



2022 Digital Construction Summer School

Autodesk Docs and Autodesk Takeoff in the Classroom

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Autodesk Docs and Autodesk Takeoff in the Classroom



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Roger Williams University, Bristol, Rhode Island

- Industry Background: Structural Engineer, General Contractor, VDC Specialist
- Teaching: BIM for Construction Managers, BIM for Designers
- Research: Global Collaboration, Gamification, Virtual Environments

Presentation Agenda

- Course Structure
- Experience with Autodesk Construction Cloud in the Classroom
- Lessons Learned





Course Structure

Course Information

CNST 116 Computer Applications for Construction

- Students are 1st year CM majors
 - 20-30 students per section
- Meet 3x per week for 50 minutes
- Course Outline
 - AutoCAD – 1 week
 - Excel – 4 weeks
 - Revit / Autodesk Construction Cloud – 5 weeks
 - Bluebeam Revu – 3 weeks
 - Procore – 1 week



RWU CM Emerging Technologies Lab



CNST 116 students

Course Delivery

CNST 116 Computer Applications for Construction

- Written step-by-step instructions
 - Allows student to work at their own pace
 - Instructions are provided digitally and printed (for single monitor work)
 - Limit to 1-2 pages per session
- Work is (mostly) completed in class
- Work is “checked off” at the end of class by the instructor or student assistant

FALL 2021 CNST 116 W8D1 REVIT PROJECT INTRO Import CAD, Levels, Grid Lines

- **Today you are going to:**
- Determine teams and roles
 - Add levels; import a CAD drawing; add grid lines and dimensions

STEPS TO COMPLETE THE EXERCISE

1. Determine which team you are on based on the seating chart. With your team, determine your roles.
2. In Revit, open a new model. Use the Imperial Architectural template.

ADD LEVELS

3. Add the following levels to your model:
 - a. 00 – Basement
 - b. 01 – Level 1
 - c. 02 – Level 2
 - d. 03 – Level 3
 - e. 04 – Roof
 - f. 05 – Tower Roof

IMPORT CAD

4. Download the Library_01 drawing from Bridges under Resources
5. Open the 01 – Level 1 floor plan and import the Library_01 drawing into the level: Insert tab → Import panel → Import CAD

ADD GRID LINES

6. Placing grid lines at the center of the columns, add numbered grid lines across the top form left to right and lettered grid from top to bottom. See image below

FALL 2021 CNST 116 W8D2 REVIT PROJECT Autodesk Construction Cloud Intro

- **Today you are going to:**
- Create the central model in Autodesk Construction Cloud
 - Test Autodesk Construction Cloud functions by adding walls
- **At the end of lab, synchronize your changes with the central model**

TEAM MEMBER 1: (DO THIS FIRST)

CREATE YOUR TEAM'S CENTRAL MODEL

1. Download the **Library Grid File** from Bridges → Resources (Please don't use your own file – everyone needs to use the same file so levels and grids are exactly the same when we merge the models in 3 weeks)
2. Open Revit 2022 and, in the upper right-hand corner, sign in using your Autodesk account
3. **IMPORTANT:** In Revit, open the Library Grid File, then **rename the file** using this structure:
 - Team_[x]_Revit_Project (e.g. Team_B_Revit_Project)
4. Upload the model to **BIM-360 Autodesk Construction Cloud**: In Revit, go to the Collaborate tab → Manage Collaboration panel → Collaborate tool
5. Select “In the cloud” (see below) → Project Files → [navigate to your team's folder] → Save
6. Close the Revit model so the rest of your teammates can access the model.



BIM Across the Curriculum

Implemented Fall 2021

- CNST 116 Computer Applications for Construction (Required)
 - In specifically identified courses:
 - **Reinforce** software taught in CNST 116
 - **Introduce** new software, e.g. 3D coordination, 4D modeling
- CNST 462 Advanced Information Technology in Construction (Elective)



An abstract, three-dimensional geometric structure made of dark, reflective metallic bars is visible on the left side of the slide. It consists of several interconnected rectangular frames, some of which are tilted and overlapping, creating a sense of depth and complexity.

