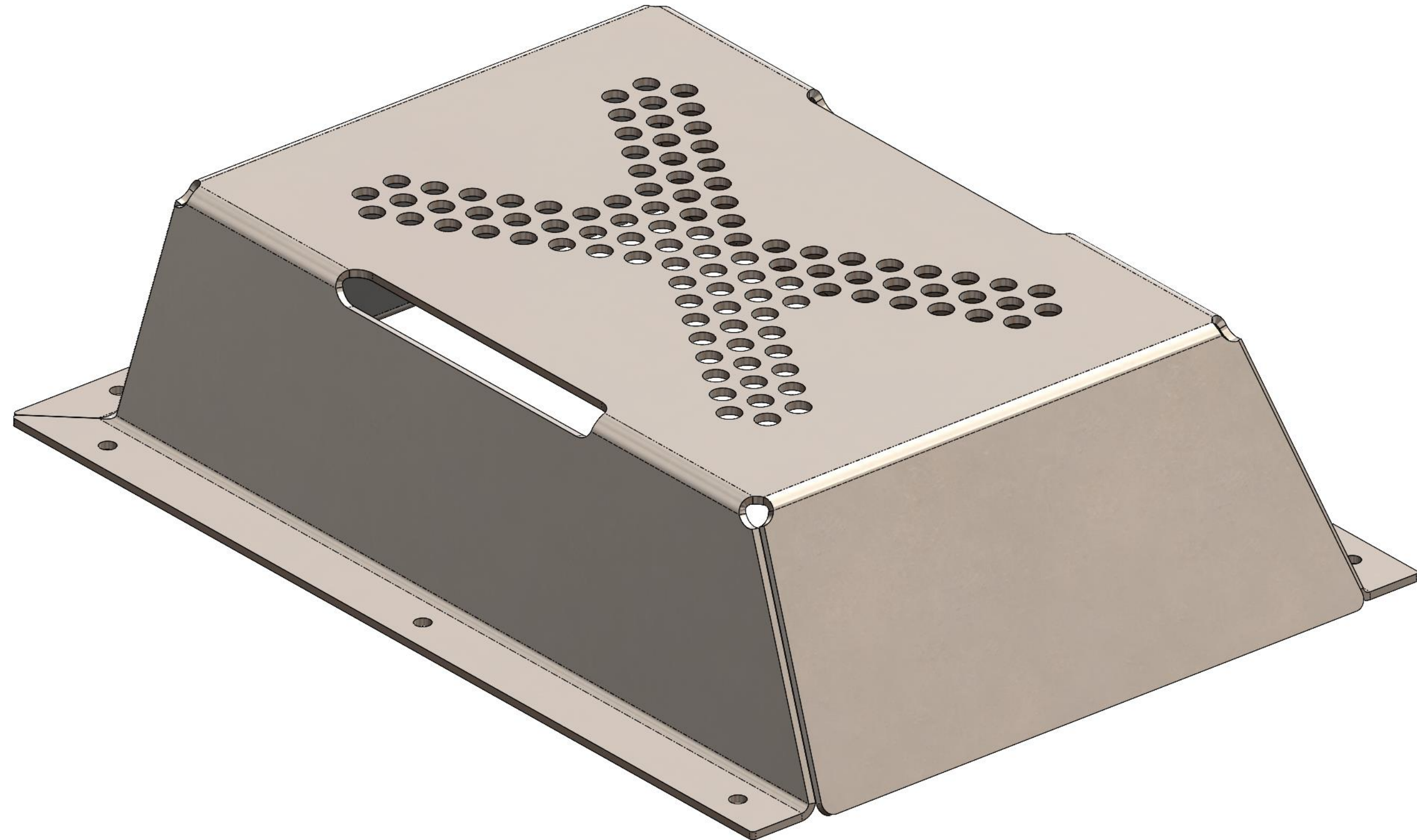
Flatten → Valmis malli!



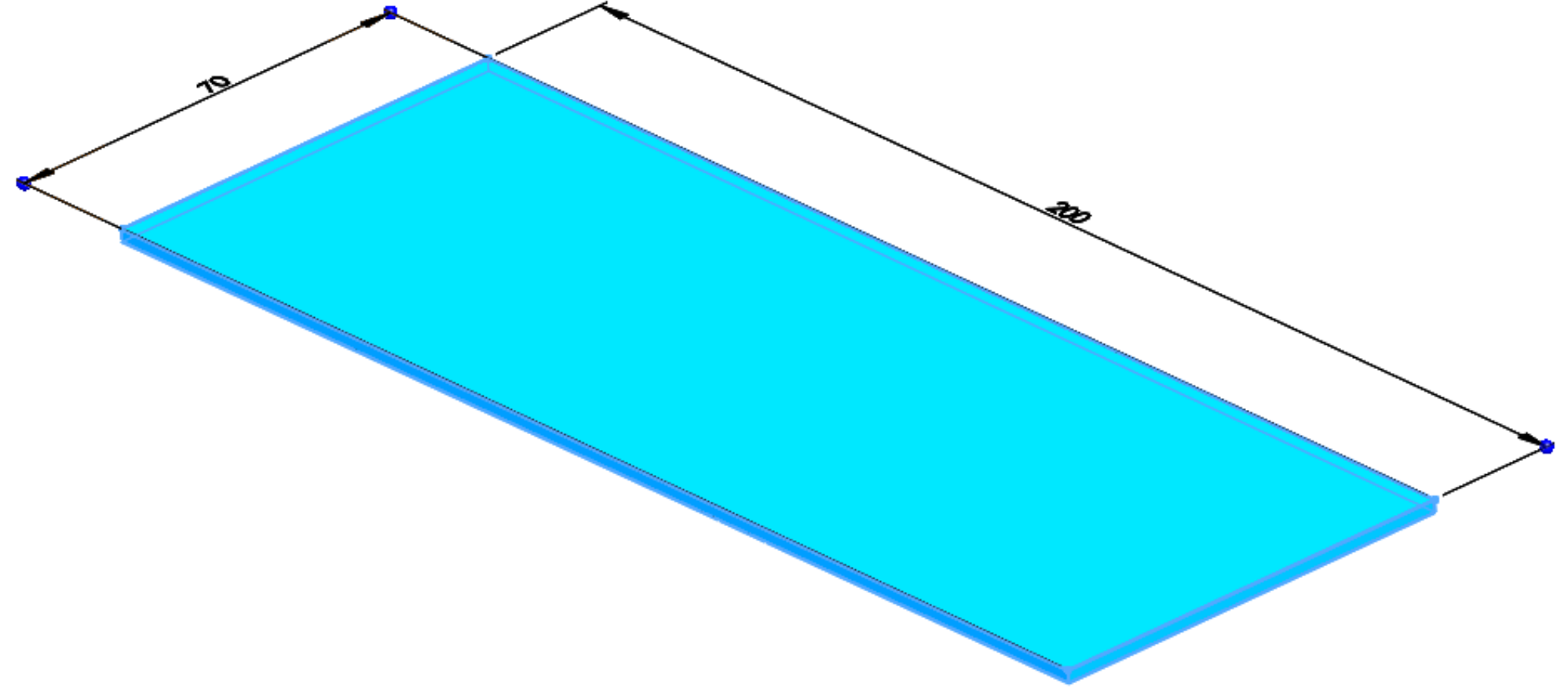
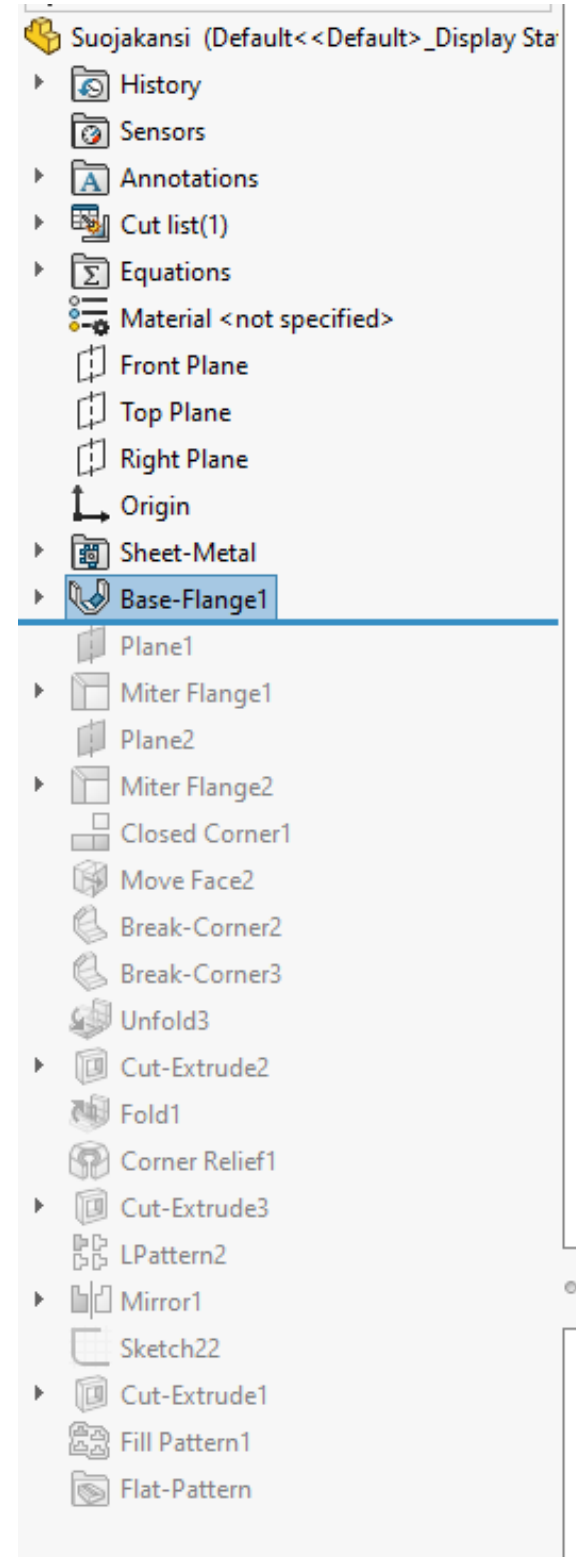
Mallinnus 2: Suojakansi



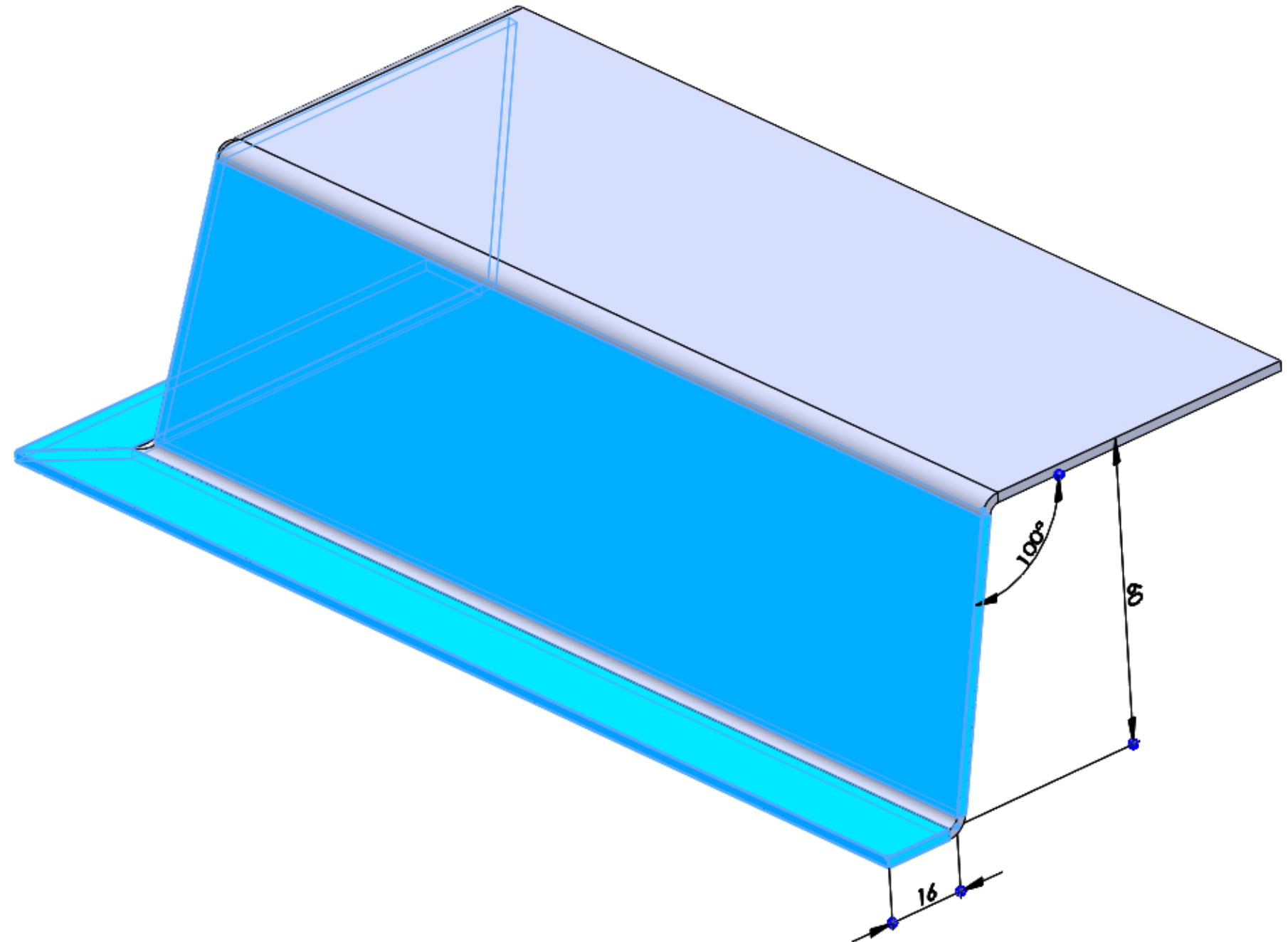
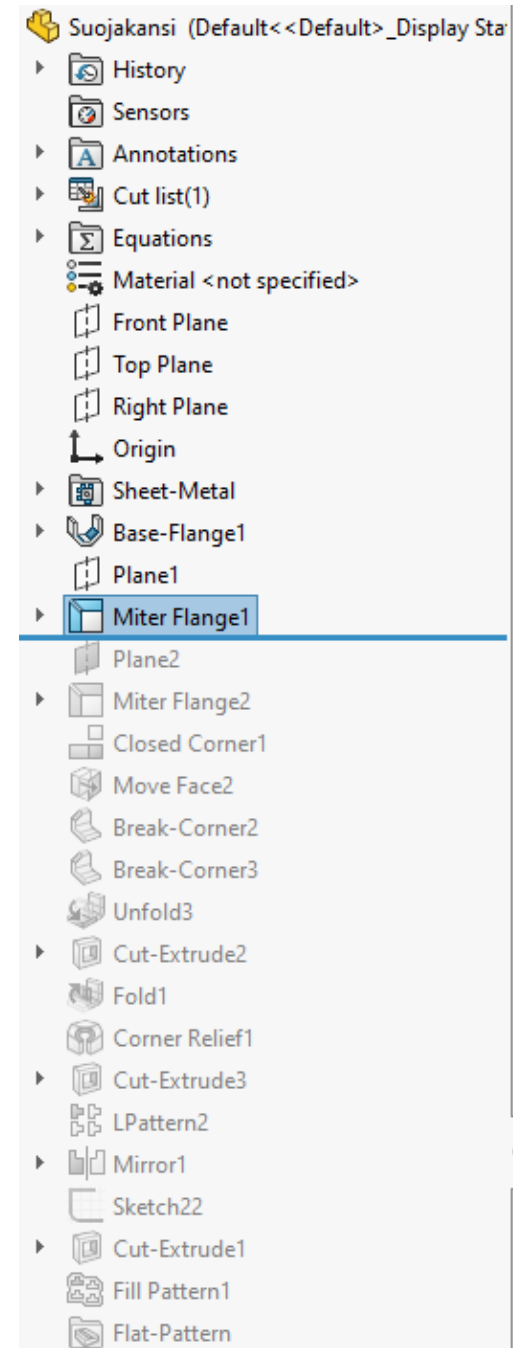
- Base Flange
- Miter Flange
- Closed Corner
- Move Face
- Break Corner
- Unfold/Fold
- Corner Relief



