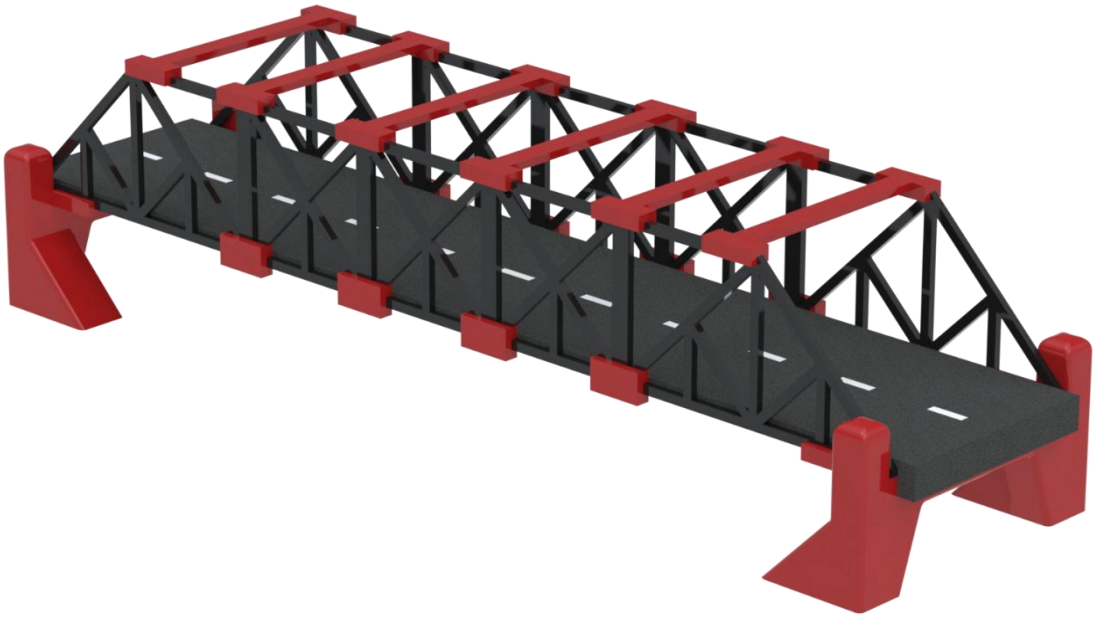
SOLIDWORKS

DESIGN PROJECTS

STUDENT GUIDE

3DEXPERIENCE



BRIDGES

DASSAULT SYSTEMES

DESCRIPTION

Welcome to the Design Projects Student Guide for bridges! The focus of this project is a Baltimore Truss style bridge design. The Baltimore truss bridge is a simple and very strong design often used for supporting trains.

This guide contains information regarding Design Intent, DFAM (Design for Additive Manufacturing) and Design Tips to keep in mind for each part.

You will use CAD to design each part, print the parts on a 3D printer and assemble them to complete the bridge.

For a video demonstrating the design approach, detailed dimensions and step by step instructions, see the links in the **Additional Resources** section below.

PROJECT TASKS

- Create the following marble run components in CAD:
  - Center Section
  - "A" Section
  - Lateral Brace with Snaps (Bottom)
  - Lateral Brace (Top)
  - Abutment
  - Deck
  - Deck Connector
- Create an assembly of the bridge in CAD.
- Print the physical components on a 3D printer.
- Assemble the bridge.