Experience with Autodesk Construction Cloud in the Classroom

Revit / Autodesk Construction Cloud – 5 weeks

CNST 116 Computer Applications for Construction

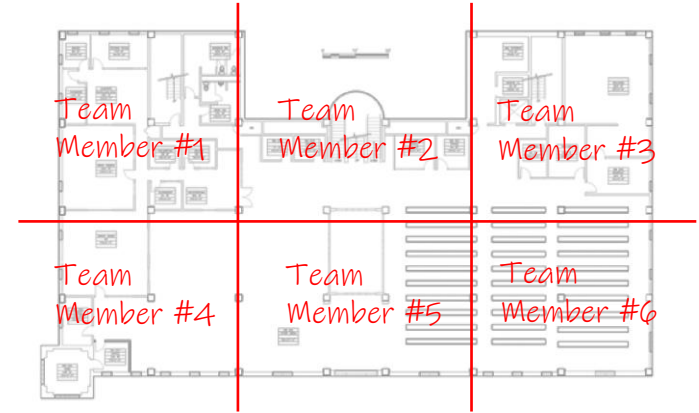
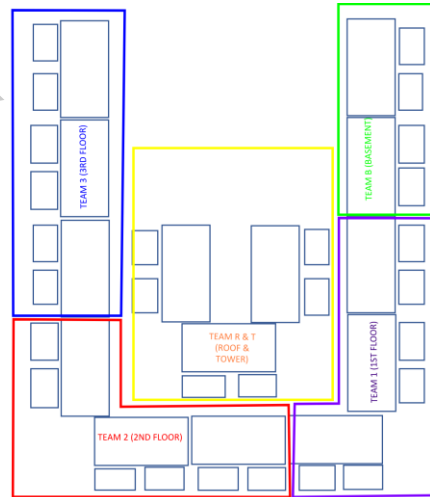
- Individual Revit Assignments
- Team Project using Autodesk Docs
- Individual Assignment Using Autodesk Takeoff

Week	Sun	Monday	Tues	Wednesday	Thurs	Friday	Sat
7	10	11 Revit Intro + In-Class Activity Quick start model; Assign bedroom sketch homework	12	13 Revit In-Class Activity Model your bedroom (bring a sketch of your bedroom plan with dimensions)	14	15 Revit In-Class Activity Add grid lines to your bedroom model; create a walkthrough of your bedroom	16
8	17	18 Revit Project Intro Determine team roles; import 2D plans to Revit; create grid file for Revit project	19	20 ACC Intro + In-Class Activity Review Project Rubric; Create and upload central model to ACC	21	22 ACC In-Class Activity Add architectural elements (walls, floors, roof, ceilings)	23
9	24	25 Revit In-Class Activity Add architectural elements (stairs, furniture, people)	26	27 Revit In-Class Activity Add structural elements (footings, columns, beams)	28	29 Revit In-Class Activity Create sheets; add views to sheets	30
10	31	Nov 1 Revit In-Class Activity Create section views and details; annotate details	2	3 Revit In-Class Activity Create QTO Part I - Revit	4	5 ACC In-Class Activity Create QTO Part II - Takeoff	6
11	7	8 Revit In-Class Activity Add mechanical and electrical elements	9 <i>Finish all model elements at your level</i>	10 Revit In-Class Activity; Revit Project Due Link other teams' models for completed building	11 Veterans Day	12 Virtual Reality In-Class Activity Walkthrough Revit models in VR	13