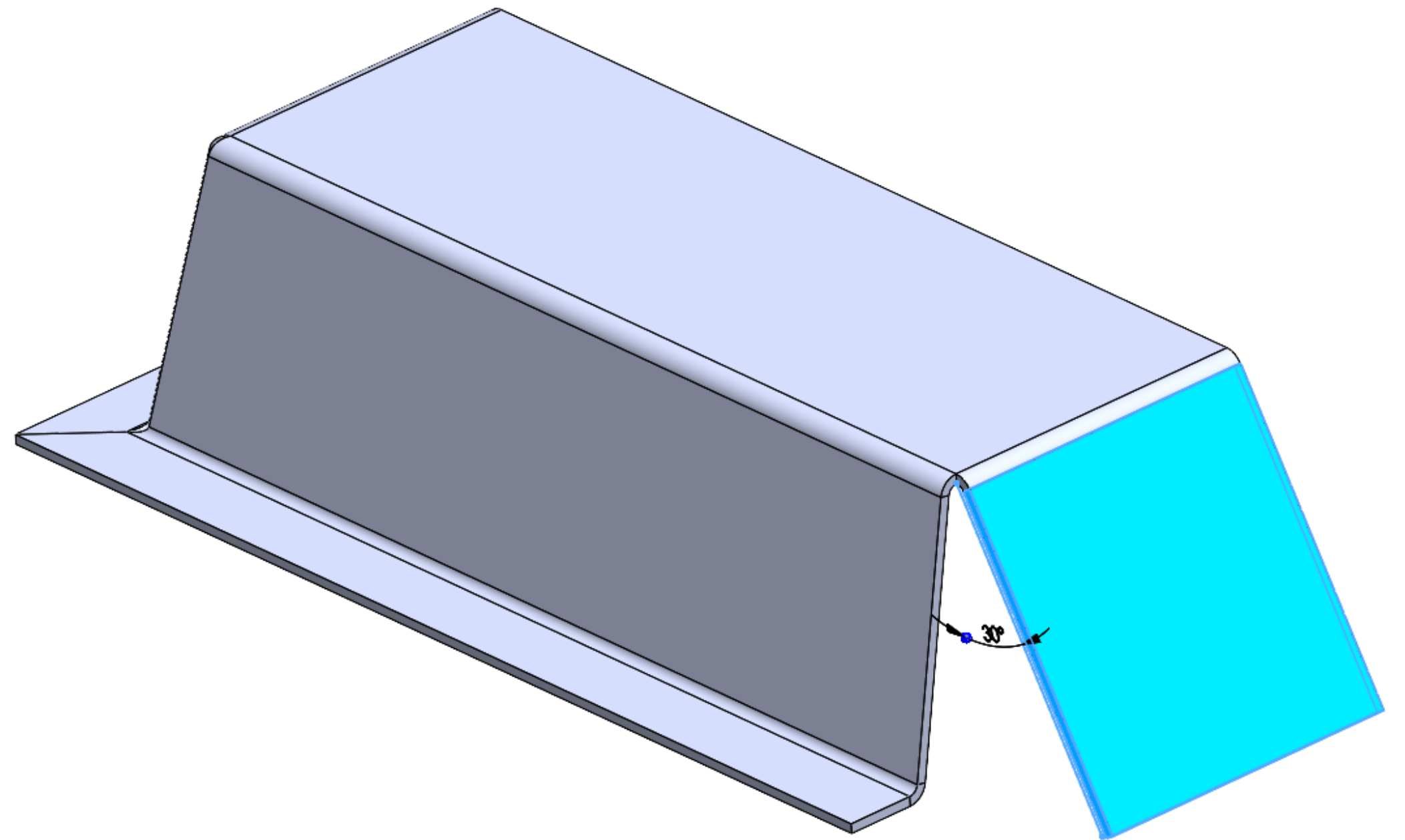
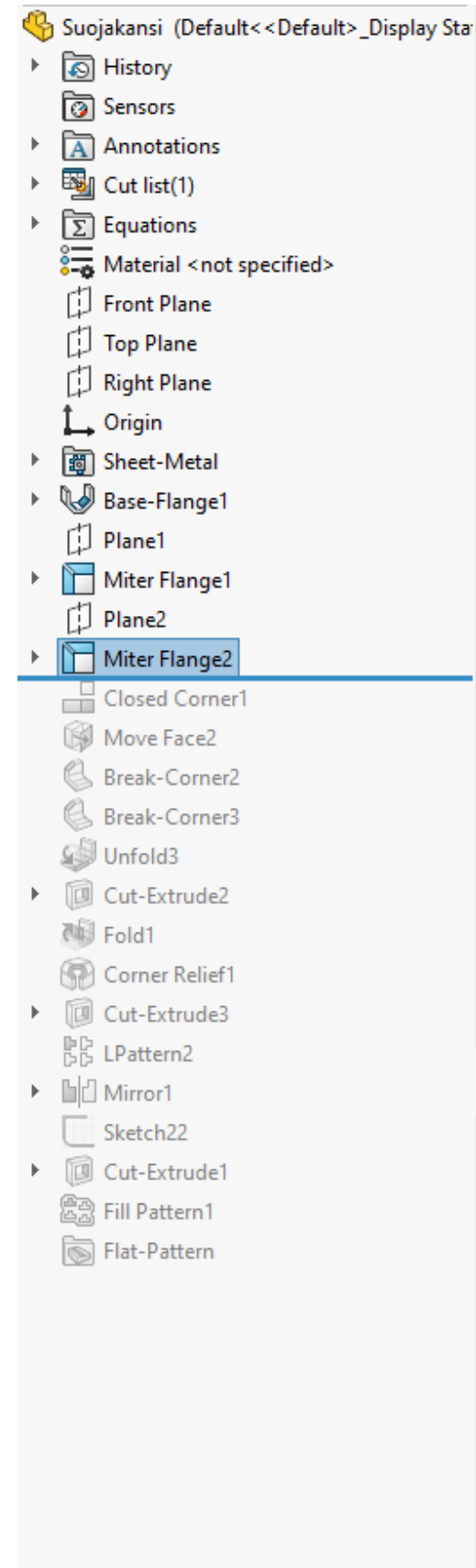
- Base Flange



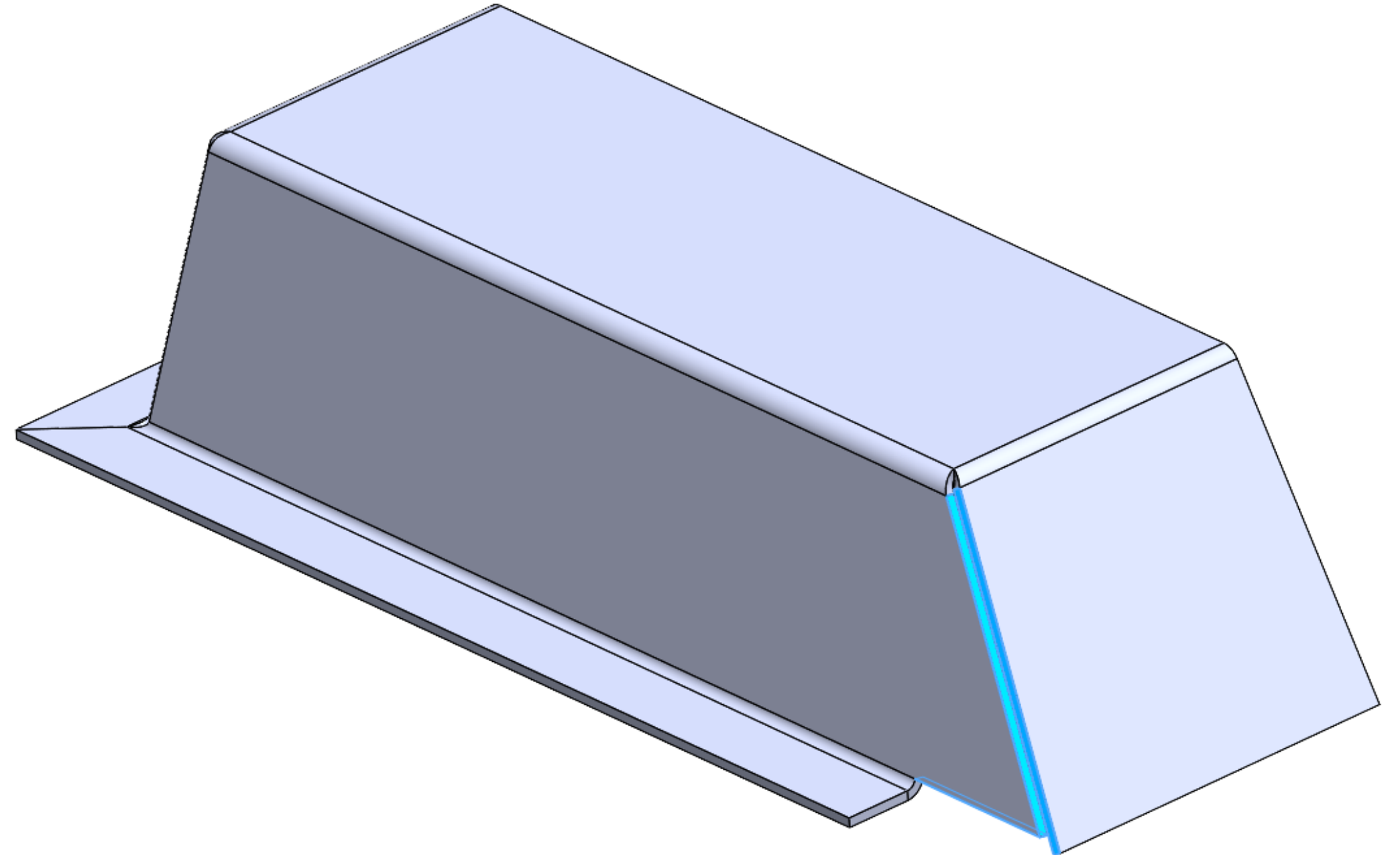
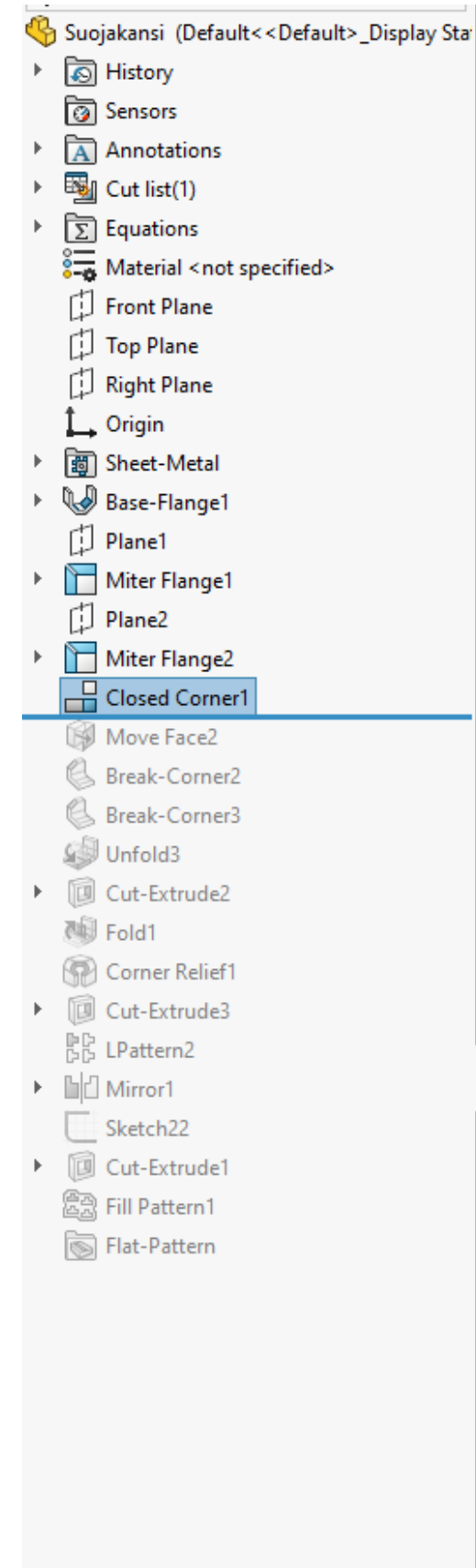
- Miter Flange 1



