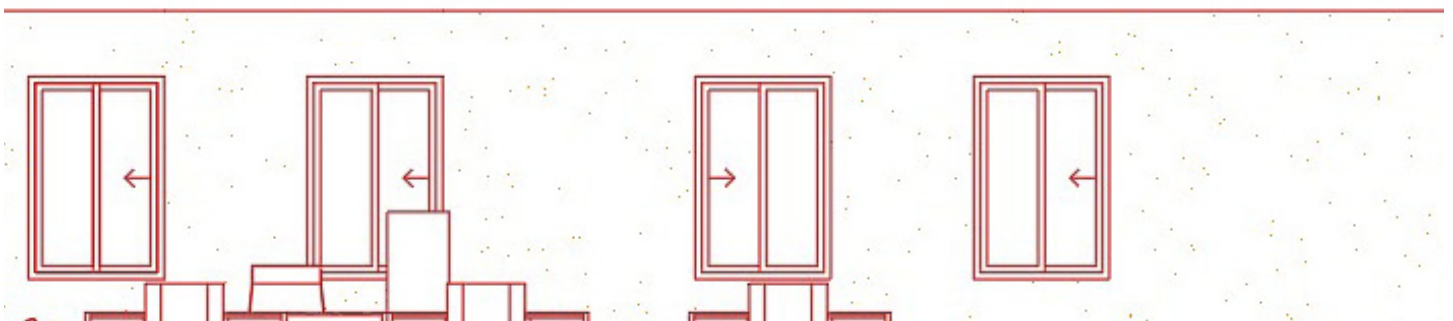
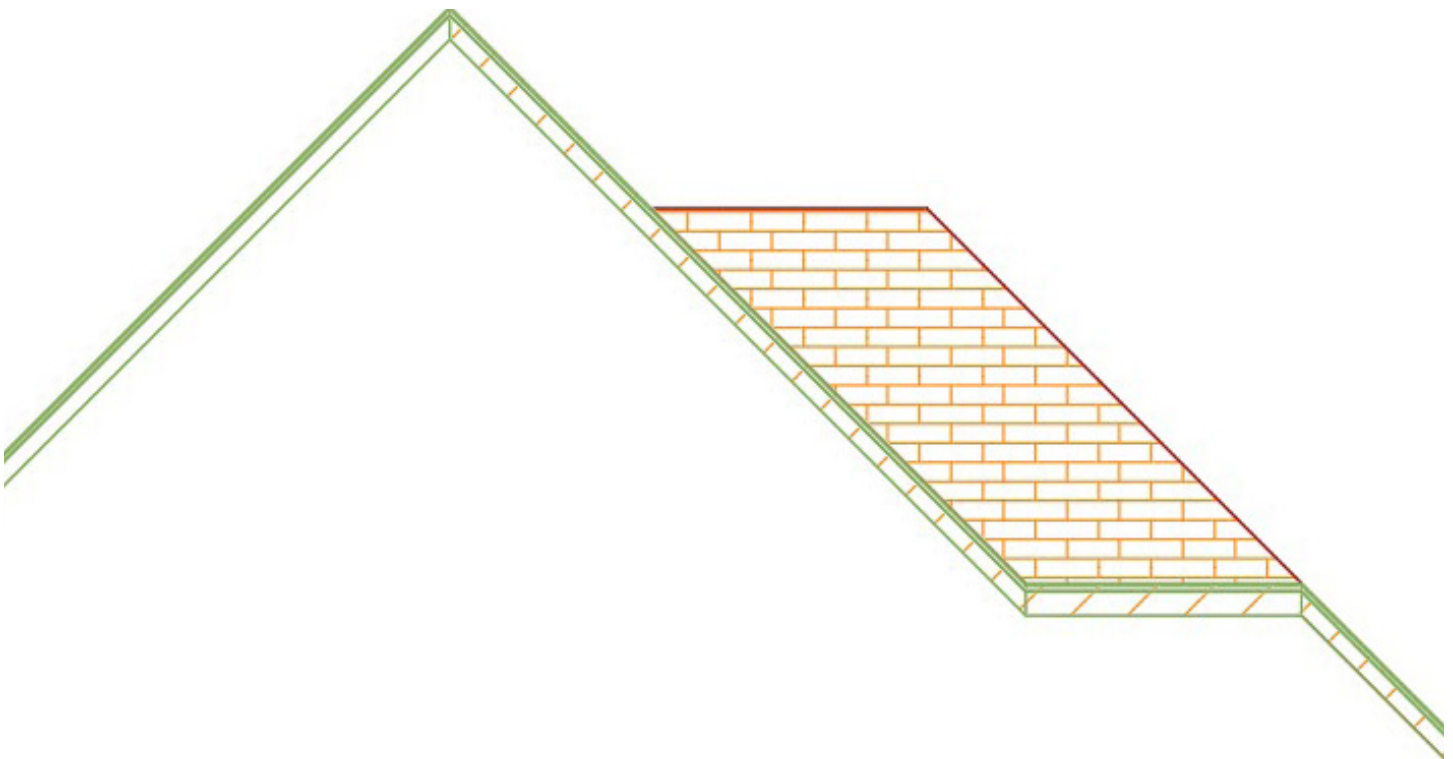