Team Project Using Docs

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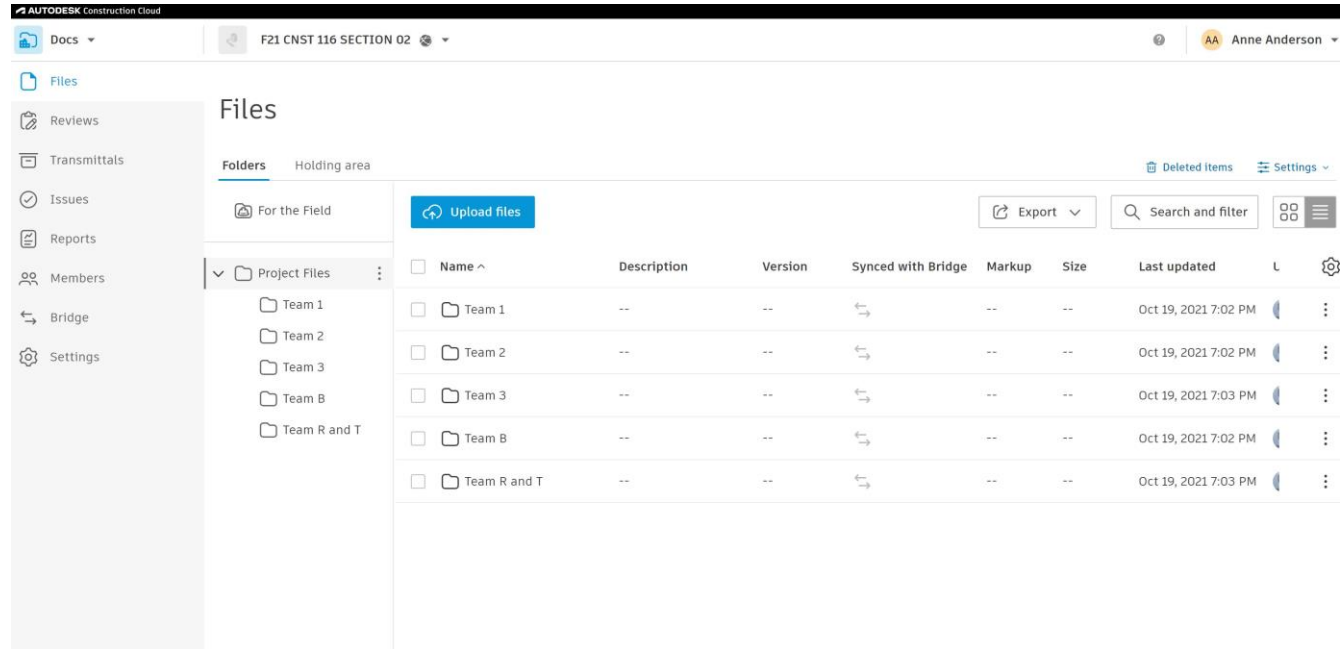
- Each class section models a campus building
- Class is divided into teams. Each team models one level
- Teams choose how to divide their level



Team Project Using Docs

CNST 116 Computer Applications for Construction

- Add students to Autodesk Construction Cloud
- Create team folders
- High trust environment