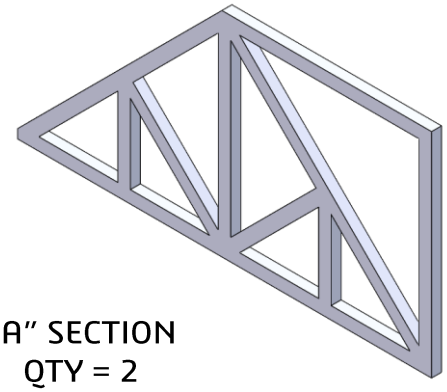
ADDITIONAL RESOURCES

LINK TO DOCUMENTS

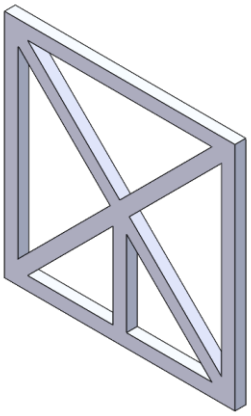
LINK TO YOUTUBE VIDEO

LINK TO STEP-BY-STEP

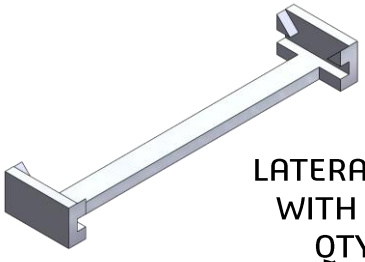
BRIDGE COMPONENTS



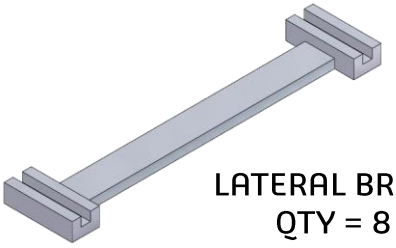
"A" SECTION
QTY = 2



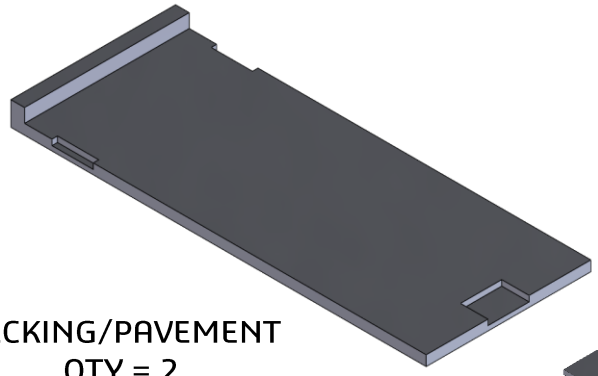
CENTER SECTION
QTY = 3



LATERAL BRACE
WITH SNAPS
QTY = 4



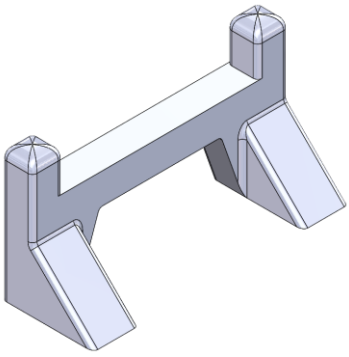
LATERAL BRACE
QTY = 8



DECKING/PAVEMENT
QTY = 2



DECKING
CONNECTOR
QTY = 1



ABUTMENT
QTY = 2

"A" SECTION

DESIGN INTENT

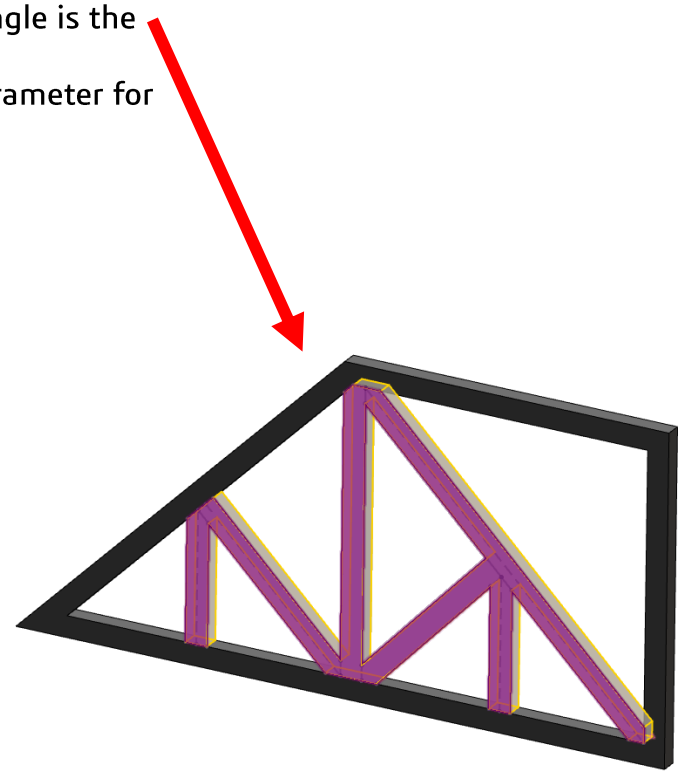
- Incorporates all structural members of a section of the bridge in one part, top and bottom chords, diagonals and verticals.
- Same thickness as the Center Section.
- Sits on top of the abutment

DFAM

- Uses Flat-Pack Design (no support material necessary).
- Incorporates nesting to print several components at one time.