The Benefits of Using the Architecture Toolset in AutoCAD®

*A productivity study detailing the differences
between AutoCAD® and the Architecture toolset.*

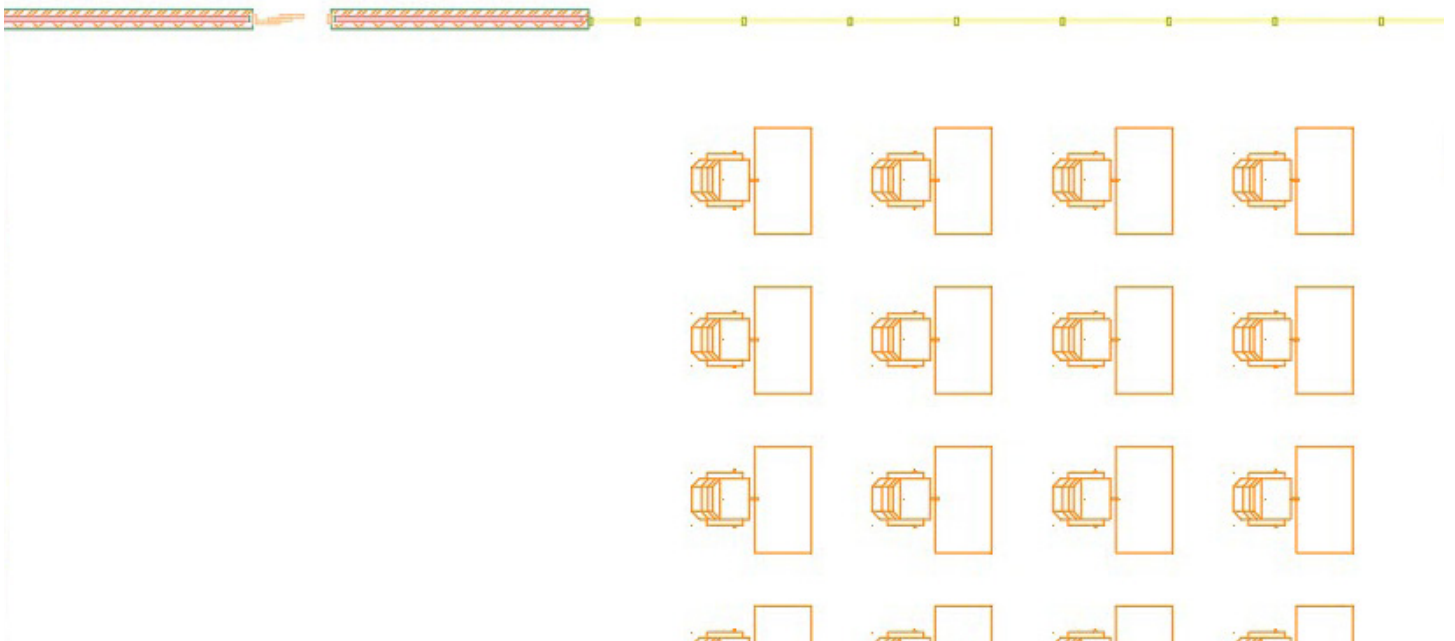
- **The Architecture toolset** (previously referred to as AutoCAD Architecture), now included with AutoCAD as a specialized toolset, is built specifically to create and modify software-based design and documentation productivity for architects. Purpose-built architectural design tools help eliminate errors and provide accurate information to the user, allowing more time for architectural design. This study details the productivity gains that users may experience when using the Architecture toolset rather than basic AutoCAD when designing and documenting a building.*