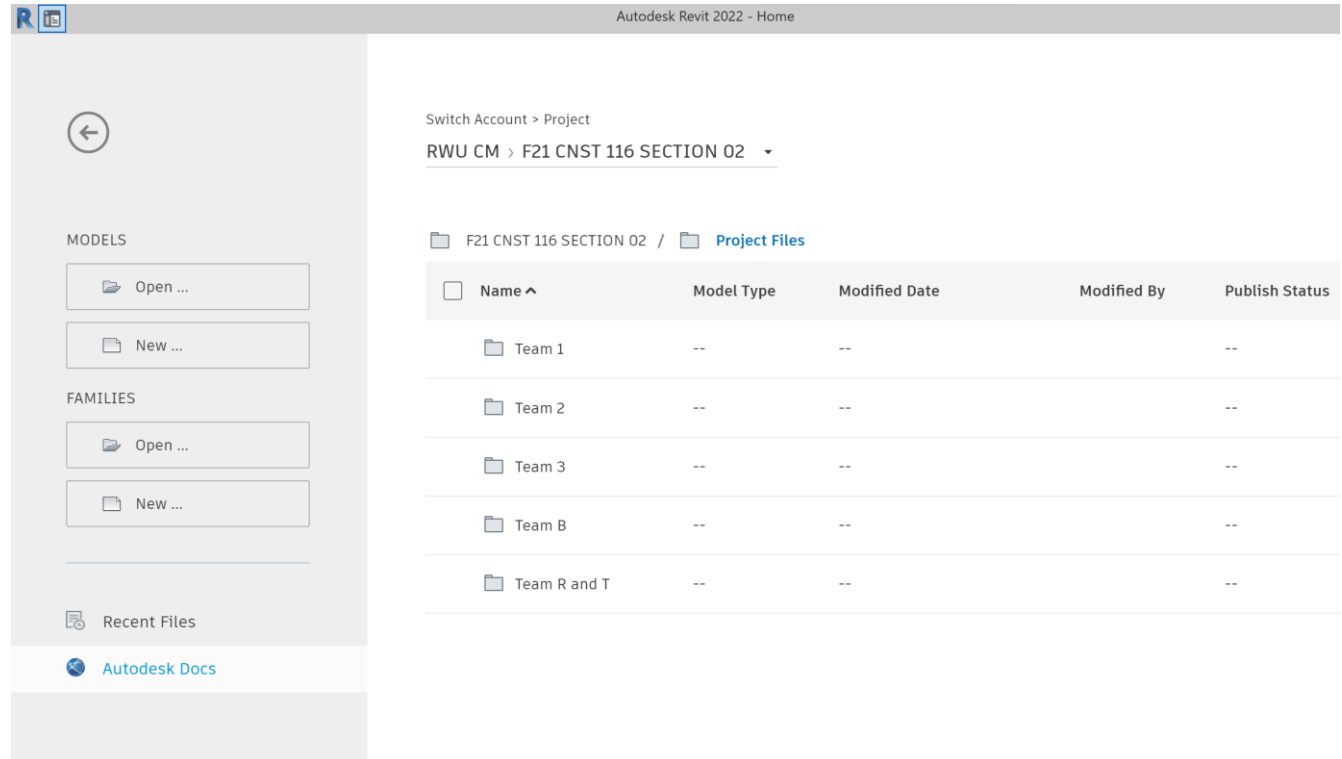
The screenshot displays the Autodesk Construction Cloud interface for a project named "F21 CNST 116 SECTION 02". The user is logged in as "Anne Anderson". The interface shows a sidebar with navigation options: Docs, Files, Reviews, Transmittals, Issues, Reports, Members, Bridge, and Settings. The main content area is titled "Files" and shows a "Folders" view. Under the "Project Files" folder, there are sub-folders for "Team 1", "Team 2", "Team 3", "Team B", and "Team R and T". A table below the folders lists these team folders with columns for Name, Description, Version, Synced with Bridge, Markup, Size, Last updated, and user actions.

Name	Description	Version	Synced with Bridge	Markup	Size	Last updated	Actions
Team 1	--	--	↔	--	--	Oct 19, 2021 7:02 PM	🔊 ⋮
Team 2	--	--	↔	--	--	Oct 19, 2021 7:02 PM	🔊 ⋮
Team 3	--	--	↔	--	--	Oct 19, 2021 7:03 PM	🔊 ⋮
Team B	--	--	↔	--	--	Oct 19, 2021 7:02 PM	🔊 ⋮
Team R and T	--	--	↔	--	--	Oct 19, 2021 7:03 PM	🔊 ⋮

Team Project Using Docs

CNST 116 Computer Applications for Construction

- Add students to Autodesk Construction Cloud
- Create team folders
- High trust environment