DESIGN TIPS:

- Use 2 extrude features, one for the outside perimeter and one for the inner members.
- Make sure the center of the triangle is the side of the square.
- Extrude 2.5mm. This is a key parameter for other parts in the design.



CENTER SECTION

DESIGN INTENT

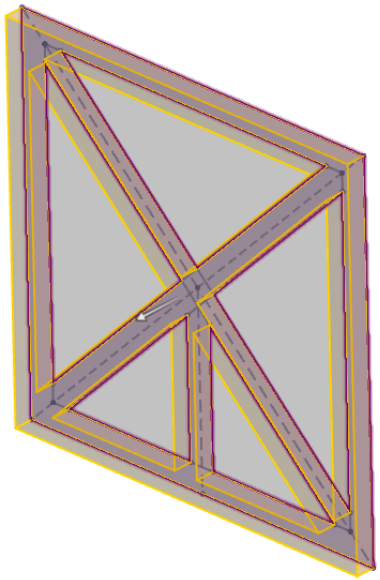
- Incorporates all structural members of a section of the bridge in one part, top and bottom chords, diagonals and verticals.
- Same thickness as the "A" Section.

DFAM

- Uses Flat-Pack Design (no support material necessary).
- Incorporates nesting to print several components at one time.

DESIGN TIPS:

- Use equal relations to make a square.
- Use Offset Entities to create the inner square.
- Use centerlines and mirror to create the inner member profiles.
- Extrude 2.5mm. This is a key parameter for other parts in the design.



LATERAL BRACE with SNAPS

DESIGN INTENT

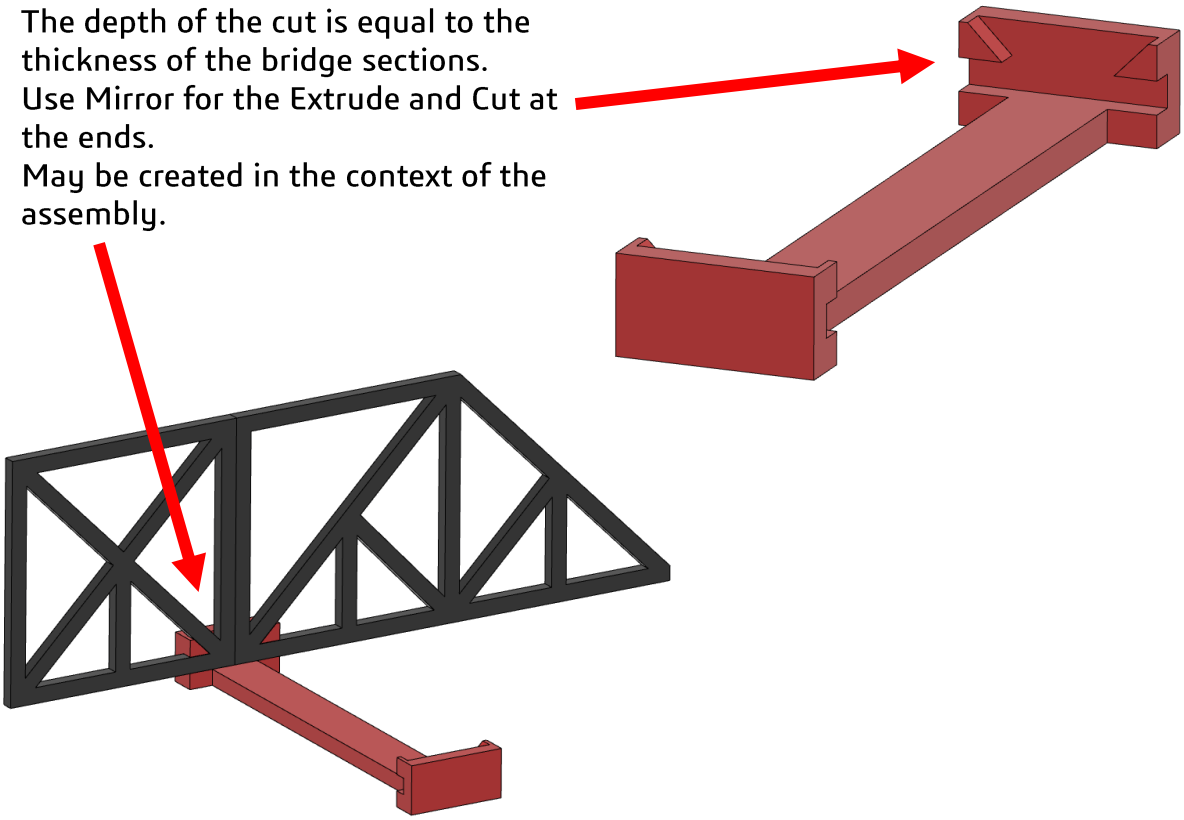
- Holds 2 bridge sections together at the bottom.
- Snaps prevent spreading as force is applied to the structure.
- Clearance is applied to allow for ease of assembly at the snaps.