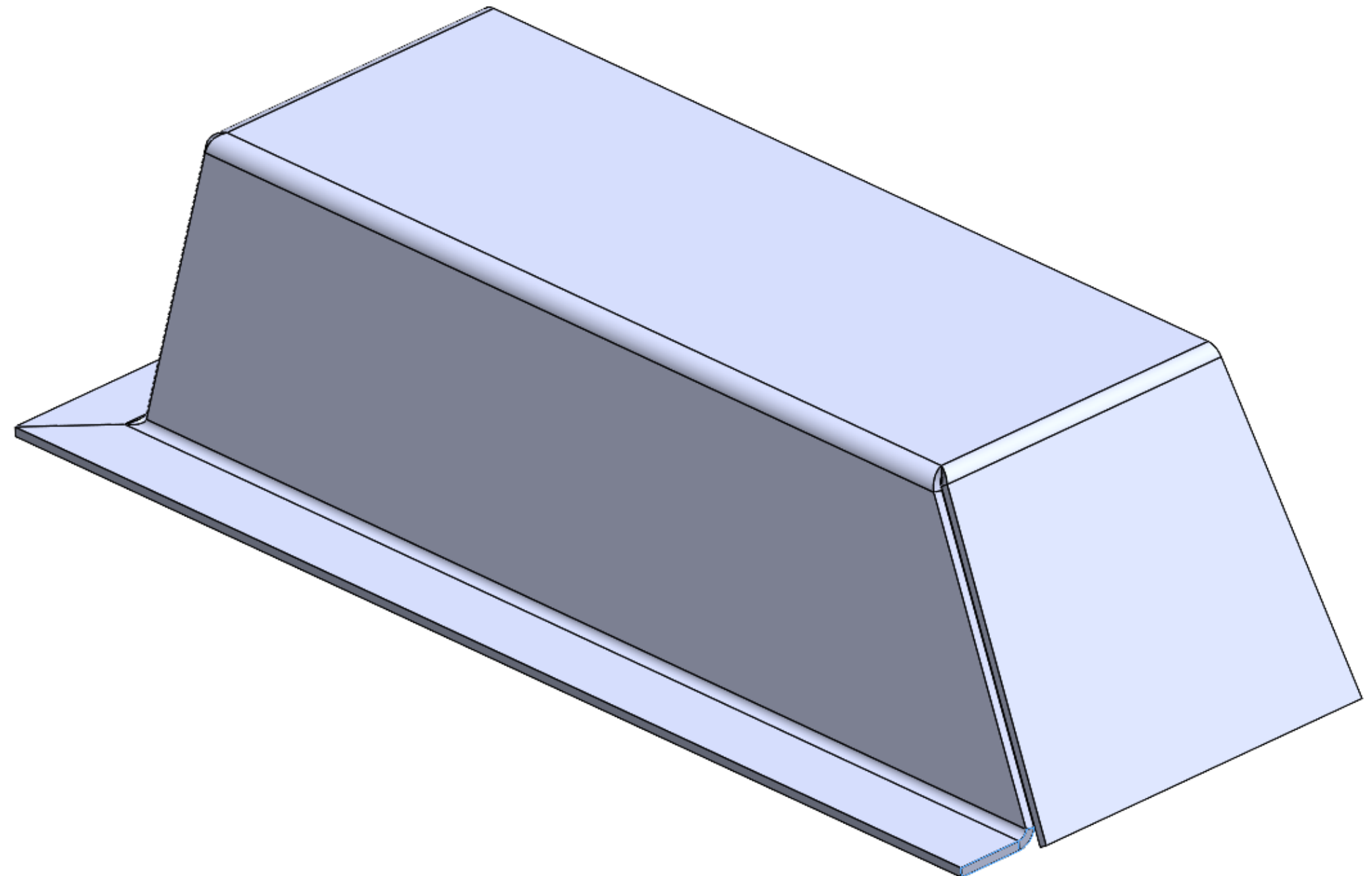
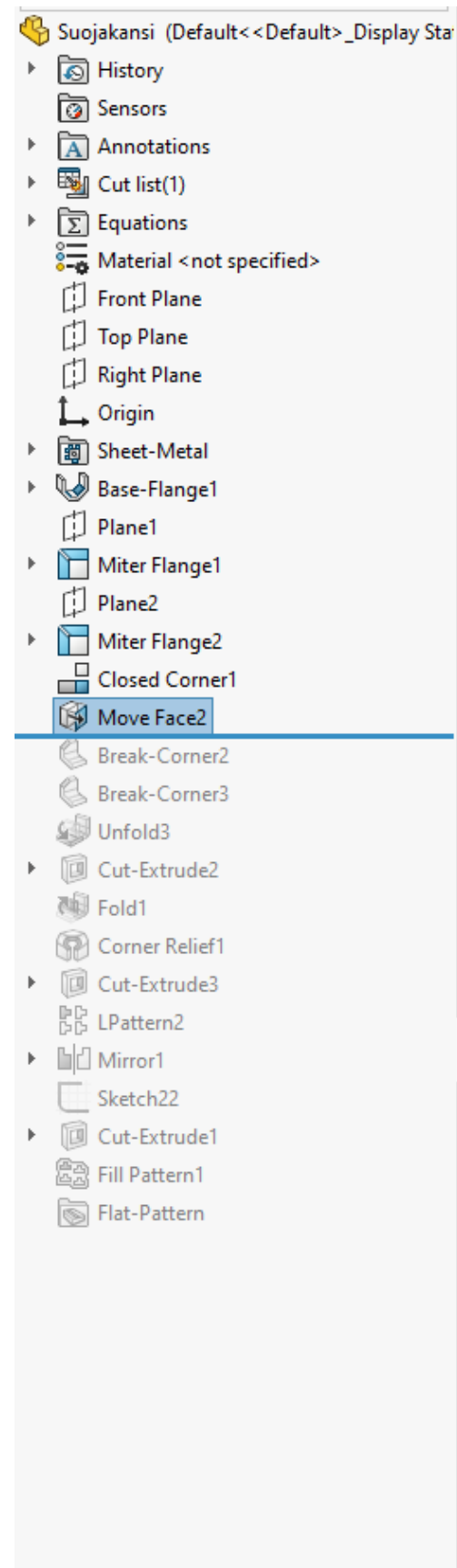
- Miter Flange 2



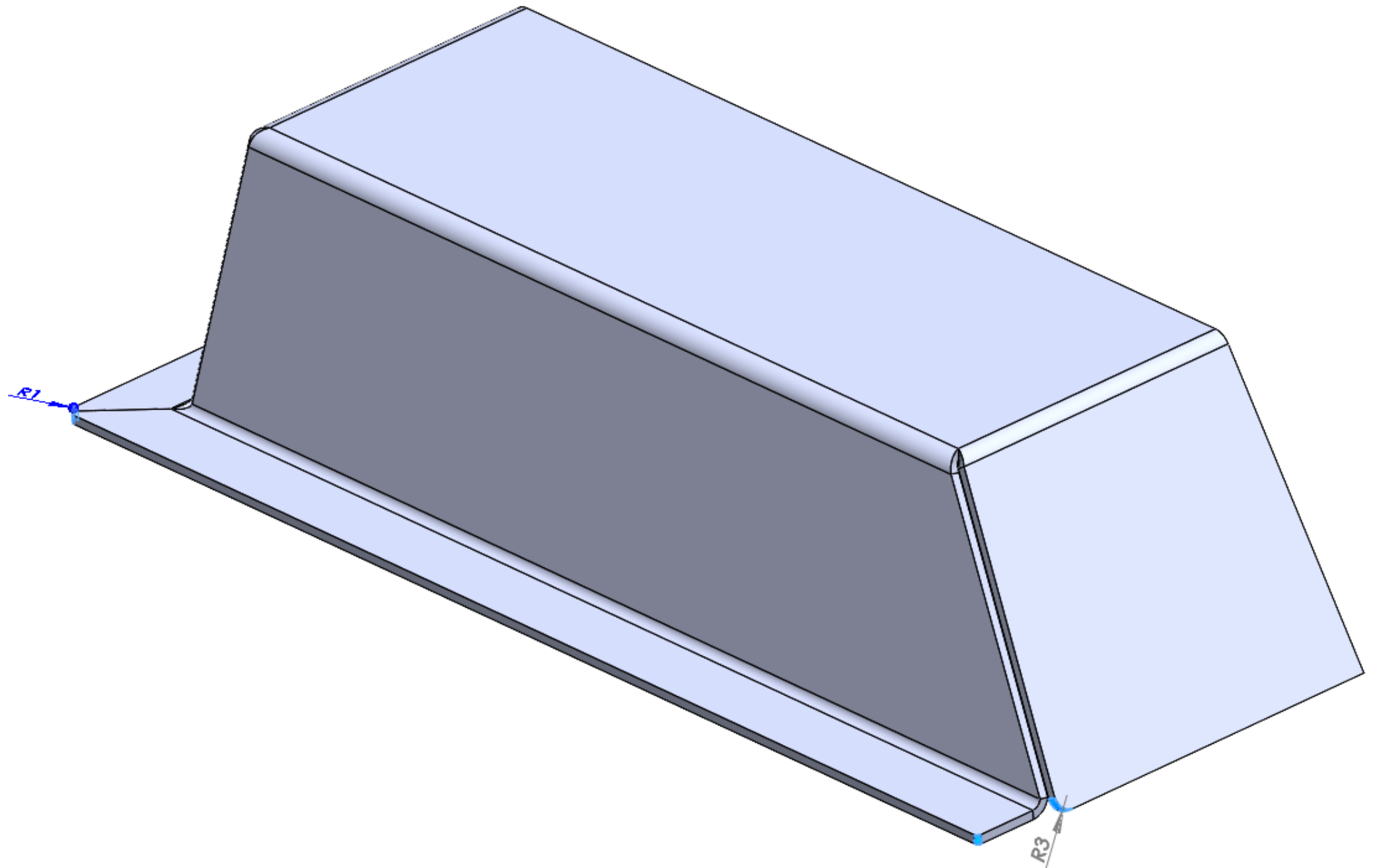
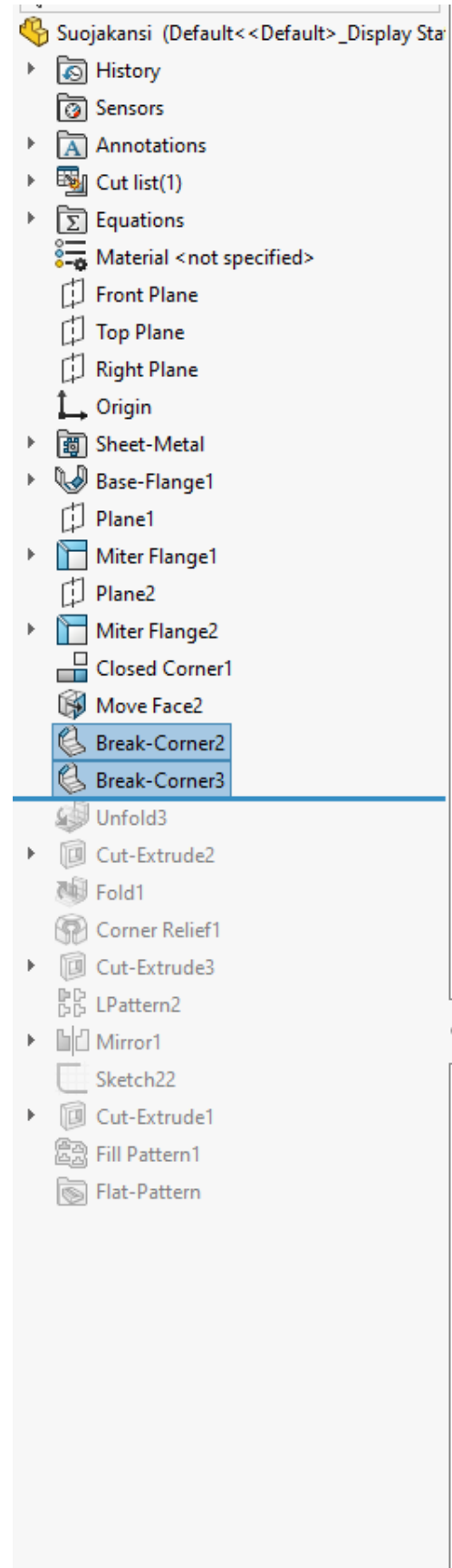
- Closed Corner



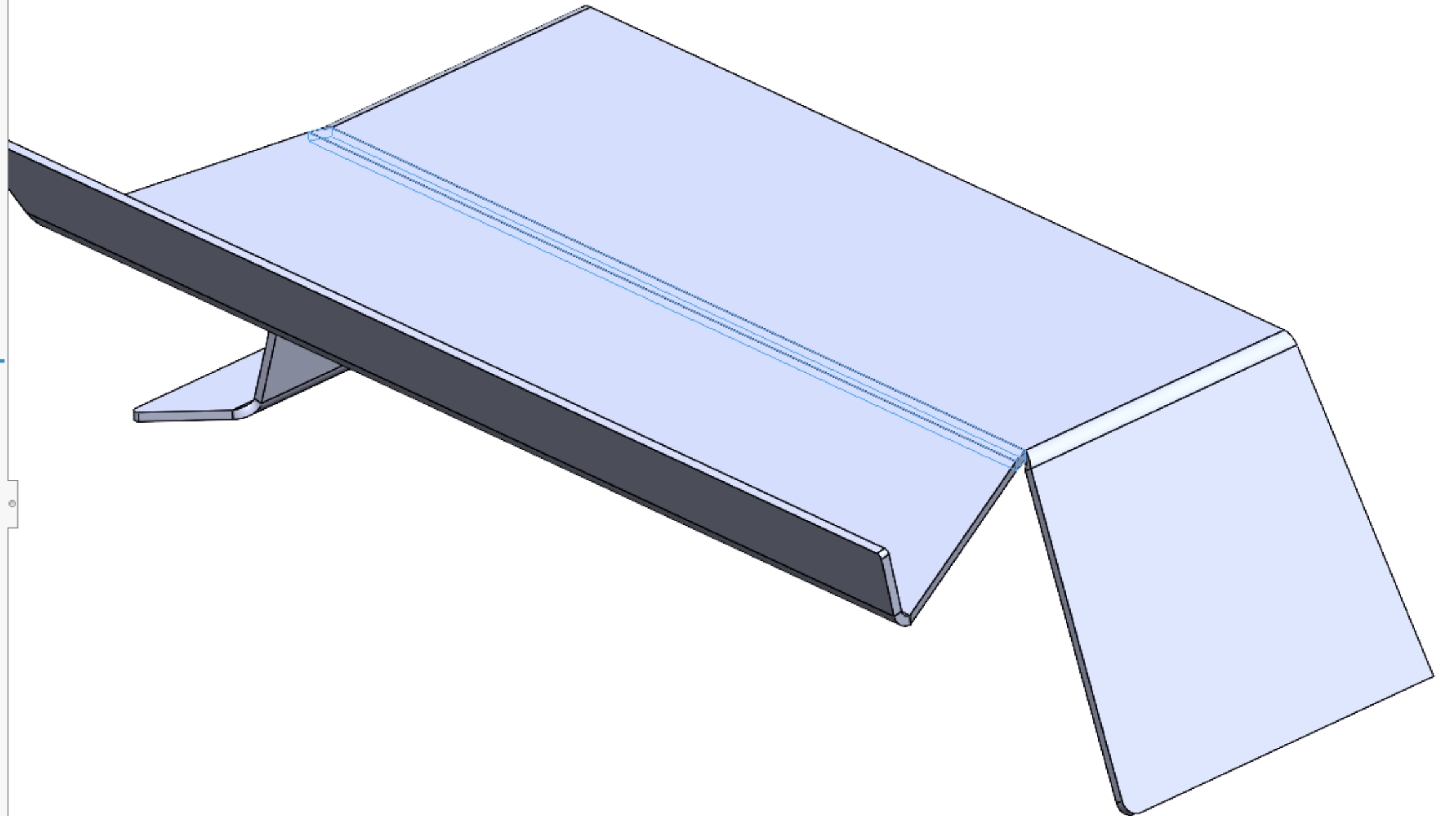
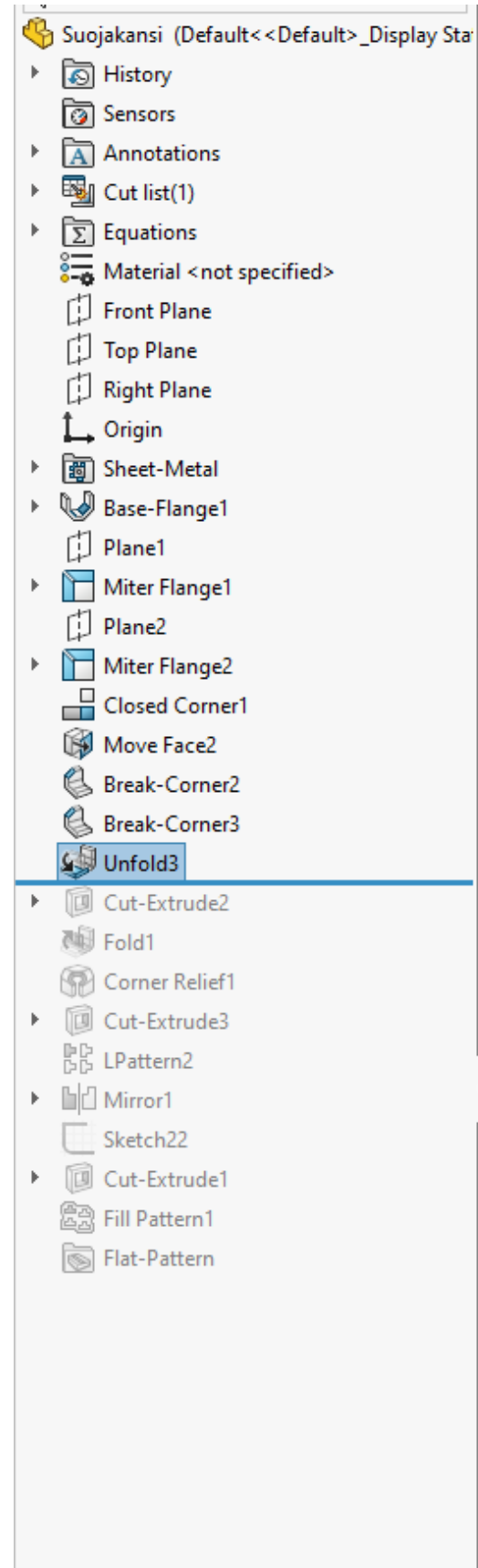
- Move Face