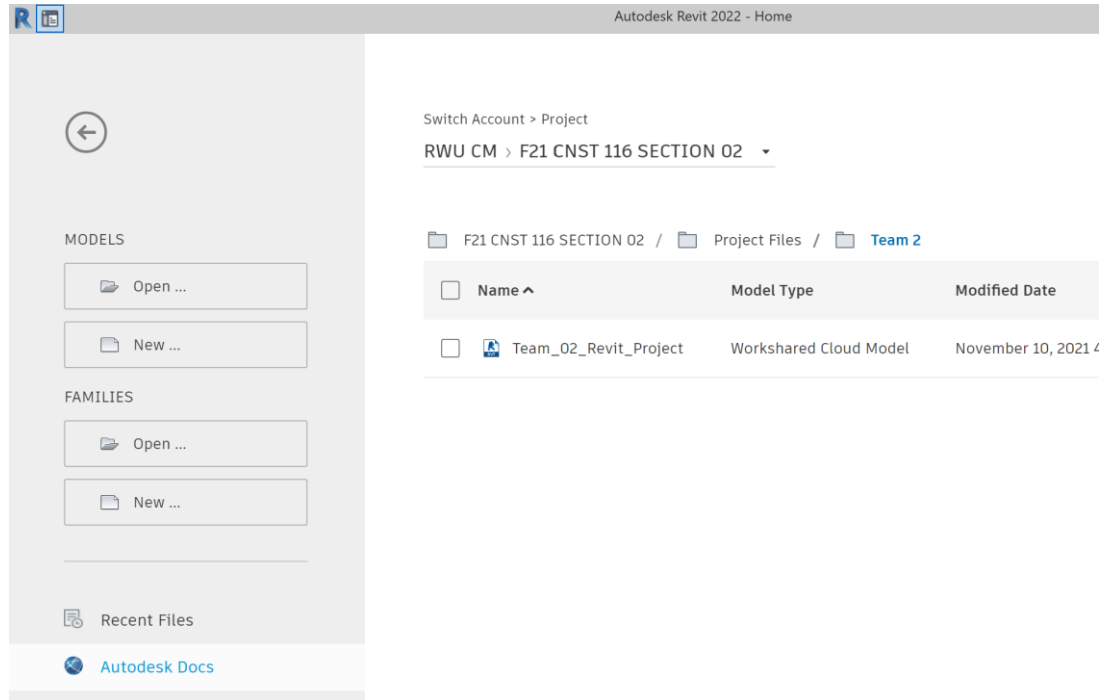
The screenshot shows the Autodesk Revit 2022 interface. The top bar indicates 'Autodesk Revit 2022 - Home'. The left sidebar contains navigation options: 'MODELS' with 'Open ...' and 'New ...' buttons, 'FAMILIES' with 'Open ...' and 'New ...' buttons, 'Recent Files', and 'Autodesk Docs'. The main workspace displays the project hierarchy: 'Switch Account > Project' followed by 'RWU CM > F21 CNST 116 SECTION 02'. Below this, a folder named 'F21 CNST 116 SECTION 02' is expanded to show a sub-folder 'Project Files'. A table lists the contents of 'Project Files'.

<input type="checkbox"/>	Name ^	Model Type	Modified Date	Modified By	Publish Status
<input type="checkbox"/>	Team 1	--	--		--
<input type="checkbox"/>	Team 2	--	--		--
<input type="checkbox"/>	Team 3	--	--		--
<input type="checkbox"/>	Team B	--	--		--
<input type="checkbox"/>	Team R and T	--	--		--


Team Project Using Docs

CNST 116 Computer Applications for Construction

- Each team has *one* cloud model



The screenshot shows the Autodesk Revit 2022 interface. The top bar indicates 'Autodesk Revit 2022 - Home'. The left sidebar contains navigation options: 'MODELS' with 'Open ...' and 'New ...' buttons, 'FAMILIES' with 'Open ...' and 'New ...' buttons, and 'Recent Files'. The main workspace shows a breadcrumb path: 'Switch Account > Project' followed by 'RWU CM > F21 CNST 116 SECTION 02'. Below this, there are folder icons for 'F21 CNST 116 SECTION 02', 'Project Files', and 'Team 2'. A table lists the models in the 'Team 2' folder:

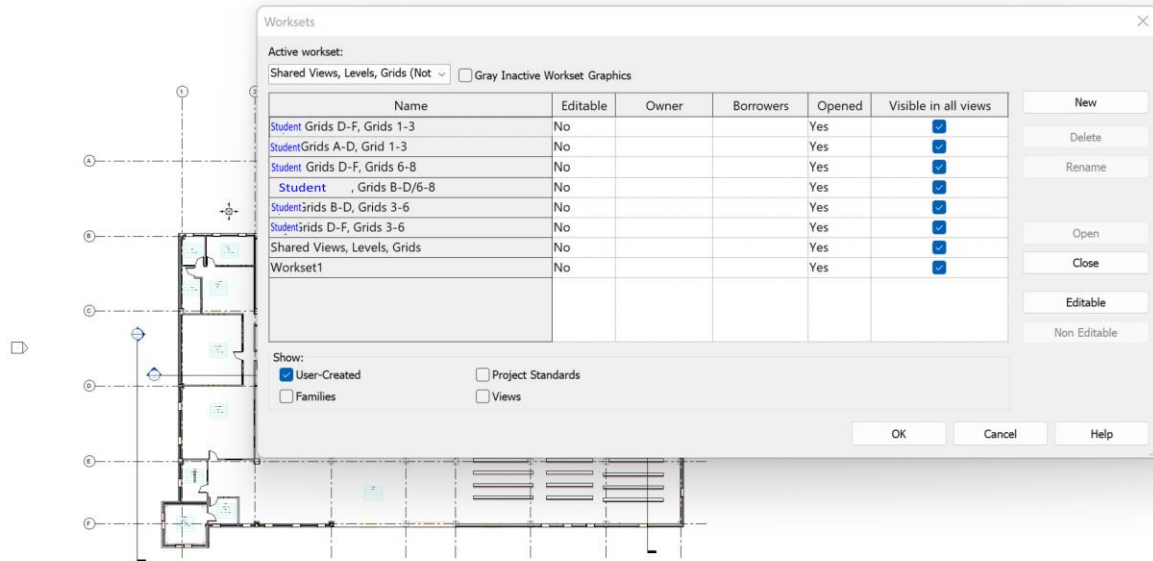
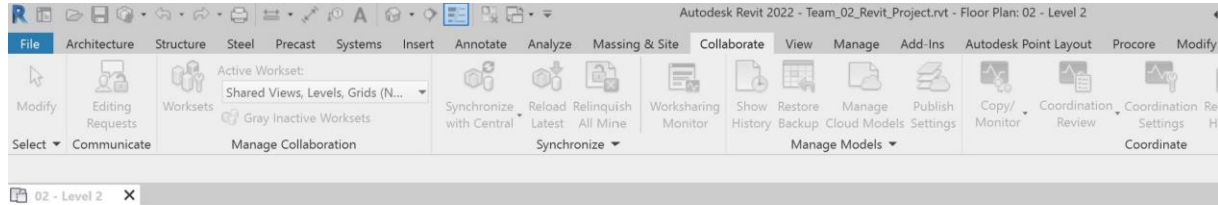
<input type="checkbox"/>	Name ^	Model Type	Modified Date
<input type="checkbox"/>	 Team_02_Revit_Project	Workshared Cloud Model	November 10, 2021 4

At the bottom of the sidebar, there is a link for 'Autodesk Docs'.

Team Project Using Docs

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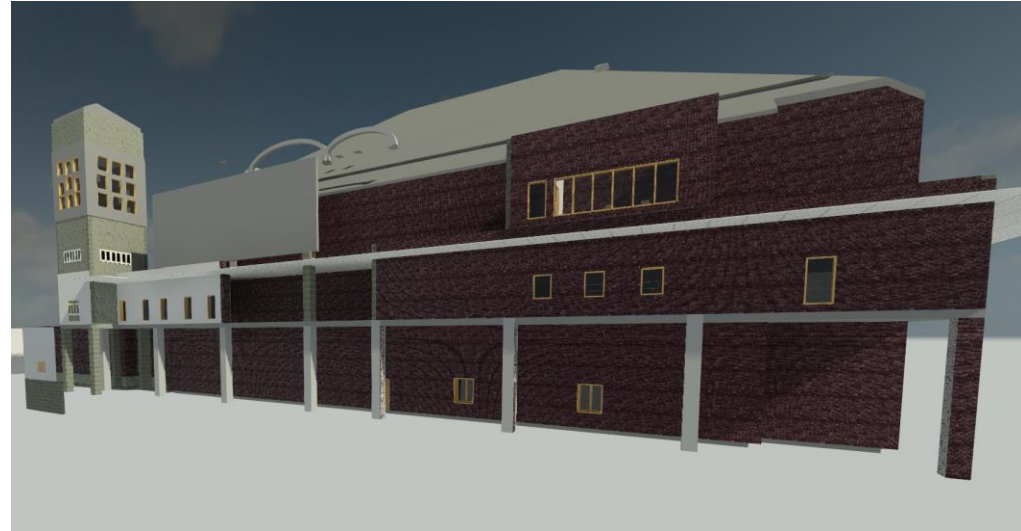
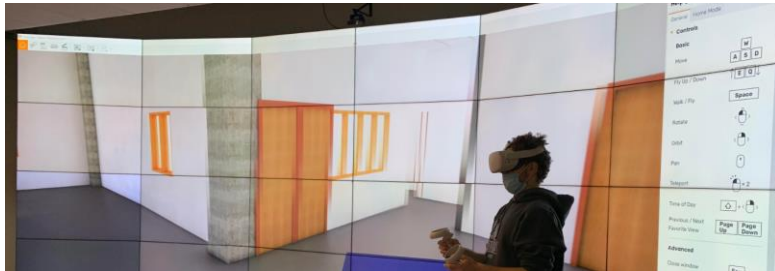
- Collaborate
→ Worksets