EXECUTIVE SUMMARY

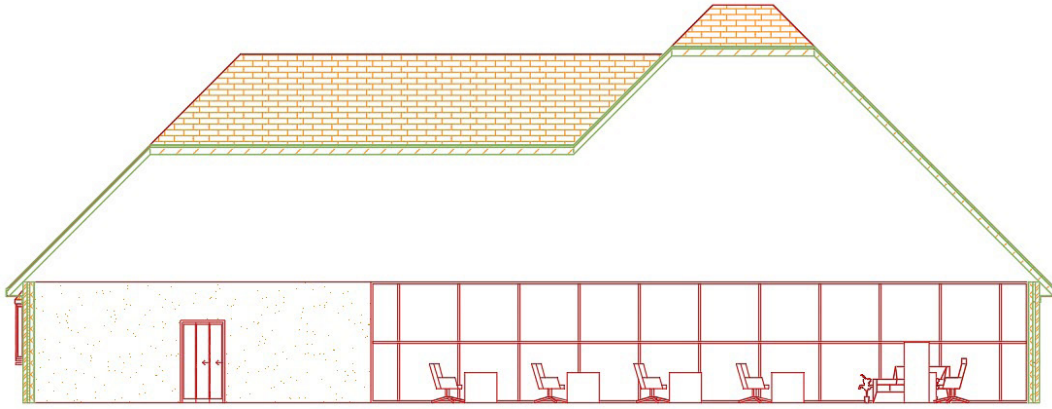
- Designed by Autodesk and commissioned to an independent consultant, this study explores common architectural design challenges when preparing construction documents in basic AutoCAD and the subsequent productivity gains by using the Architecture toolset. A set of design documents will be recreated using both basic AutoCAD and the Architecture toolset, with tasks ranging from drawing floor plans and sections to creating details and making revisions. The Architecture toolset provided a 60% productivity gain over the time taken to accomplish each task in basic AutoCAD (depending on user expertise level with the Architecture toolset and based on experience and training).

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KEY FINDINGS

- Creation of floor plans was 50% faster.
- The time taken to create architectural elevations was reduced by 75%.
- Detailing and scheduling time was reduced by up to 70%.
- There was an overall productivity gain of 60% using the Architecture toolset.



THE STUDY

This study explores nine common design challenges and shows direct comparisons of the time and effort required to accomplish each specific task in basic AutoCAD versus with the Architecture toolset.*

The same tasks were completed up to 60% faster using the Architecture toolset.*

The performance results in this paper were achieved by one user, with expert-level experience, using both basic AutoCAD and the Architecture toolset, conducting comparative tests on the same sample AutoCAD project of a small one-story village school. The tasks are comprehensive in nature. For each task the total time it took to complete each task using both basic AutoCAD and the Architecture toolset is documented in each case.

It was assumed during the study that all symbols and title blocks needed in basic AutoCAD for the design process were local to the document. Searching time is subjective and the methodologies allowed for the quick placement of required blocks in the shortest amount of time possible.

A detailed description of the study follows.