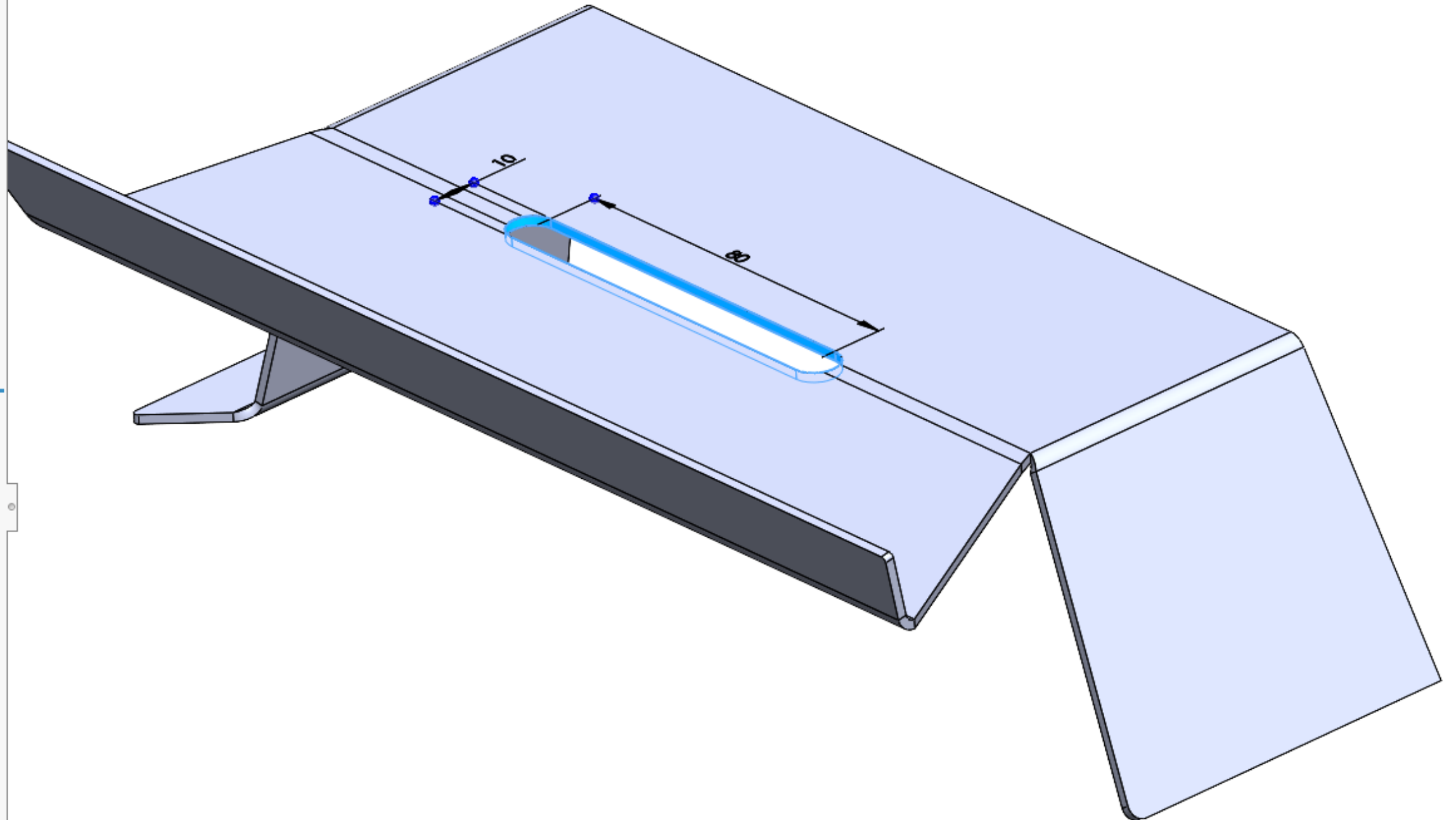
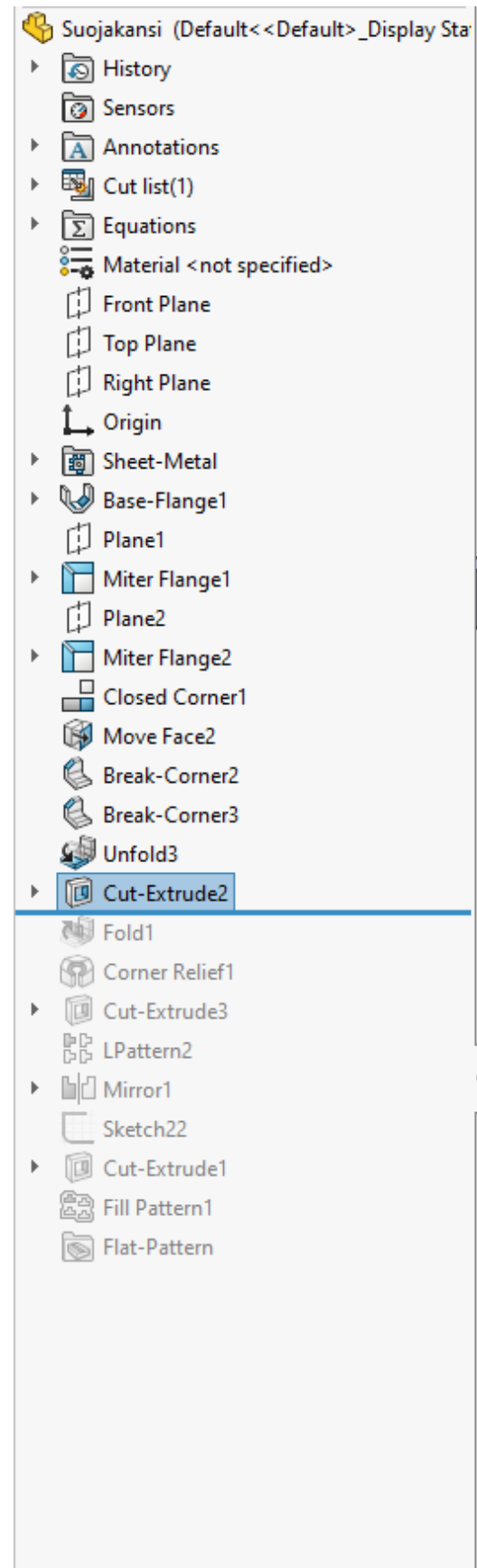
- Break Corner



- Unfold



- Cut -> Fold



- Corner Relief

Corner Relief

Message

 Create corner relief by selecting sheet metal body and collect all corners or manually define corner

Corner Type

☒ 2 Bend Corner

☐ 3 Bend Corner

Scope

 Fold1

Corners

 Corner1 [Circular]

 Corner2 [Circular]

 Collect all corners

Define Corner

 Face<1>

 Face<2>

 New Corner

Relief Options

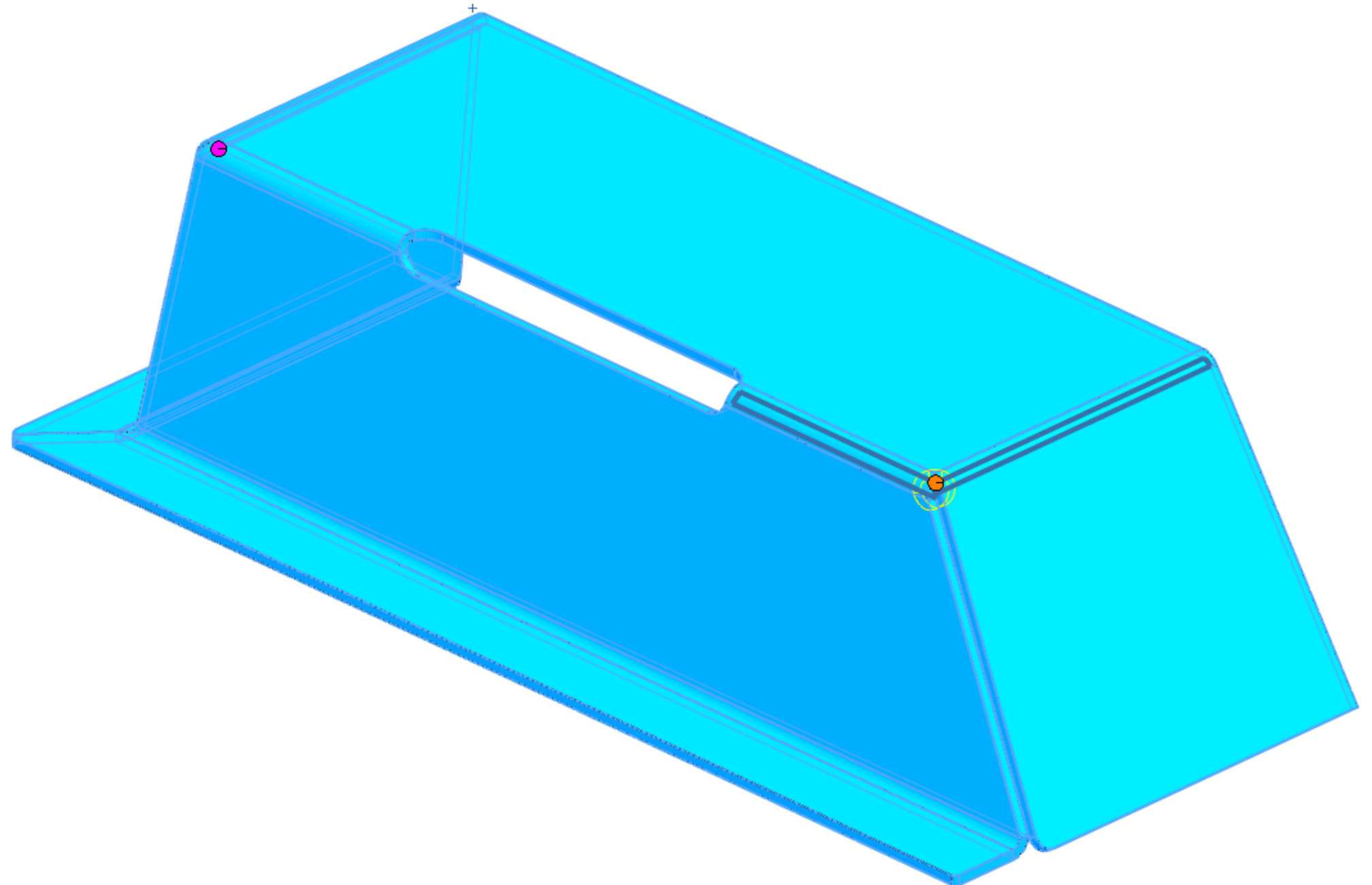
 Circular

☒ Centered on bend lines

 4.0mm

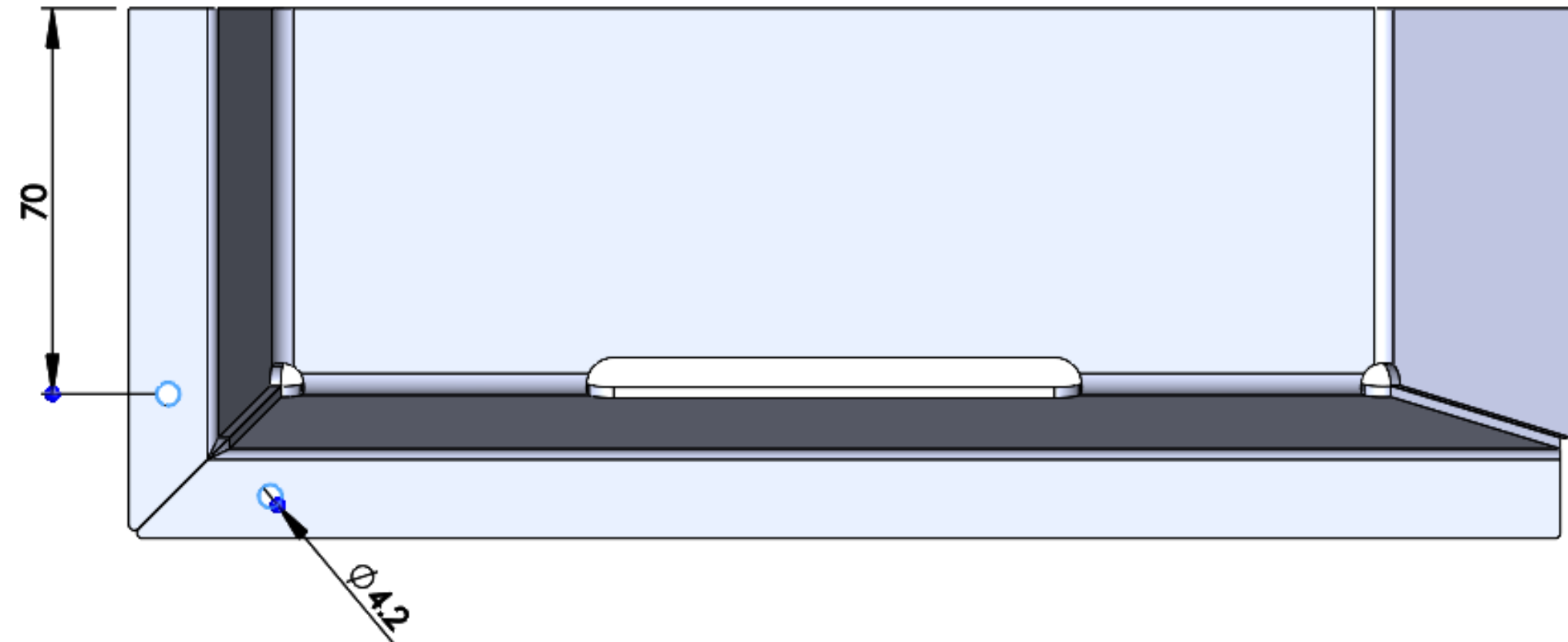
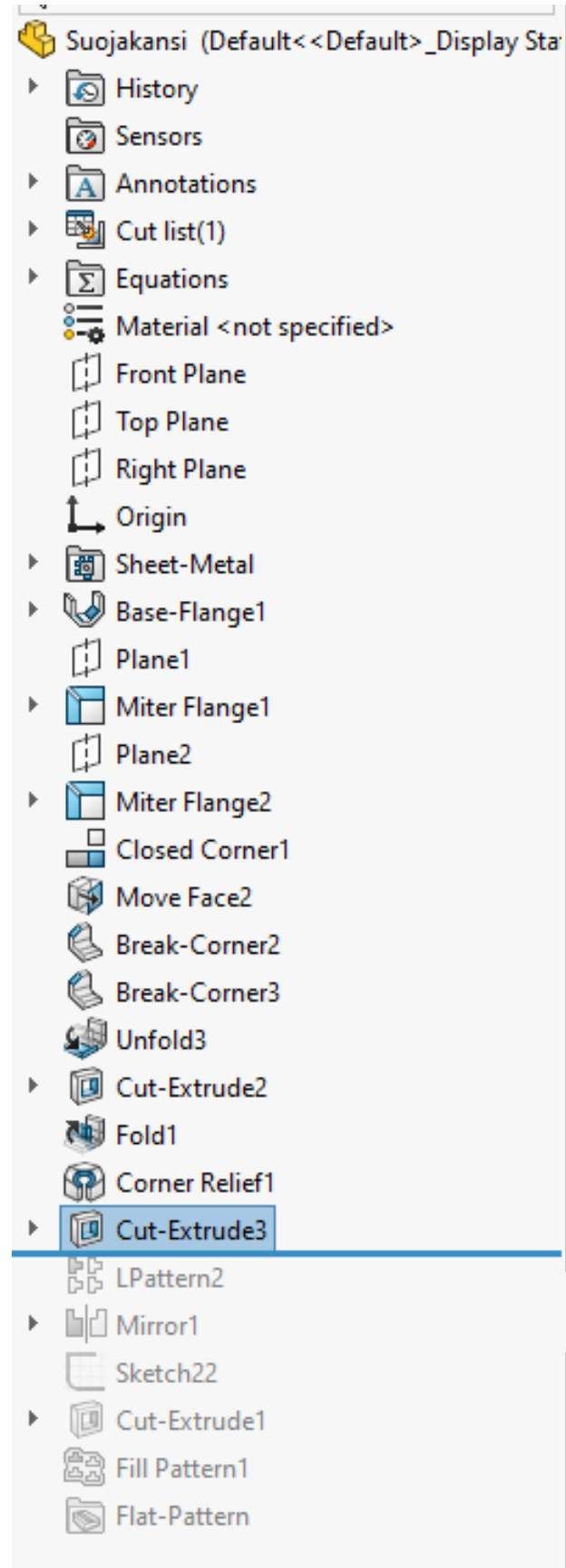
☐ Ratio to thickness

