TOTAL SURFACE AREA OF STRUCTURAL BEAMS

Dynamo Cheat sheet Anatomy

Title Zone

Dynamo Node Zone

Geometry Zone

Notes and Steps Zone
Exercises
Additional 85+ Examples in Appendix of Handout
Exercise 1

TOTAL SURFACE AREA OF STRUCTURAL BEAMS

**Family Types**
- WShapes:W12X26
  - Family Type

**All Elements of Family Type**
- Family Type
- Elements

**Element.Solids**
- element
- Solid[]

**Solid.Area**
- solid
- double

**Flatten**
- list
- var[]{[]}

**Math.Sum**
- values
- sum

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**Dynamo Nodes**

**Dynamo Geometry**

**Steps & Notes**

1. Open file "Beam_Area_Start.RVT"
2. Open a new Dynamo file, place nodes as shown and run script

Notes: Alt. method is to extract solid and get surface area and could be used on most Revit solid and surface elements.
Exercise 2

ALIGN REVIT BEAMS WITH AN OFFSET WITH DYNAMO PLAYER

- **Select Model Element**: Change Element
  - **Element**: 388563

- **Select Edge**: Change Curve
  - **Edge of Element Id**: 815765

- **Element Set Location**: Change geometry

- **Integer Slider**
  - **Min**: -1
  - **Max**: 1
  - **Step**: 2

- **Curve Offset**
  - **Curve**: Curve
  - **Distance**: Distance

- **Offset Curve from Edge of Slab by 1'0" Note: Sliders become input in Dynamo Player**

- **RELOCATE THE SELECTED BEAM TO THE SPECIFIED DYNAMO GEOMETRY (SLAB EDGE)**

- **OFFSETS THE CURVE FROM THE EDGE**

**DYNAMO NODES**

- **DYNAMO PLAYER**

- **Edge of Slab**
  - **Beam to Align 1'-0" from Edge**

**REVT GEOMETRY WITH DYNAMO PLAYER**

- **Plan View Before**

- **Plan View After**

**Steps**

1. Open file "ALIGN_OFFSET_START.RVT". Open new Dynamo, add nodes, and save.
2. Open Dynamo player and navigate to folder with .DYN file.
3. Select the "Edit Inputs" on player, select slab edge and beam and click run.
Exercise 3

CREATE BEAMS FROM 2-PT AC LINE FAMILIES

Family Types
CENTERLINE_ADAPTIVE • Family Type

All Elements of Family Type
Family Type Elements

Element Curves

CONVERTS/EXTRACTS THE CURVES FROM THE AC FAMILY

StructuralFraming BeamByCurve

curve
level
structuralFramingType

Levels

Level 1 • Levels

StructuralFraming Types

W16x36 • Framing Types

SELECT ALL THE INSTANCES OF ADAPTIVE COMPONENT FAMILY TYPES

CREATES BEAMS OF SPECIFIED TYPES AT THE AC LINE FAMILY

Dynamo Nodes

Revit Geometry and Steps

STEP 1

CREATE A 2-POINT AC FAMILY AND LOAD INTO PROJECT

STEP 2

OPEN "BEAMS_AC_LINES_START.RVT"

STEP 3

PLACE 2-POINT AC FAMILIES IN PROJECT AS ROOF FRAMING

STEP 4

PLACE DYNAMO NODES AND DYNAMO WILL PLACE BEAMS ON AC LINES

NOTES

CONSIDER USING A 2-PT AC FAMILY FOR ROOF FRAMING IN LIEU OF BEAM FRAMING.
PLACE THE BEAMS ON THE AC FAMILIES VIA DYNAMO.
Exercise 4

SETTING MIN CONCRETE FLOOR THICKNESS USING ENGINEERING LOGIC

SELECTS DIMENSION STRING AND GETS VALUES

NOTE: CUSTOM NODE FROM CLOCK WORK PACKAGE

SELECTS SLAB ELEMENT AND ELEMENT TYPE

SETS THE FLOOR SLAB THICKNESS TO MIN

SETS MIN THICKNESS PER RULES OF THUMB AND GETS MAX VALUE

STEP 1: OPEN "ONE WAY_BEAM_SLAB_SYSTEM_START.RVT"
STEP 2: OPEN NEW DYNAMO AND ADD NODES
STEP 2: SELECT SLAB AND SELECT LOWER DIMENSION STRING W/ "SELECT" AND RUN DYNAMO
Exercise 6