DFAM

- Designed to minimize support material.
- Incorporates nesting to print several components at one time.
- Support material is required at overhangs of the snaps.

DESIGN TIPS:

- The depth of the cut is equal to the thickness of the bridge sections.
- Use Mirror for the Extrude and Cut at the ends.
- May be created in the context of the assembly.



LATERAL BRACE

DESIGN INTENT

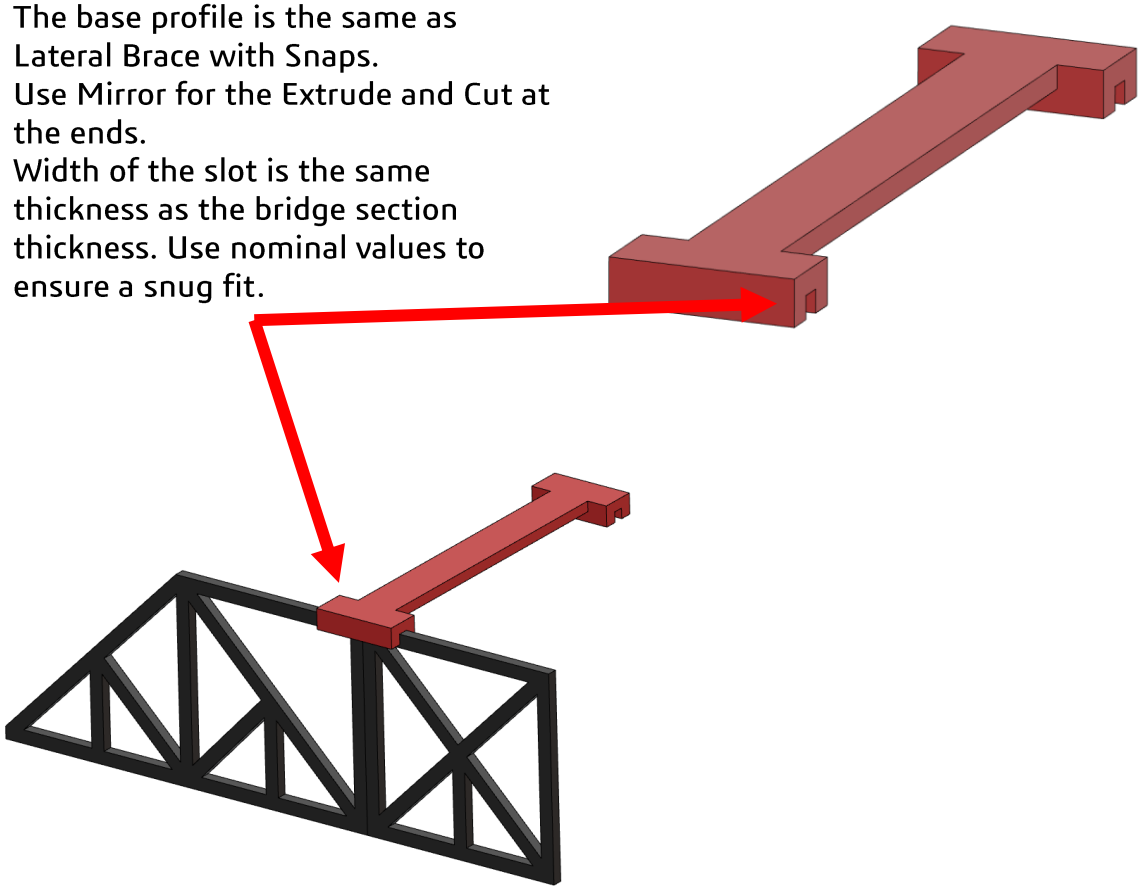
- Holds 2 bridge sections together at the top.
- Slots are the same thickness as the sections.