☐ Tangent to bend



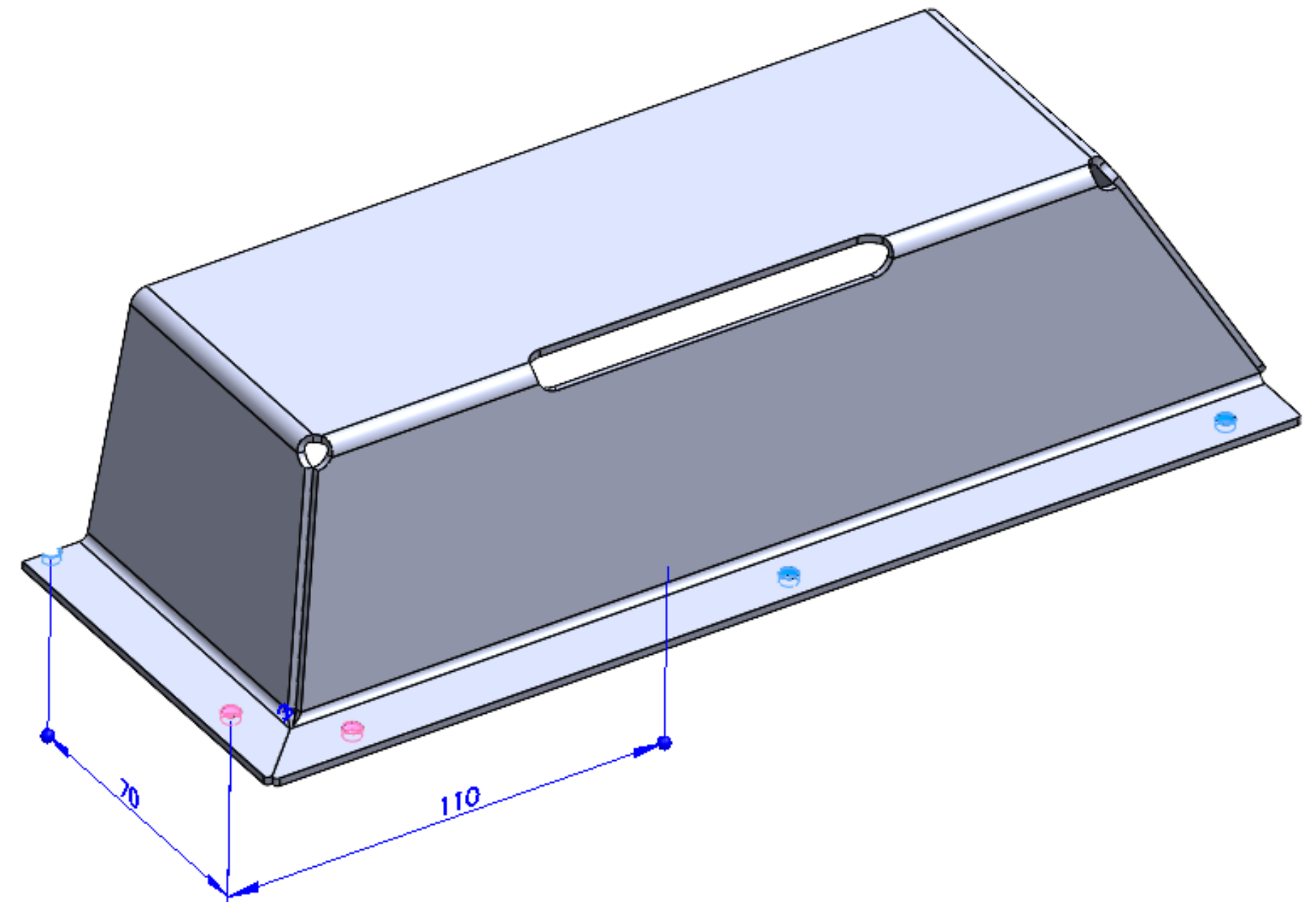
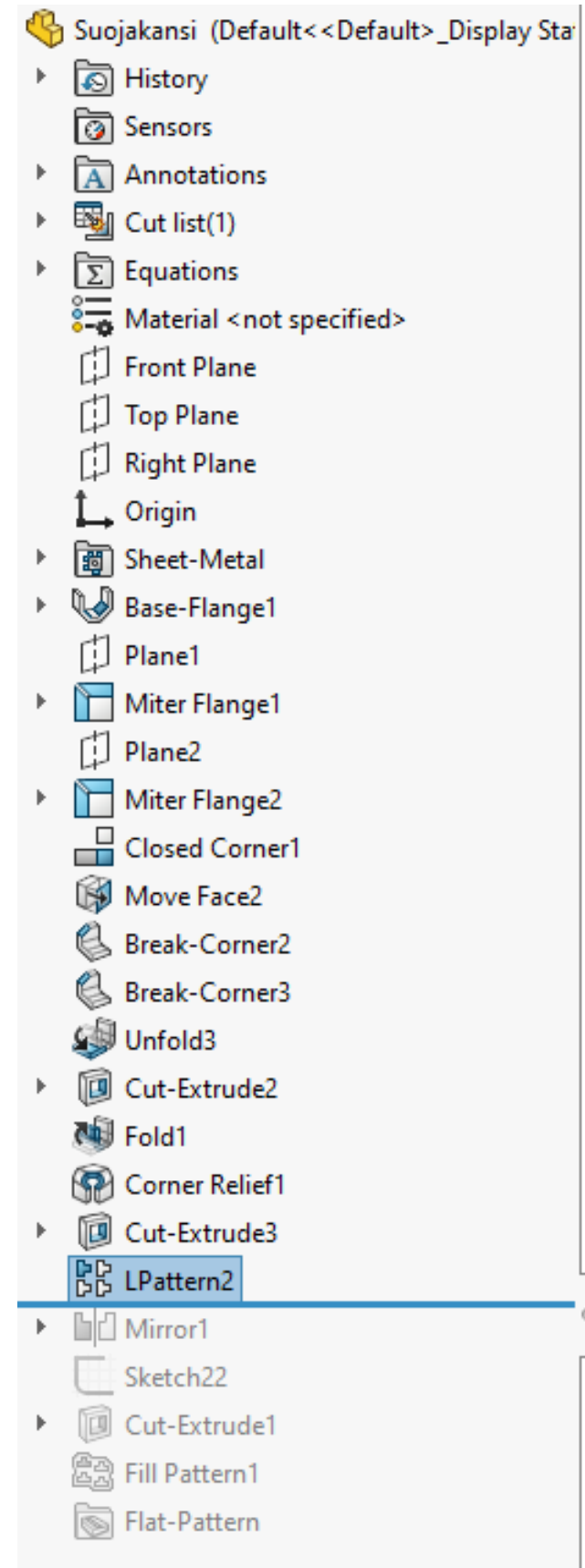
Mallinnus 2: Suojakansi

- Cut

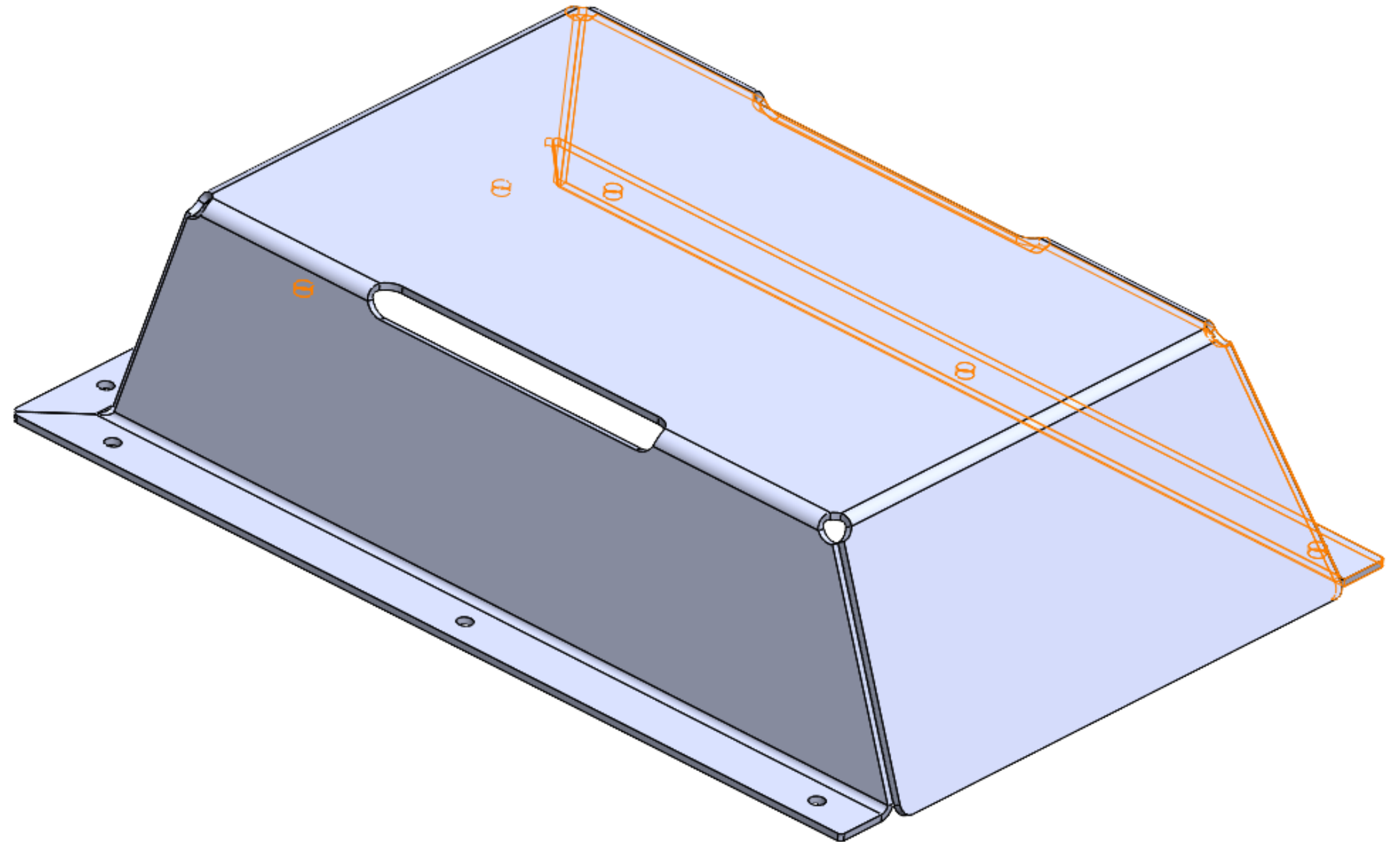
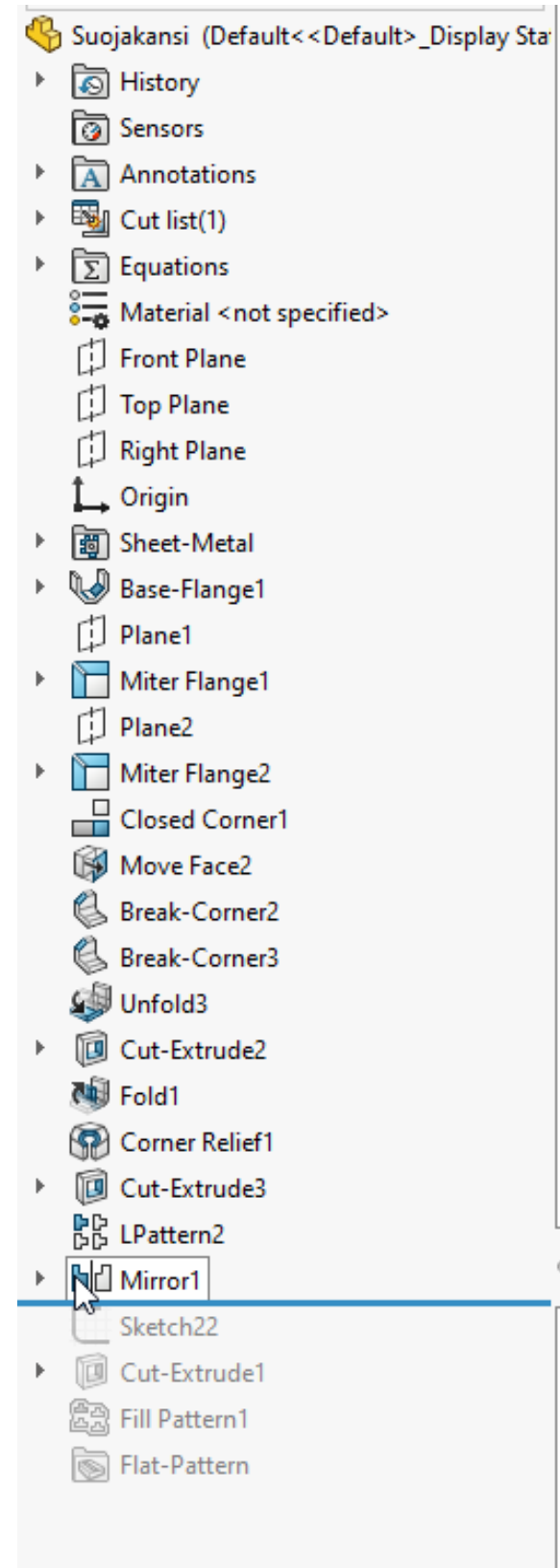