1

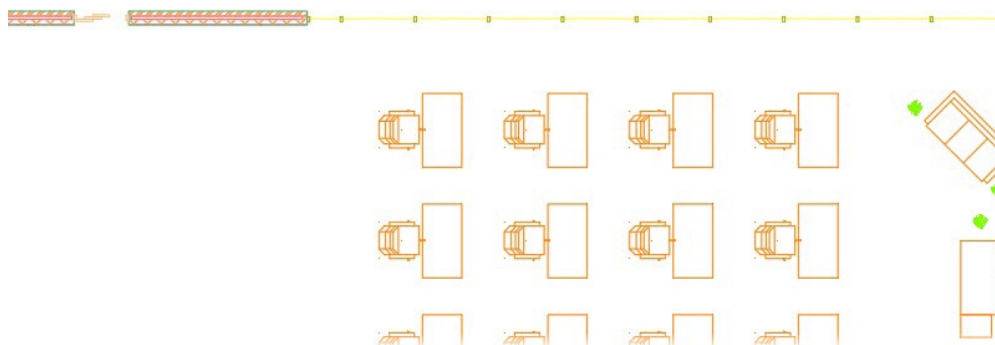
FLOOR PLANS

■ Task:

When working with basic AutoCAD, a set of construction documents created by the architect would begin with the floor plans. Before that process starts, any styles and symbols that will be used need to be created and developed: text styles, dimension styles, standard blocks, etc. This includes building objects, such as wall styles, doors, windows columns, and beams, and symbols, such as tags, used to identify rooms and the building objects themselves. The Architecture toolset includes a huge library of thousands of predefined building objects added to tool palettes. These objects can also be customized to suit the individual project if needed. The task was to develop floor plans for a simple building project.

■ Steps:

- Create a ground floor plan
- Add appropriate walls, doors, and windows, and set out internal fixtures (furniture)



Floor Plans	AutoCAD	Architecture Toolset
Set up project	10:00	15:00
Create a structural grid	45:00	45:00
Create wall outlines	15:00	15:00
Create custom windows and doors	60:00	0:00
Generate custom walls	60:00	0:00
Add dimensions and tags	30:00	30:00
Generate roof	45:00	30:00
Total time to complete task	265:00	135:00
Time savings with the Electrical Toolset		50%

(Figures shown in minutes and seconds)

■ Facts:

The Architecture toolset provides a huge library of architectural components, including multi-level blocks, which allow for more productivity when setting up your architectural designs. Regular AutoCAD blocks can still be used, but the blocks must be moved and rotated to align with elements such as the structural grid, walls, and dimension annotation.

2

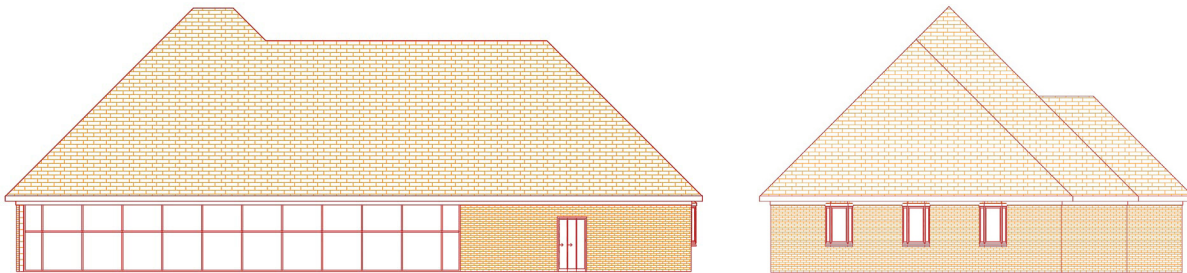
ELEVATIONS

■ Task:

The task was to create the four primary elevations of the architectural project: north, south, east, and west. The Architecture toolset provides you with the facility to create elevations easily and quickly from your 3D architectural model. In basic AutoCAD, the building plans only existed as 2D drawings, so any elevations or sections must be created by projecting lines from the floor plans, like using a drawing board. Any doors or windows also must be recreated in elevation as new blocks to be inserted into the elevations and/or sections.