BUILD A COMPLEX BEAM IN DYNAMO AND SEND TO REVIT

- Select Edge
  - Change
  - Curve
  - Edge of Element: 549778

- Curve.PlaneAtParameter
  - Plane
  - param

- CoordinateSystem.ByPlane
  - CoordinateSystem

- GETS THE LOCAL COORDINATE SYSTEM OF THE PLANE ON CURVE

- Circle.ByCenterPointRadius
  - centerPoint
  - radius

- Geometry.Transform
  - geometry
  - cs

- Sweeps the circle "PROFILE" along the selected curve

- THIS CUSTOM NODE FROM THE "SPRING" PACKAGE CREATES AND PLACES A REVIT LOADABLE FAMILY FROM SOLID GEOMETRY

STEPS

1. OPEN FILE "CANOPY_BEAMS_TO_REVIT.START.RVT" OPEN NEW DYNAMO, ADD NODES
2. SELECT THE CANOPY EDGE USING THE "SELECT EDGE" NODE AS SHOWN AND RUN
Exercise 7

**ORIENT BEAMS PERP TO SURFACE**

- **Code Block**  
  - `Code Block`  
  - `Face of Element Id : 316155`

- **Select Face**  
  - `Change`
  - `Surface`

- **Family Types**  
  - `4x2_ac_beam`
  - `Family Type`

**NOTE** THE U, V PARAMETERS MATCH THE REVIT SURFACE. ALSO NOTE THAT AT LEVEL IS ACTIVATED HOWEVER "CROSS PRODUCT LACING" ALSO WORKS.

**Dynamo Nodes**

- **AdaptiveComponent By Parameters On Face**  
  - `u`  
  - `surface`  
  - `familyType`

**This Node Hosts 2-PT AC Beam On Surface**

**Revit Geometry**

- **REVIT FINAL GEOMETRY AND U V COORDINATES OF REVIT ROOF SURFACE**

**Steps**

1. OPEN "BEAM_ORIENTATION_START.RVT"
2. OPEN A NEW DYNAMO FILE, AND ADD NODES
3. SELECT THE SURFACE USING THE "SELECT FACE" NODE
4. SELECT THE "4X2" FAMILY TYPE AND RUN - NOTE BEAMS ARE ADAPTIVE COMPONENTS
Exercise 8

**CONVERT REVIT ANALYTICAL BMS + PTS TO SOLIDS FOR RENDERING IN A GAME ENGINE (SIMPLE METHOD)**

**ANALYTICAL NODES**
- **Category**:
  - **Element Geometry**
  - **Spheres ByCenterPointRadii**
  - **ImportanceByGeometries**

**DYNAMO NODES**
- Selects all analytical nodes in the project
- Converts analytical nodes to Dynamo pts
- Adds spheres to all analytical nodes
- Imports all solids into Revit via SAT import

**ANALYTICAL BMS**
- **Element Types**
  - **AnalyticalModel = Types**
  - **Element Geometry**
  - **Cone BySemiHeightRadius**

**DYNAMO NODES**
- Selects all analytical BMS in the project
- Converts analytical BMS to Dynamo curves and joins them
- Adds cylinders to all analytical lines
- Imports all solids into Revit via SAT import

**ANALYTICAL LINES IN REVIT**

**ANALYTICAL MODEL CONVERTED TO SOLIDS IN REVIT**

**ANALYTICAL REVIT SOLID MODEL RENDERED IN A GAME ENGINE**

**STEPS & NOTES**
- **Step 1**: Open "analytical_model_start.rvt"
- **Step 2**: Open a new Dynamo file and add nodes as shown and run script
- **Step 3**: Isolate and open or export to game engine

*Note: Game engines will not render single lines and nodes thus need method above*