Mallinnus 2: Suojakansi

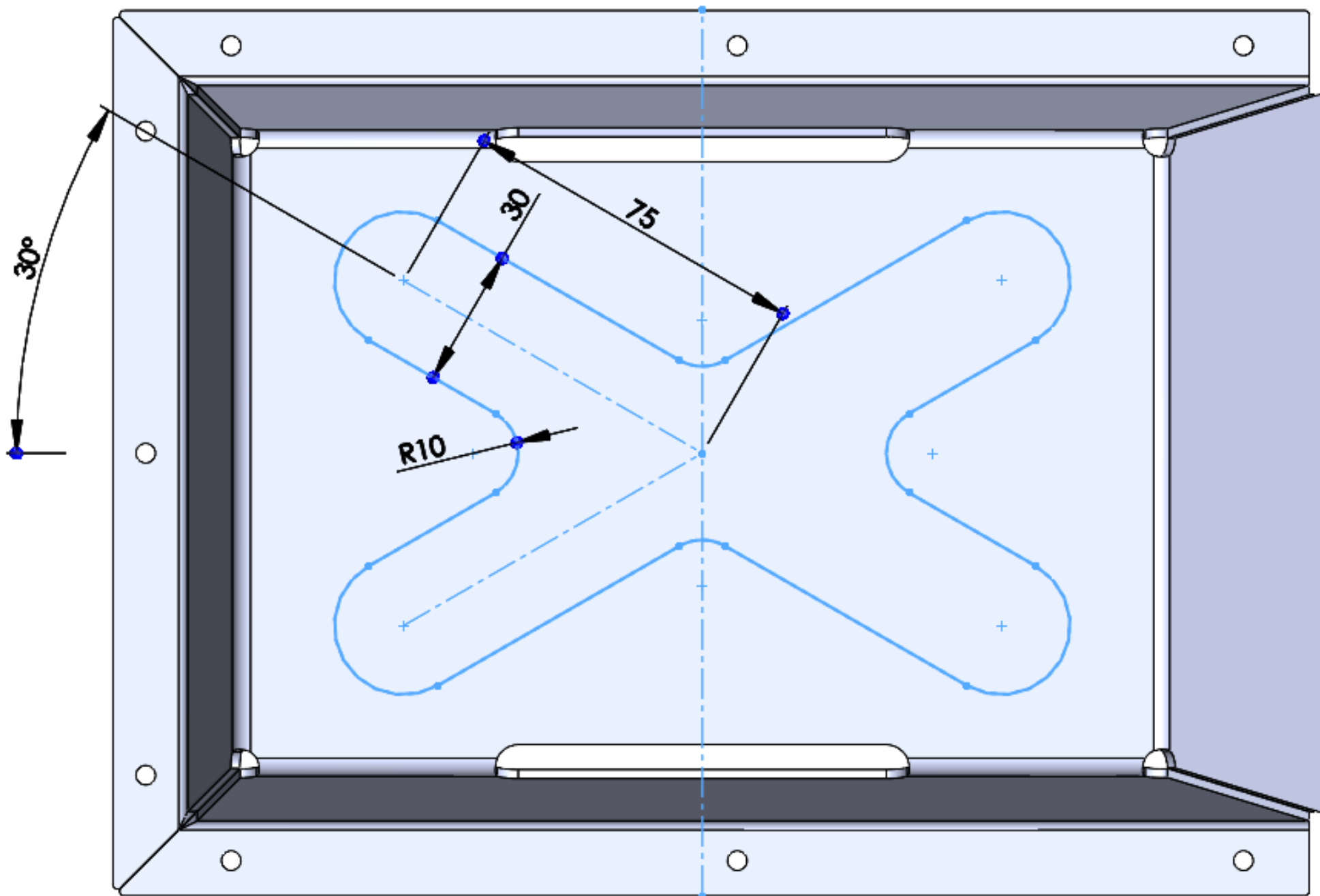
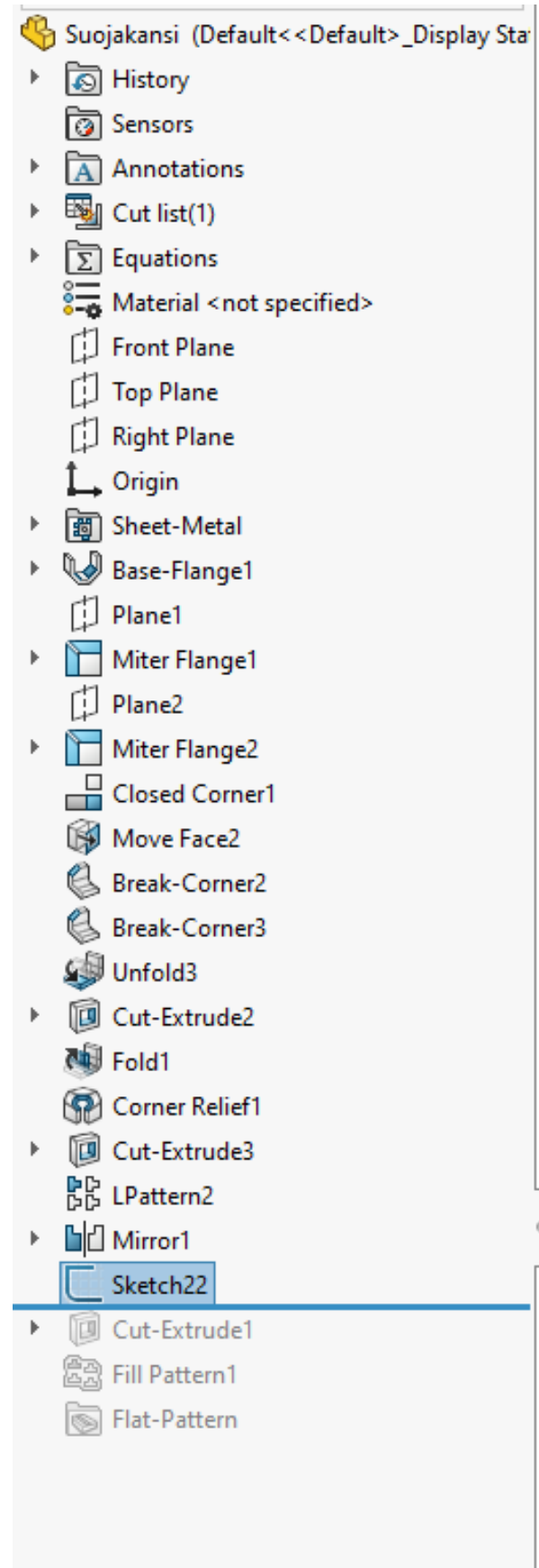
- Pattern (Geometry)



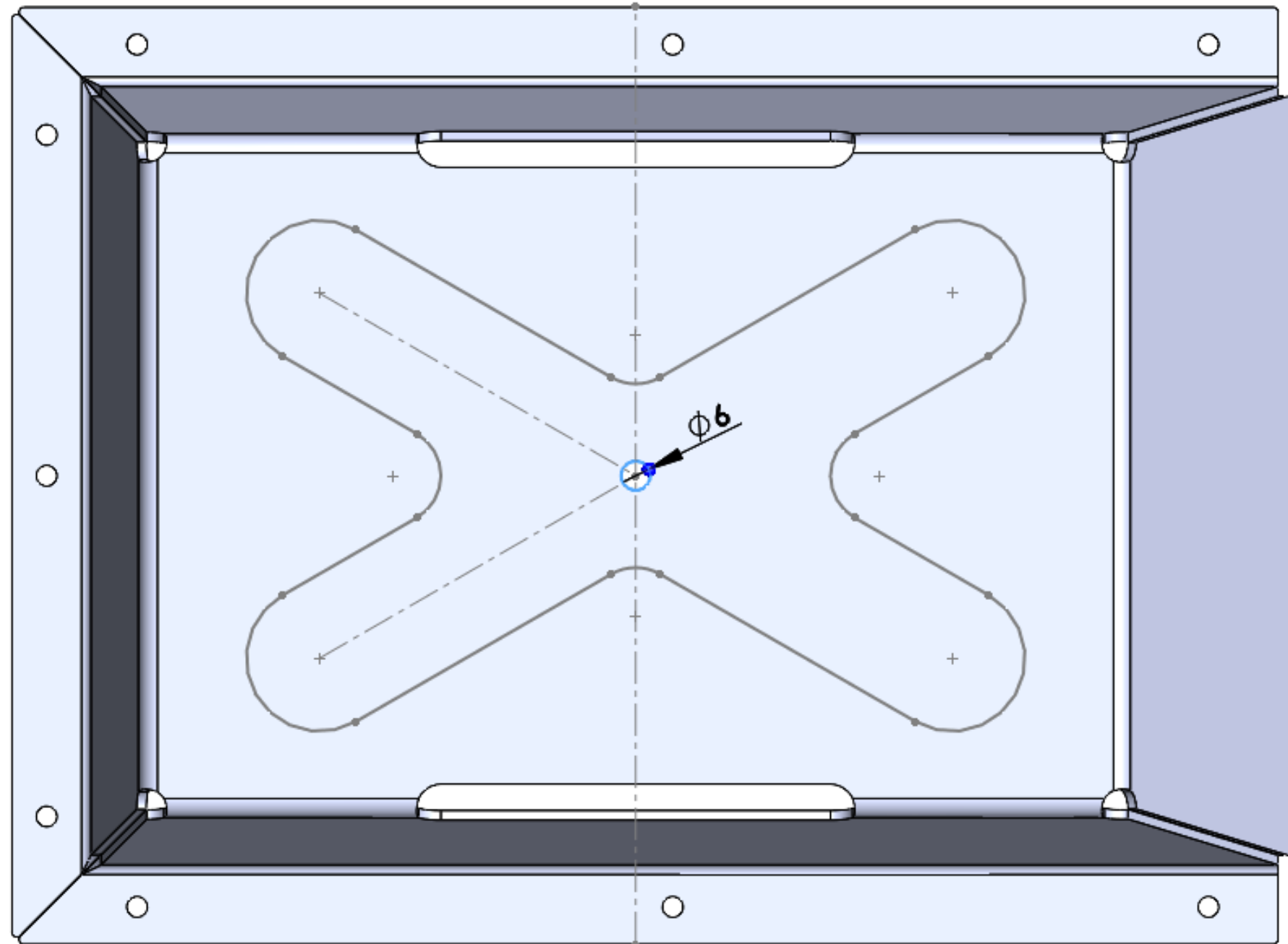
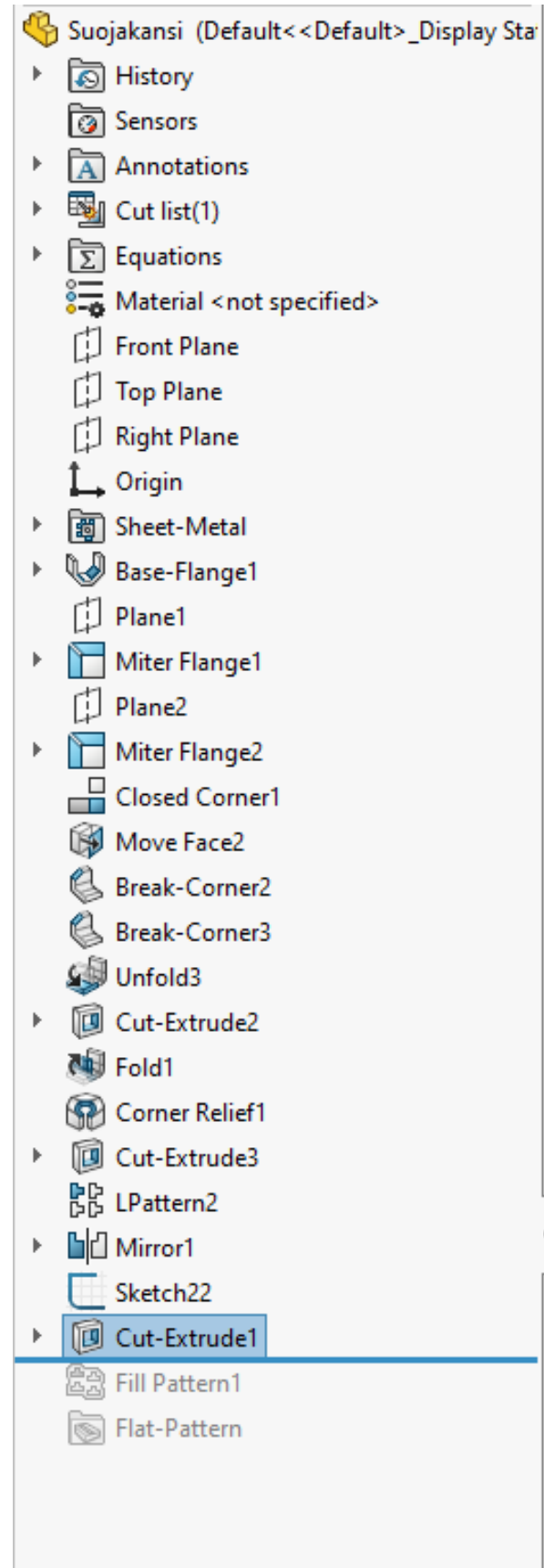
- Mirror (Body)