■ Steps:

- Create project geometry (walls, doors, windows) from floor plans
- Create 2D blocks in elevation (doors and windows)
- Complete elevations and adding annotation where required



Elevations	AutoCAD	Architecture Toolset
Create project geometry from floor plans	45:00	1:00
Create 2D blocks of windows and doors for elevations	30:00	0:00
Complete elevations	120:00	50:00
Total time to complete task	195:00	51:00
Time savings with the Electrical Toolset		75%

(Figures shown in minutes and seconds)

■ Facts:

The Architecture toolset can save vast amounts of tedious 2D editing time that would be required in basic AutoCAD. During this task, it was obvious that building the 3D model in the Architecture toolset would be far more beneficial than trying to create the project from 2D, due to the automatic generation of both elevations and sections with the Architecture toolset.

The Architecture toolset also provides great cataloging tools that allow you to ensure that all fixtures, such as doors and windows, use the appropriate materials as all this information is already associated with them when you bring them from the library into the project.

3

REFLECTED CEILING PLANS

■ Task:

The task was to generate an arrangement of ceiling grids and light fixtures in the reflected ceiling plan for the project. To do this in basic AutoCAD, the floor plans were copied and layers that would not be needed were either frozen or turned off. A new hatch pattern was then used to represent the ceiling tiles with the perimeter of the ceiling (and any subsequent partitions) outlined with the polyline command.

The light fittings and fixtures were created with dynamic blocks and added to a new tool palette, with the drag-and-drop method being used to add them to the ceiling plan.

The Architecture toolset allows you to create rooms and spaces from the 3D model, automatically creating outlines for rooms, which also allows for automatic creation of ceiling grids. The Architecture toolset's extensive content library provided pre-drawn light fixtures which could be dragged and dropped into the ceiling grids from DesignCenter™ with no further editing required.

■ Steps:

- Draw the ground floor ceiling plan
- Create and add lighting fixtures to the ceiling plan

Reflected Ceiling Plans	AutoCAD	Architecture Toolset
Create the ground floor ceiling plan	60:00	40:00
Create and add light fixtures to the ceiling plan	20:00	20:00
Total time to complete task	80:00	60:00
Time savings with the Electrical Toolset		25%

(Figures shown in minutes and seconds)

■ Facts:

The Architecture toolset provides the following advantages:

- Automatically generates ceiling grids from existing room and space outlines
- Features an extensive content library of pre-drawn lighting fixture blocks
- Automatically inserts lighting fixtures from DesignCenter™ with no further editing required
- Avoids costly errors.

4

BUILDING SECTIONS

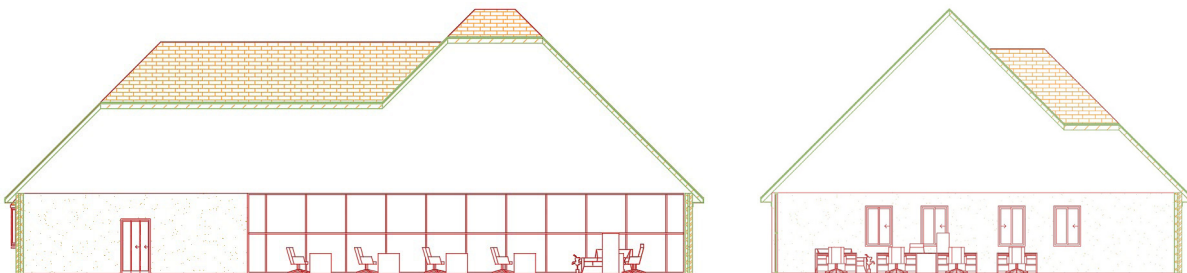
■ Task:

Building sections are an important part of construction documents. The Architecture toolset can create building sections using the 3D model in the same way sections were created in Task 2.

Like in Task 2, the building plans only existed as 2D drawings in basic AutoCAD, so any building sections must be created by projecting lines from the floor plans, like using a drawing board. In this case though, any doors or windows had already been created as blocks to be inserted into the elevations and could be used in the sections.

■ Steps:

- Create project geometry (walls, doors, windows) from floor plans
- Create additional 2D blocks in section (doors, windows, and walls where applicable)
- Complete sections and add annotation where required



Building Sections	AutoCAD	Architecture Toolset
Create building section going WEST-EAST	110:00	40:00
Create building section going NORTH-SOUTH	108:00	37:00
Total time to complete task	218:00	77:00
Time savings with the Electrical Toolset		65%

(Figures shown in minutes and seconds)

■ Facts:

The Architecture toolset offers huge time savings here because:

- Building sections can be created automatically with similar tools to those used for elevations.
- Section marks can be straight or staggered.
- Building sections (and elevations) can be refreshed should their positioning in the model change.