DFAM

- Designed to minimize support material.
- Incorporates nesting to print several components at one time.

DESIGN TIPS:

- The base profile is the same as Lateral Brace with Snaps.
- Use Mirror for the Extrude and Cut at the ends.
- Width of the slot is the same thickness as the bridge section thickness. Use nominal values to ensure a snug fit.



ABUTMENT

DESIGN INTENT

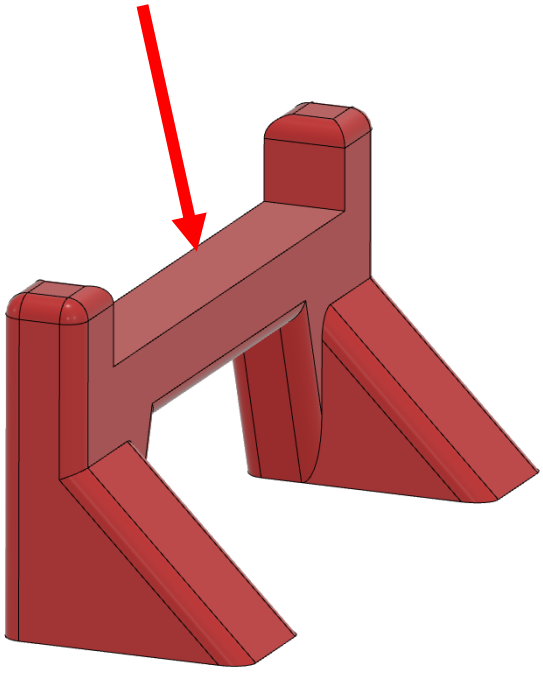
- Supports bridge structure at the ends.
- Holds together the bridge sections with the deck.
- Base is oriented inwards due to forces applied to the bridge.

DFAM

- Designed to minimize support material.
- Incorporates nesting to print several components at one time.

DESIGN TIPS:

- Use Mirror for the angled Extrudes at the base.
- The inner width the of the abutment will hold the side sections and decking with a snug fit.



DECK

DESIGN INTENT

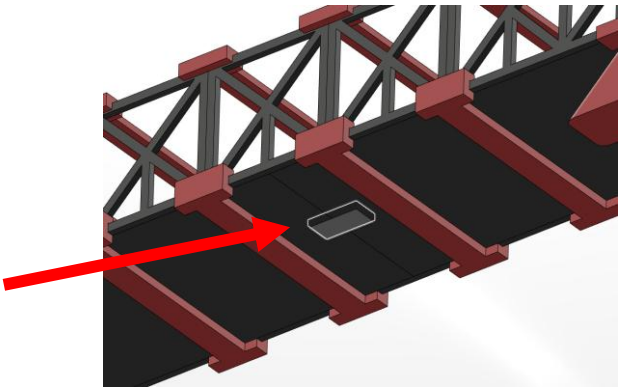
- Provides lateral support.
- Fits between sides of bridge and abutment.
- 2 sections joined together with a connector.