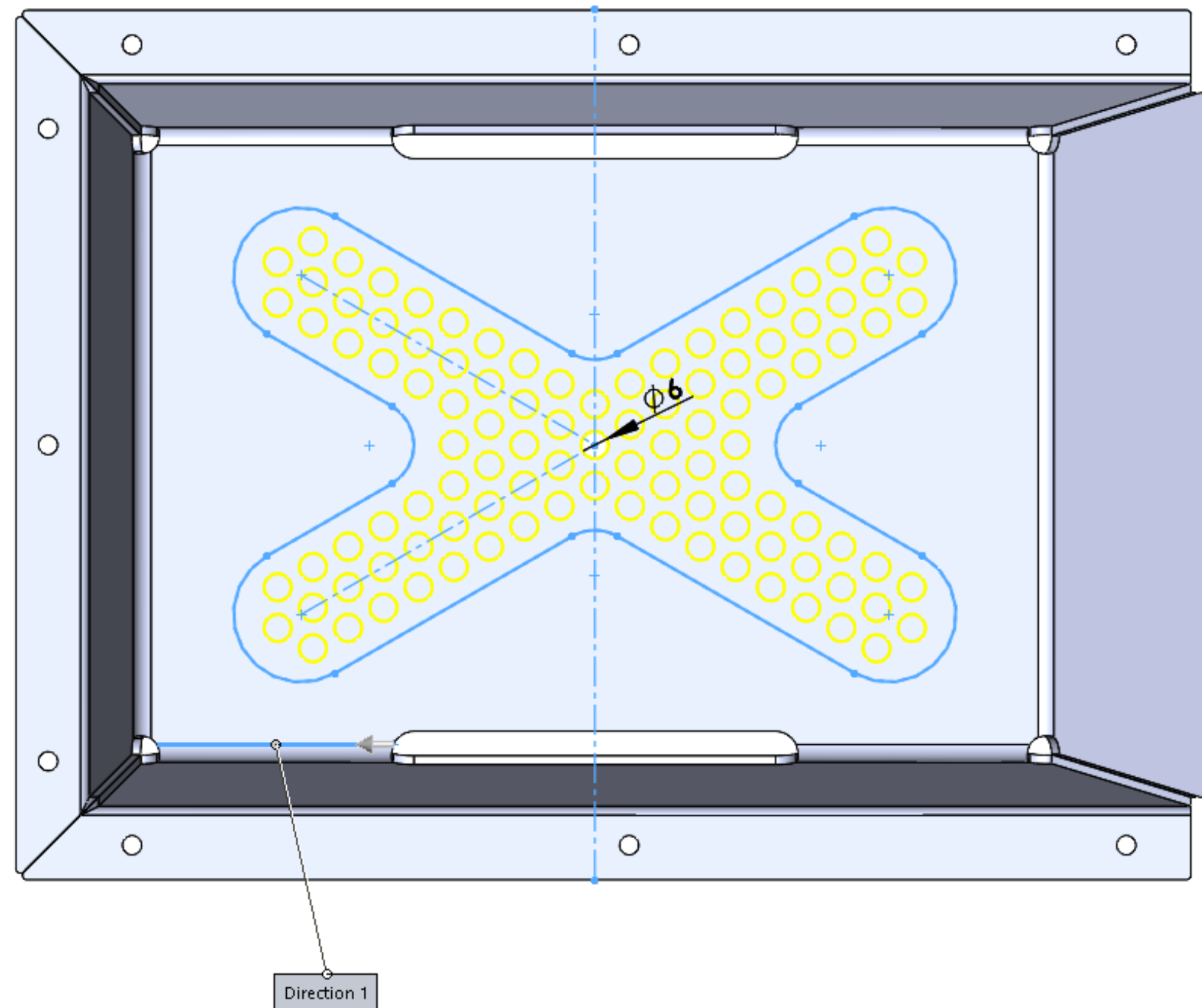
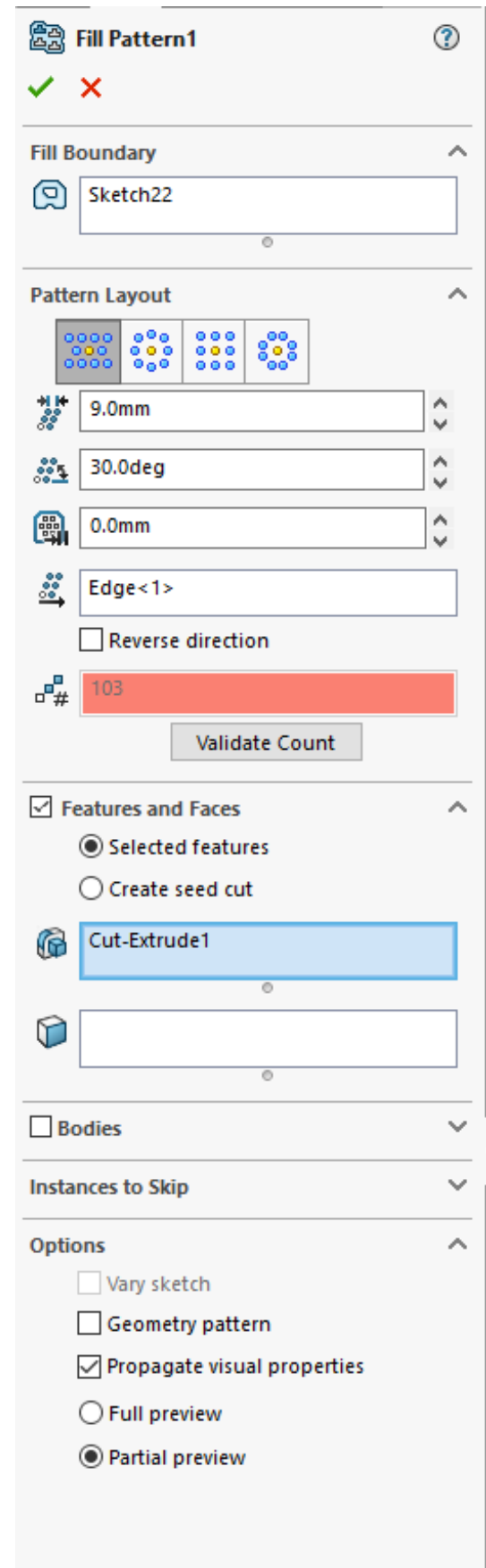
- Sketch



- Cut

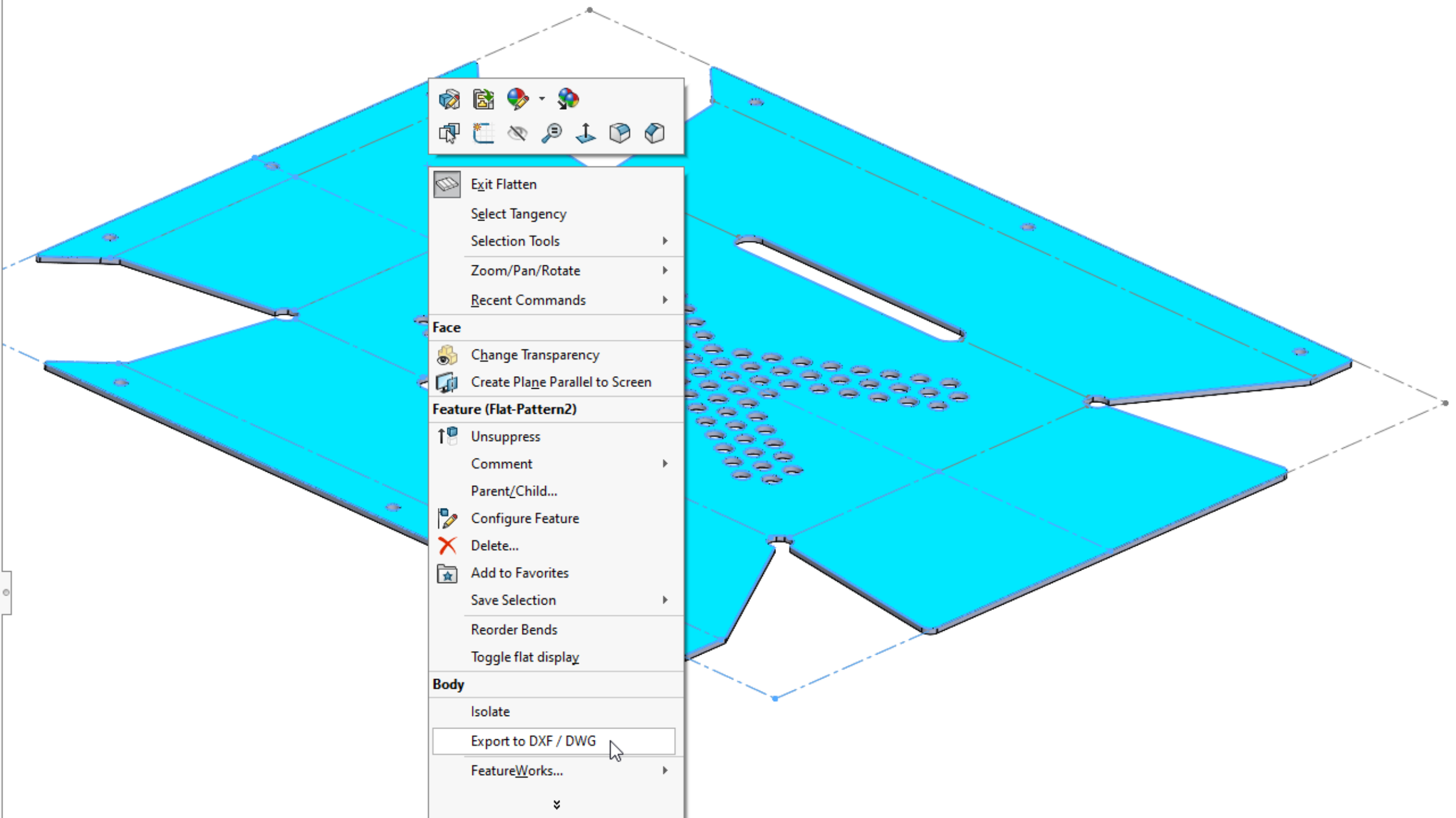
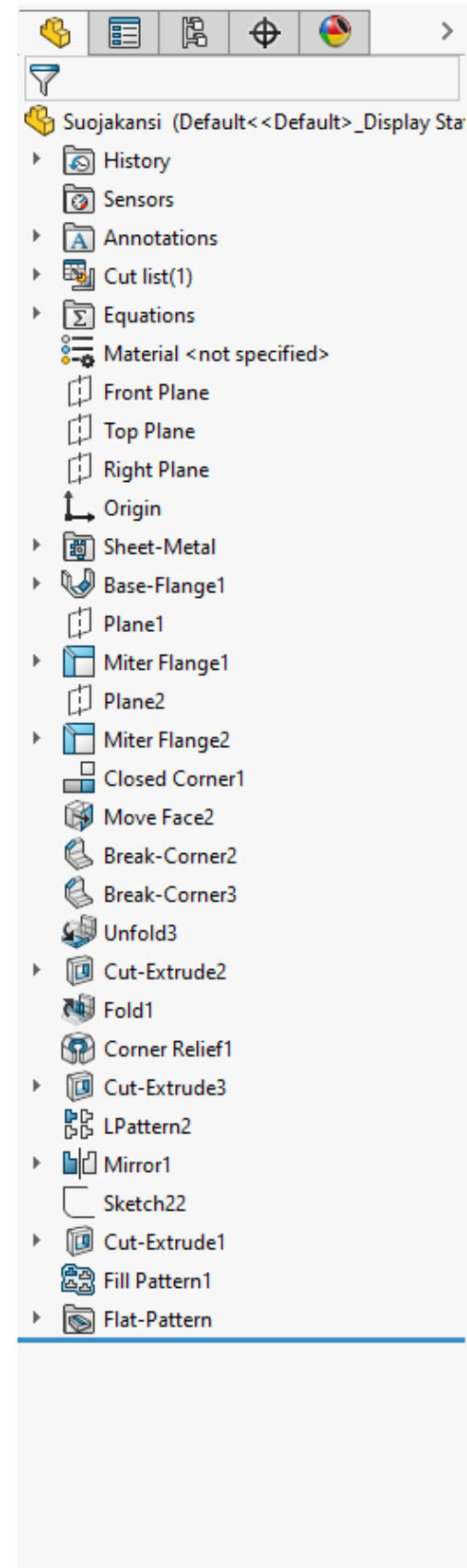


- Fill Pattern



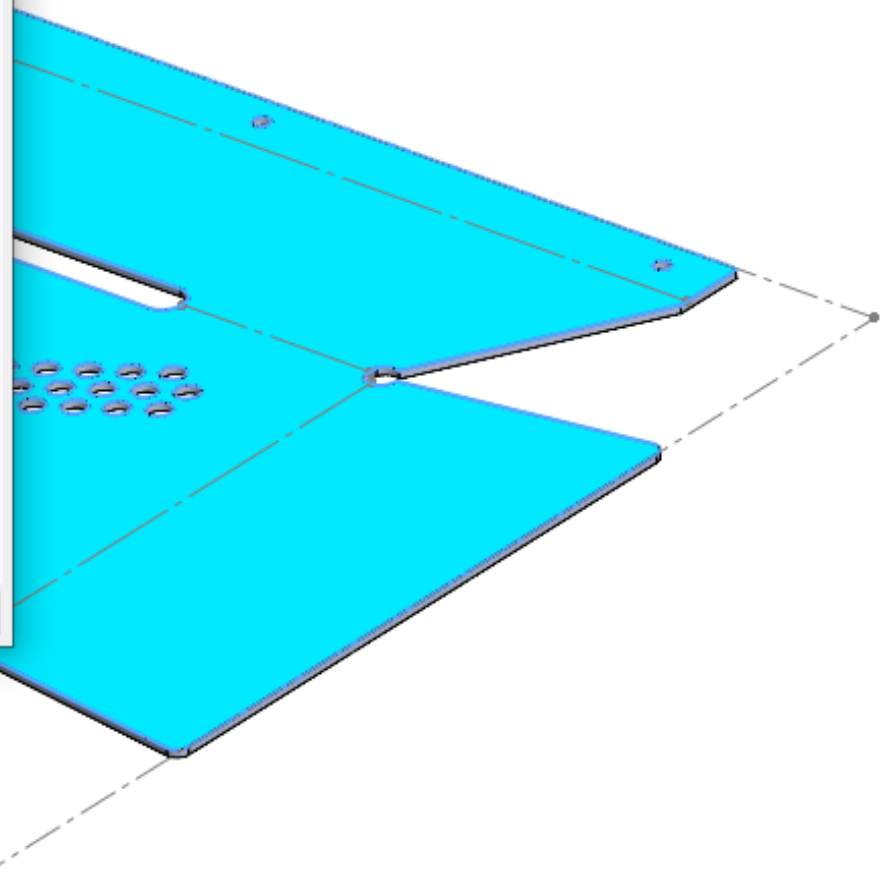
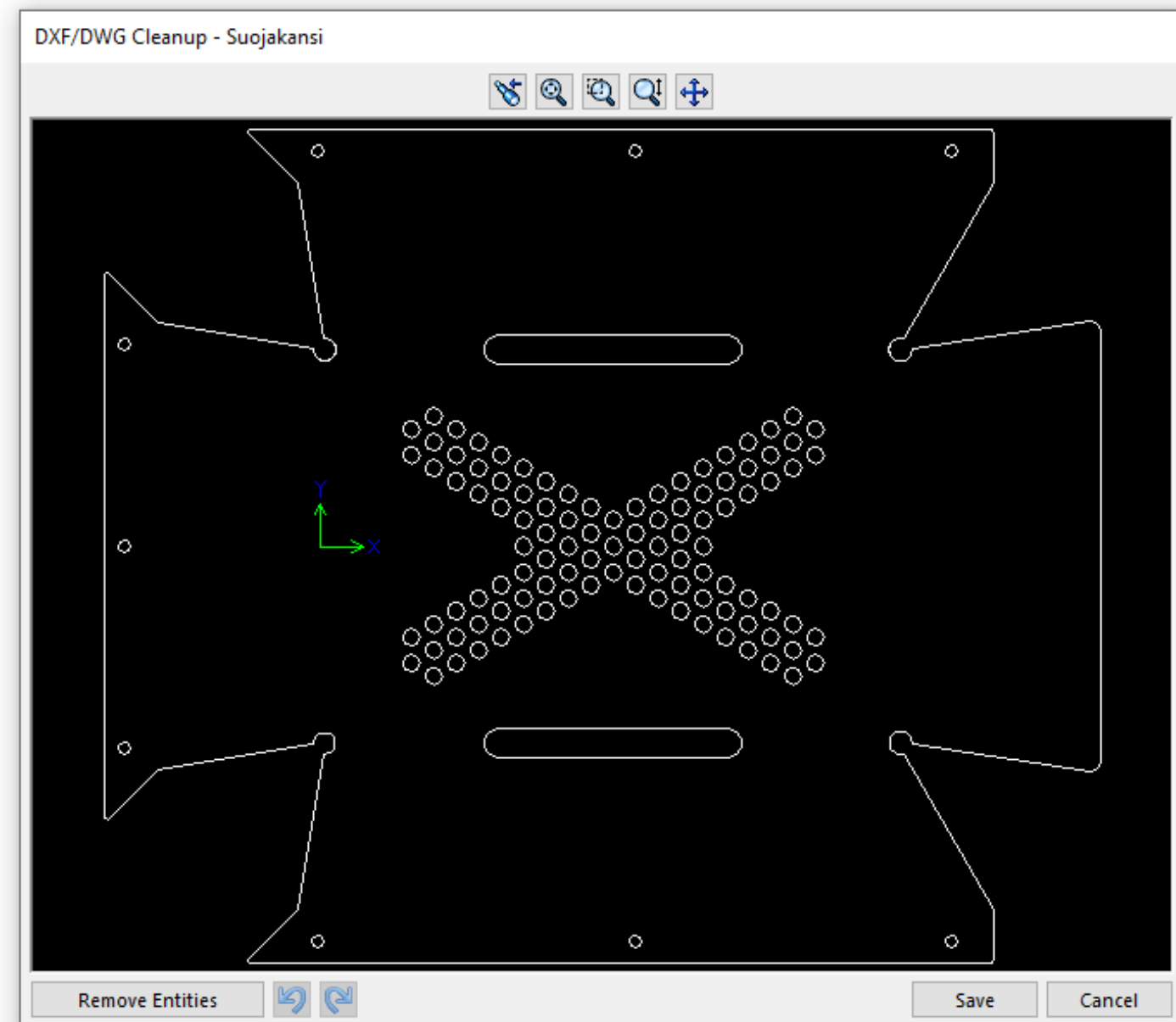
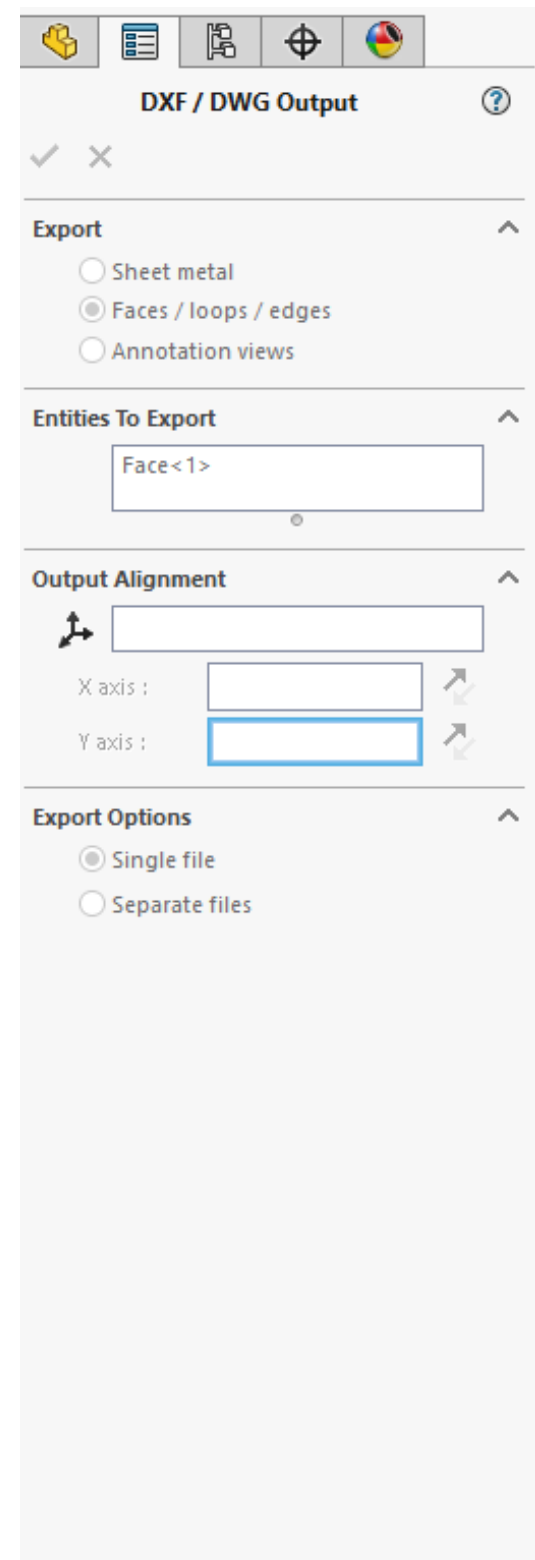
Mallinnus 2: Suojakansi