5

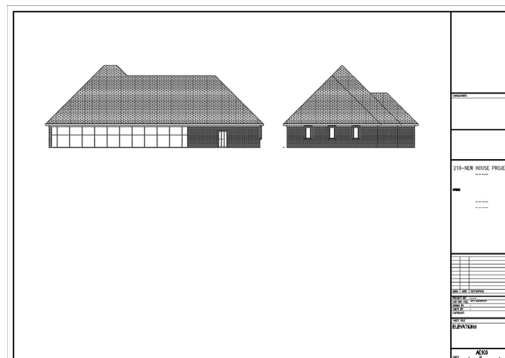
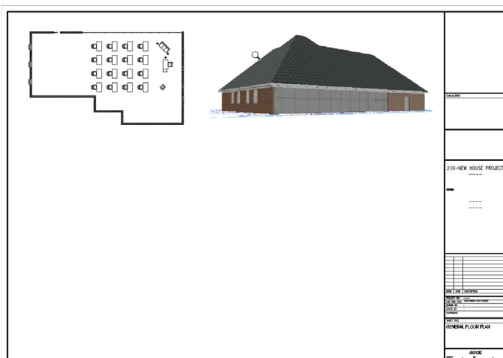
SHEET LAYOUTS

■ Task:

The Architecture toolset offers the same sheet set functionality that basic AutoCAD does, so the preparation of sheet layouts for the project in both applications was similar. Once the sheets were generated, files could be dragged and dropped to create viewports of individual project elements such as floor plans, elevations, and sections.

■ Steps:

- Create sheet set for the project
- Create a project cover sheet with a perspective view of the project
- Create sheets for floor plans, ceiling plans, elevations, and sections
- Place appropriate views on sheets
- Create page setups for plotting and printing



Sheet Layouts	AutoCAD	Architecture Toolset
Create sheet sets	60:00	06:00
Create cover sheet (including perspective view)	70:00	25:00
Create sheets for plans, elevations, and sections	53:00	18:00
Place views on sheets	55:00	14:00
Create page setups	10:00	10:00
Total time to complete task	248:00	73:00
Time savings with the Electrical Toolset		71%

(Figures shown in minutes and seconds)

■ Facts:

The advantages of the Architecture toolset:

- The project model is in 3D, so no extra drafting is needed to create sheet views, especially the perspective view on the cover sheet.
- Any subsequent changes to the sheets can be refreshed and require no re-drafting.
- Additional sheet set tools provide productivity gains, saving time on sheet set creation.

6

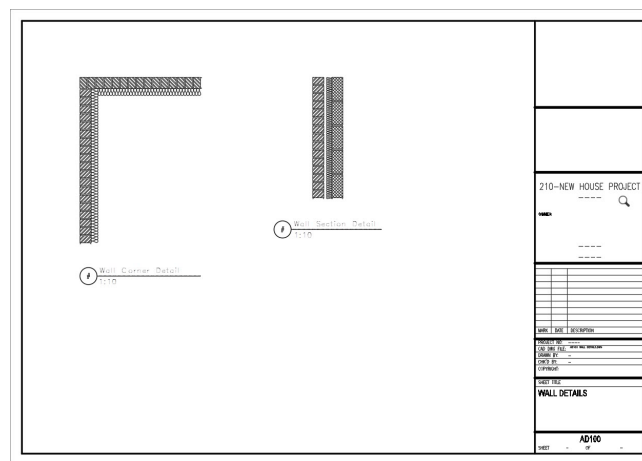
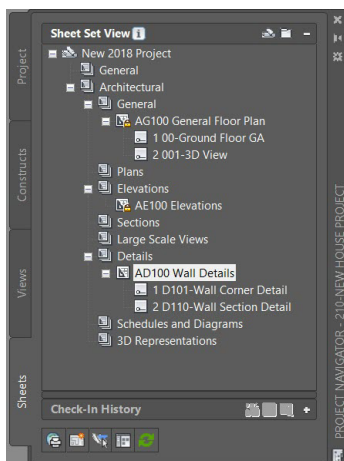
DETAILS

■ Task:

Architectural construction projects, by their nature, contain many sheets of large-scale details. Often, a single 'typical' details sheet is created, rather than numerous time-consuming sheets of every individual detail in the project. This task comprised of creating two wall details: corner and section.