Team Project Using Docs

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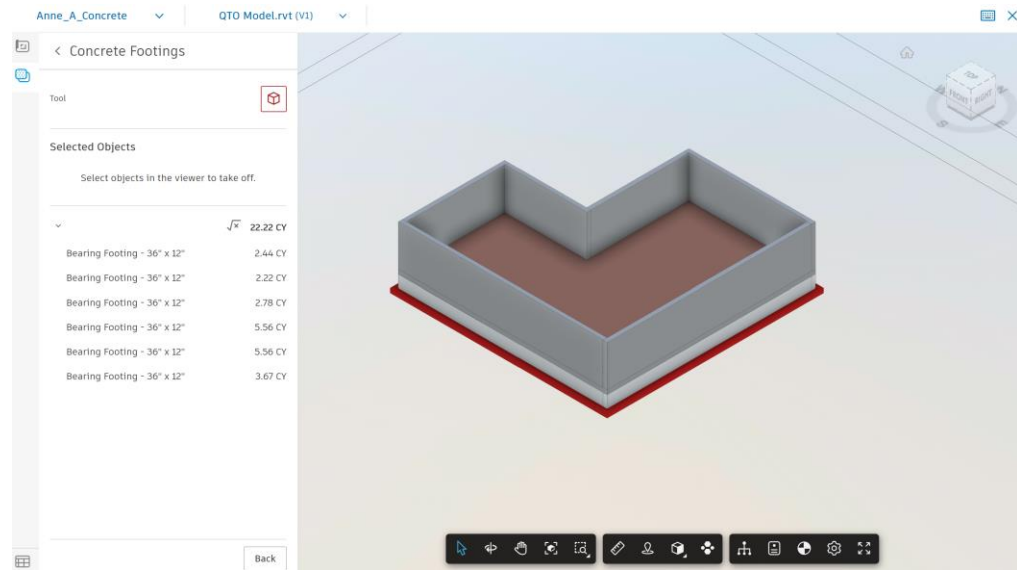
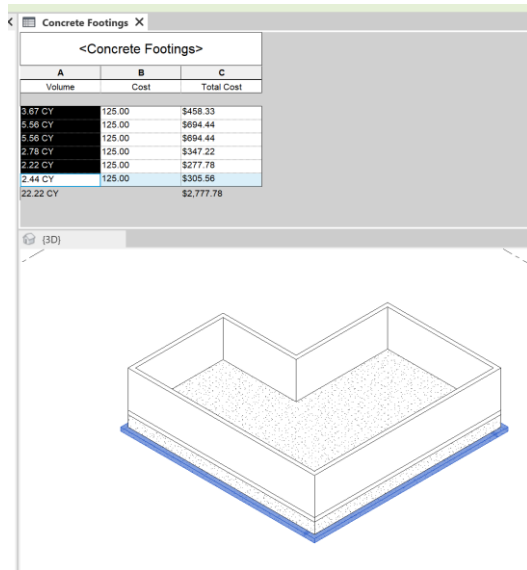
- Final day: each team links all other teams' levels for a complete model



Individual Assignment Using Autodesk Takeoff

CNST 116 Computer Applications for Construction

- Compare experience/numbers with Revit QTO assignment



Individual Assignment Using Autodesk Takeoff

CNST 116 Computer Applications for Construction

- Compare experience/numbers with Revit QTO assignment

FALL 2021 CNST 116 W10D2 REVIT Quantity Takeoff (QTO)

➤ **Today you are going to:**

- Quantify volume of concrete in the concrete footings using Revit.
- Report the concrete quantity in **cubic yards** and find the **total cost**.