- Flatten ->
Export to DXF



Mallinnus 2: Suojakansi

- DXF Preview ->
Save

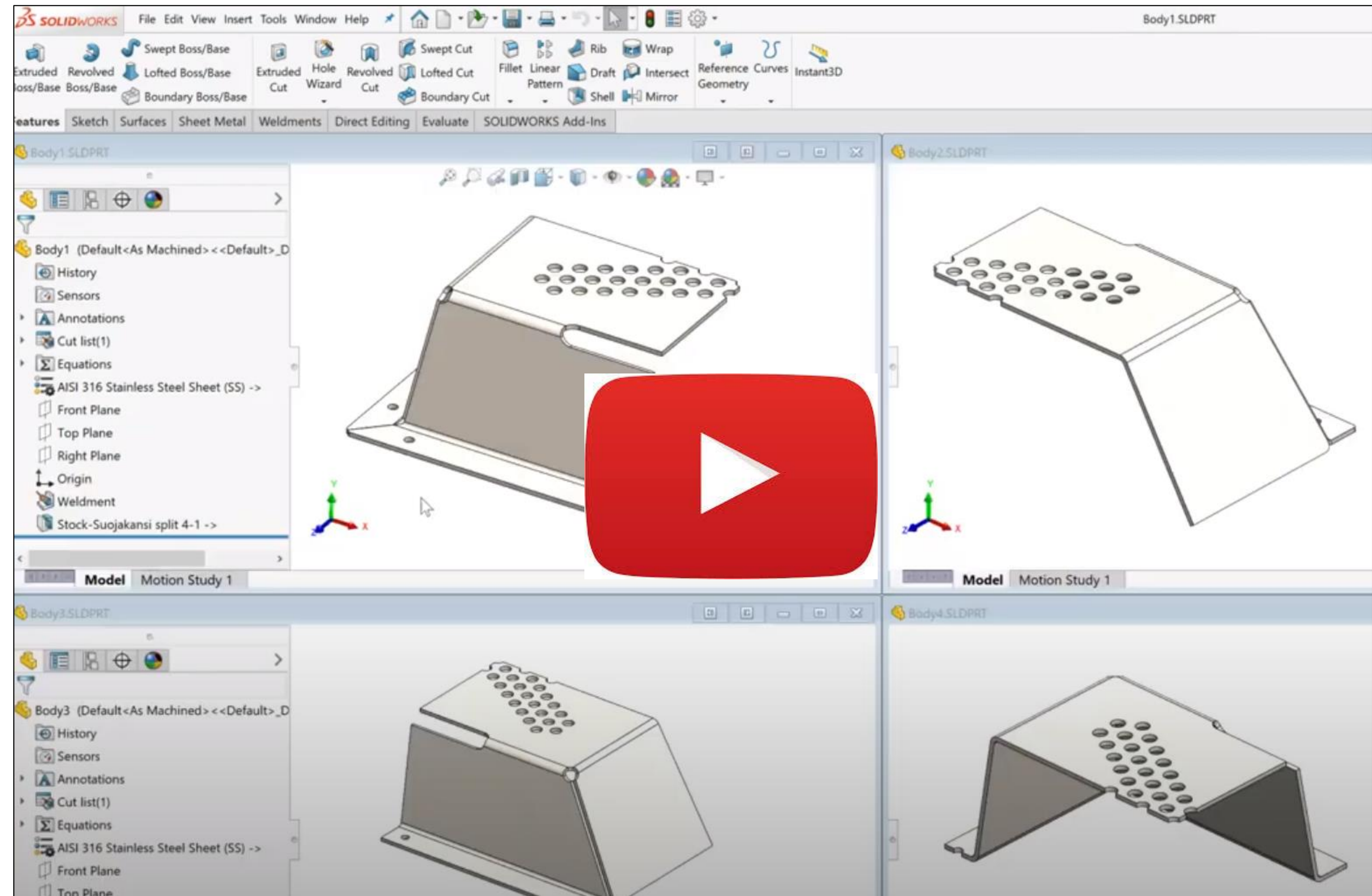


<https://aipworks.fi/2020/04/23/mallin-jakaminen-osiin>

Joskus voi olla tarpeen
jakaa osamalli useampiin
osiin.

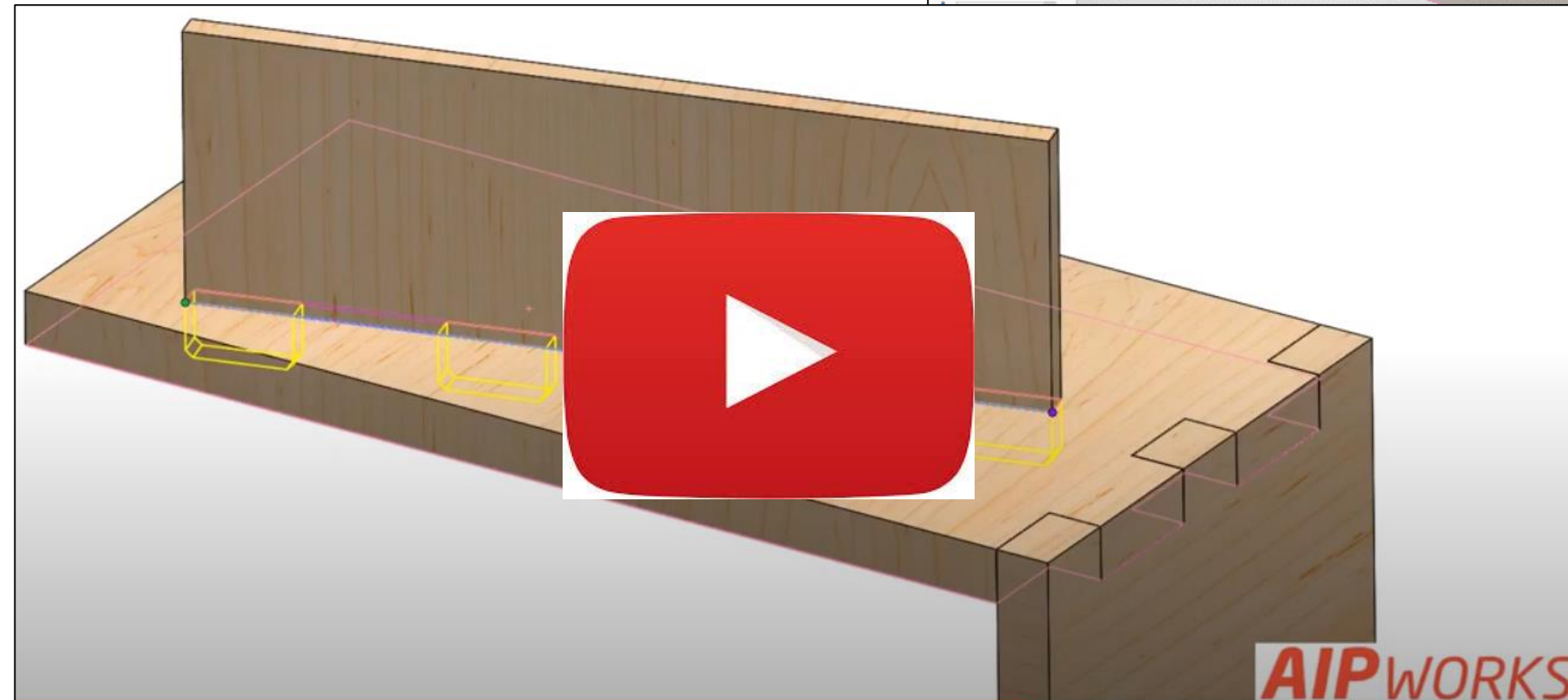
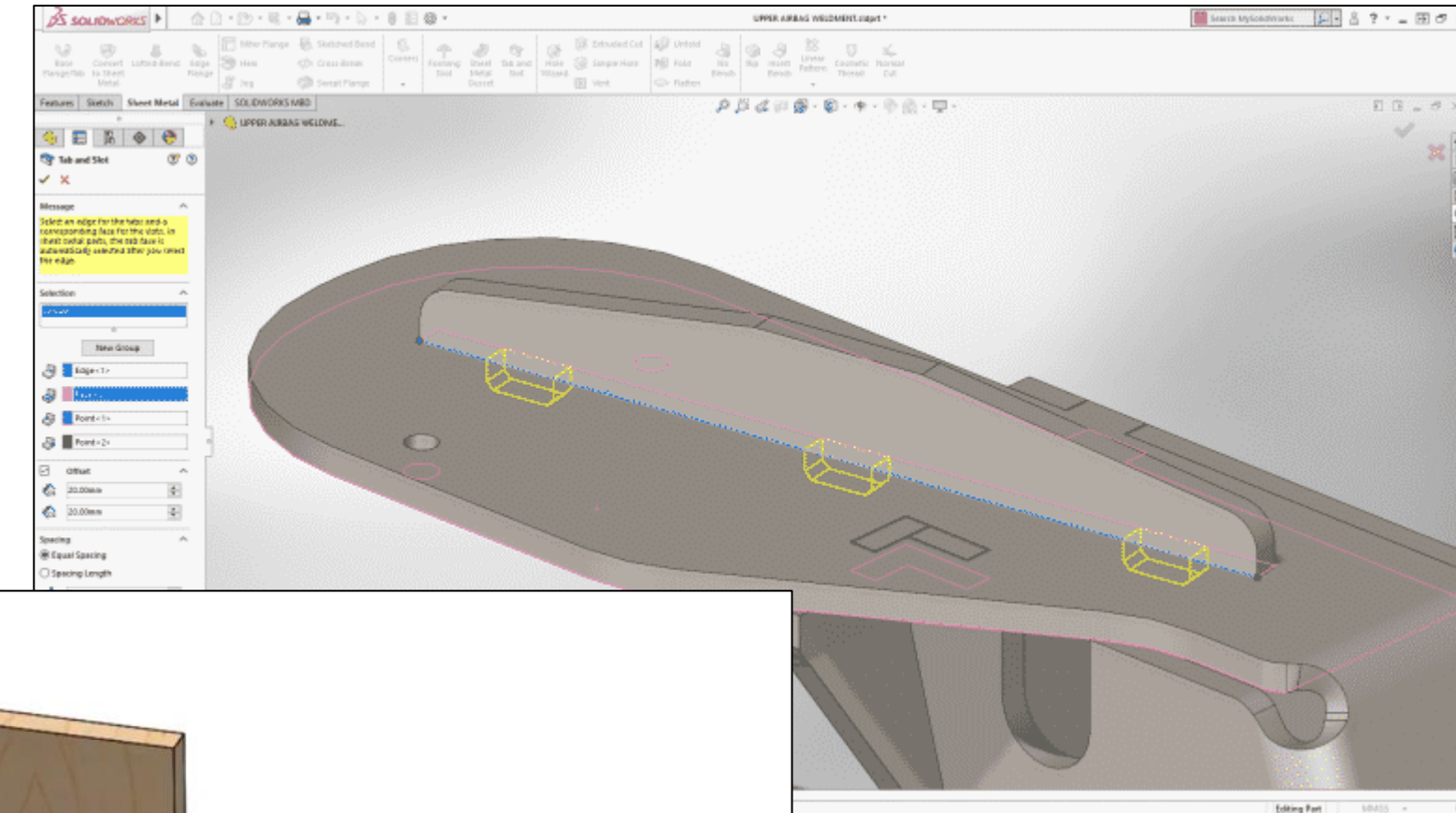
kokoonpantavuus
valmistettavuus

Videoilla kaksi tapaa



<https://aipworks.fi/2017/10/20/solidworks-tab-and-slot-itsepaikoittuvat-liitokset/>

- Tab and Slot -piirre
- Helpota osien paikoitusta kokoonpantaessa
 - Esim asemointi hitsatessa
- Mallinna nopeasti
- Vähennä kiinnittimien tarvetta
- Tsekkaa video yksinkertaisista puupalikoista





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aipworks.fi/koulutus/