■ Steps:

- Create an enlarged plan view from which to take the detail views
- Create detail views from the enlarged plan view
- Add detail components to detail and enhance detail views
- Add appropriate view annotation on detail sheets



Details	AutoCAD	Architecture Toolset
Create an enlarged plan view	15:00	10:00
Create a section through wall corner for detail	90:00	15:00
Create a section through wall for section detail	45:00	20:00
Total time to complete task	150:00	45:00
Time savings with the Electrical Toolset		70%

(Figures shown in minutes and seconds)

■ Facts:

Creating sections with basic AutoCAD is a time-consuming task, especially in 2D drawings. The Architecture toolset provides substantial time savings, primarily due to the 3D model and pre-designed multi-level blocks in the content library.

- Details are created from 3D model sections where the drawing information is already in place
- Blocks from the content library provide all the necessary graphical information for the details
- Detail components can be added to enhance the detail views

7

SCHEDULES

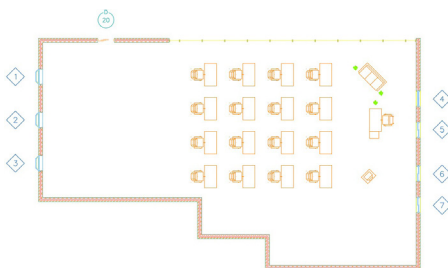
■ Task:

All construction projects need schedules. This accounts for the necessary building elements, such as windows, doors, and other associated fixtures. Schedules provide the necessary information to cost and catalog a project. Manufacturer, size, description, and item cost can be included.

Basic AutoCAD requires this information in blocks with attributes, and there is no refresh option should that attribute information change. The Architecture toolset content library already has a lot of this information contained in the pre-drawn blocks. If used in the project and changed, a block from the library will trigger the appropriate schedule in the project to be refreshed to show the current details.

■ Steps:

- Add the appropriate tags to windows and doors in a floor plan
- Create a window schedule from the tagged windows
- Add the schedule to the floor plan
- Any updates to the windows will appear on the refreshed schedule



WINDOW SCHEDULE					
Number	SIZE		TYPE	MATERIAL	Remarks
	Width	Height			
1	1010	1510	---	---	---
2	1010	1510	---	---	---
3	1010	1510	---	---	---
4	1010	1510	---	---	---
5	1010	1510	---	---	---
6	1010	1510	---	---	---
7	1010	1510	---	---	---
?	?	?	---	---	?

Schedules	AutoCAD	Architecture Toolset
Add tags to floor plan, including windows and doors	25:00	10:00
Create a window schedule; select windows	35:00	10:00
Add schedule to floor plan drawing	N/A	01:00
Total time to complete task	60:00	21:00
Time savings with the Electrical Toolset		65%

(Figures shown in minutes and seconds)

■ Facts:

The time savings provided by the Architecture toolset is substantial:

- Necessary information for scheduling is already in the pre-drawn content library blocks
- Schedules are easily created and refreshed
- Schedule styles are automatic, whereas they must be created in basic AutoCAD