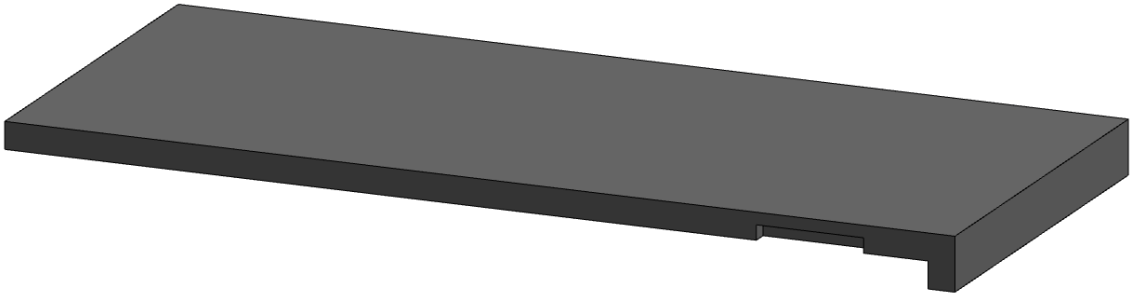
DFAM

- Designed in 2 sections, due to the requirements of the 3D printer envelope.
- Designed to minimize support material.
- Incorporates nesting to print several components at one time.

DESIGN TIPS:

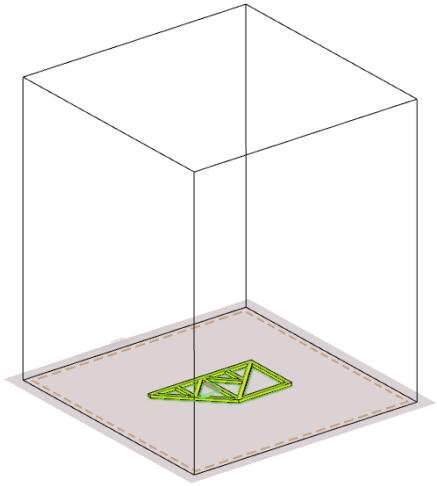
- Create one deck section in the context of the assembly to fit between the side sections of the bridge.
- Use Mirror in the assembly to create the other deck section.
- Create a small connector to join the two deck halves together.

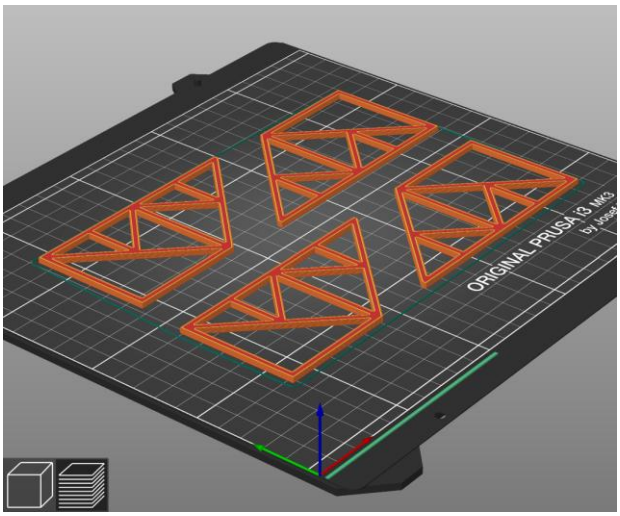




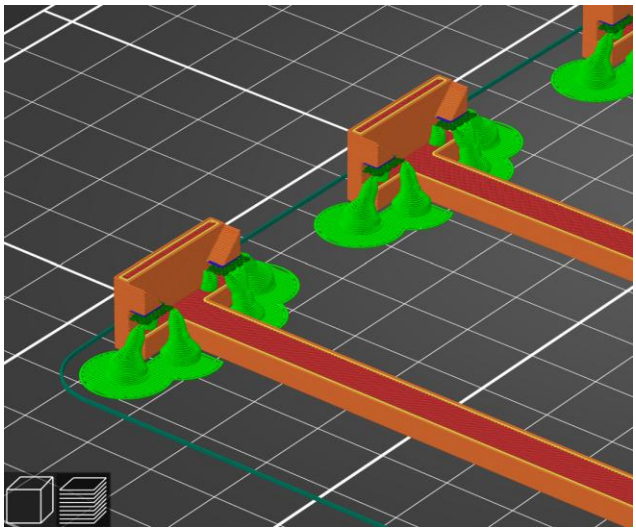
3D PRINTING

- Save the parts as an STL file.
- Nest your parts to print many at one time.
- Orient the parts to minimize the use of support material (see image below)





NESTING



ORGANIC SUPPORT STRUCTURES