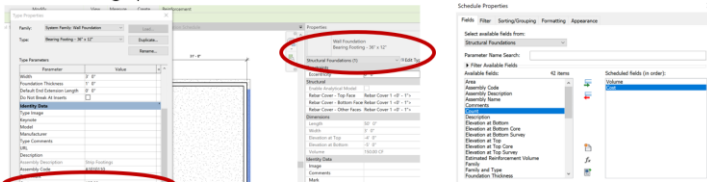
➤ **At the end of lab, have the instructor or TA check your work.**

STEPS TO COMPLETE THE EXERCISE

1. Open Revit 2022 and, in the upper right-hand corner, sign in using your Autodesk account
2. Download the QTO Model from Bridges under Assignments → Revit QTO

QUANTIFY CONCRETE FOOTINGS

1. Open the Level 1 plan and select one of the 36" x 12" Wall Foundation Bearing Footings. In the Properties palette, click on Edit Type, then scroll to the bottom and add 125.00 in the cost field (see below, left). This is a UNIT cost, not a total cost (i.e. \$125.00 per CY of concrete)
2. Create a new "Quantities" Schedule for the footings: View tab → Create panel → Schedules dropdown → Schedules/Quantities → Category: Structural Foundations → OK
3. In the Schedule Properties dialog box, in the Fields tab, select: Volume and Cost (see below, right) → OK



FALL 2021 CNST 116 W11D1 REVIT

Takeoff using [Autodesk Construction Cloud Takeoff](#)

➤ **Today you are going to:**

- Quantify volume of concrete in the concrete footings using **ACC Takeoff**
- Report the concrete quantity in **cubic yards** and find the **total cost**.

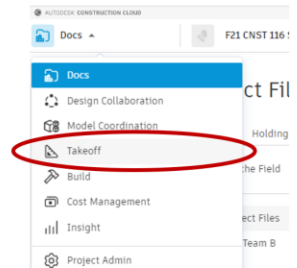
➤ **At the end of lab, have the instructor or TA check your work.**

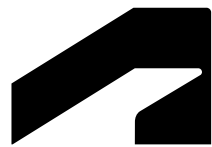
UPLOAD THE MODEL TO AUTODESK CONSTRUCTION CLOUD. NOTE: TO SAVE TIME TODAY, THIS PART HAS BEEN DONE FOR YOU. STEPS BELOW ARE FOR FUTURE REFERENCE.

1. Log in to Autodesk Construction Cloud ([acc.autodesk.com](#))
2. In the upper left dropdown, select Takeoff
3. On the left, select Sheets & Models
4. Click on 3D Models in the tab above "Upload Files"
5. Click on Upload Models, then drag & drop or navigate to where your file is saved locally. Your model may take a few minutes to upload.

QUANTIFY CONCRETE FOOTINGS

6. Log in to Autodesk Construction Cloud ([acc.autodesk.com](#))
7. In the upper left dropdown, select Takeoff
8. Go to the Packages tool
9. Go to settings on the right
 - Select imperial
 - Select classification system from the dropdown (typically either Masterformat or Uniformat. Today you'll use the Sample Assembly Classification)
10. On the left, select Packages
11. Click on the blue "+Create Packages" button and enter the package title: **FirstName_LastInitial_Concrete**
12. Click on your package name in the list
13. On the left, click on the model in the list (on a typical project,





Lessons Learned

Faculty Reflections

- With the cloud model, only need to open one model for grading
- With access to Autodesk Construction Cloud resources (learnacc.autodesk.com), students can explore beyond the classroom assignments
- Autodesk is continually innovating
- Keeping up to date
- Support from Autodesk
- Autodesk Digital Construction Summer School

Student Comments

Working with classmates, and overall **group work** helped me learn the material.

Hands on experience, it wasn't just learning it through lecturing and stuff. We got to **actively practice** what we were learning in class.

Being **in the class** and using the **programs** helped with learning them and have easy access to someone who can answer my questions

Dr. Anderson furnished **hand out sheets** that listed the objective for that class, and guided you through how to complete it and she also had a TA that helped answer questions.

It was good how we had the **worksheets** that gave us directions

Everyday we got a worksheet that would get be us a **step by step** guide on what to do in an assignment

I greatly appreciate the packets that were handed out. They had **step-by-step** processes and they were very helpful.

I like the **interaction**, and engaging way professor anderson ran her course. **instructions** were very straight forward

Q&A



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