8

AUTOMATIC PROJECT REPORTS

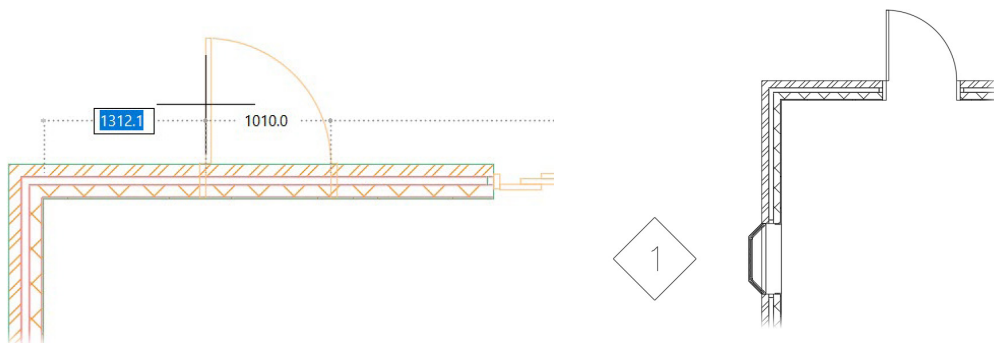
■ Task:

There will always be changes in architectural projects – it is unavoidable. Typical issues that often come up are changes to the positioning of doors and windows and the positioning of internal partition walls to accommodate the use of the building. In this task, the positioning of some windows and doors were changed, and the subsequent project drawings and sheets were updated to follow suit. The basic AutoCAD drawings did not contain any intelligent objects, so even small changes caused a considerable amount of manual rework. Moving walls, doors, or windows meant adjoining lines must to be redrawn.

In the Architecture toolset, intelligent objects maintained their relationships and design changes could be implemented quickly and easily, with updates also automatically reflected in elevations, sections, and details.

■ Steps:

- Reposition/change doors and windows in floor plans
- Update drawings and sheets accordingly



Schedules	AutoCAD	Architecture Toolset
Reposition or change doors and windows	30:00	12:00
Update drawings by reloading references	15:00	10:00
Update sheets to reflect new information	15:00	10:00
Total time to complete task	55:00	32:00
Time savings with the Electrical Toolset		42%

(Figures shown in minutes and seconds)

■ Facts:

As you can see, it takes nearly an hour to make the simplest of changes required by this task using basic AutoCAD. That time is nearly halved by using the Architecture toolset, due to the ability to refresh drawings and sheets automatically after any changes are made.

9

COORDINATION AND PUBLISHING

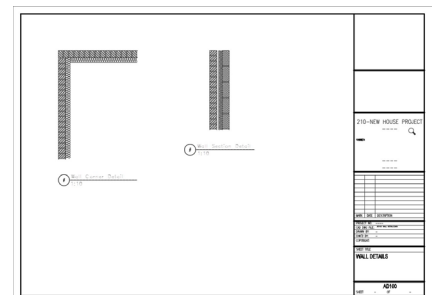
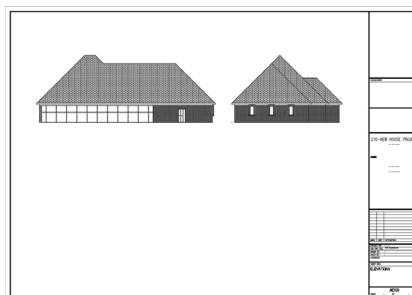
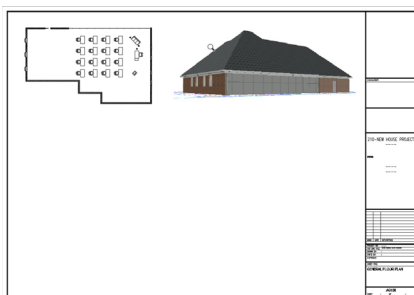
■ Task:

The coordination and publishing of an architectural project can be very time-consuming. Architects must ensure that the completed drawings go out on time, that all callouts refer to the proper drawings on the correct sheets, and so on. Then, the drawings go out for production, and even the smallest error can be costly.

This task involved implementing some minor modifications to the project drawings, adding additional callouts, and linking them to the appropriate views on the sheets. The project was then published from the available sheet set created.

■ Steps:

- Add callouts, corrections, and additions to the project drawings
- Publish the project using the sheet set available



Coordination and Publishing	AutoCAD	Architecture Toolset
Add callouts, corrections, and additions to drawings	55:00	40:00
Publish from project sheet set	20:00	08:00
Total time to complete task	75:00	48:00
Time savings with the Electrical Toolset		36%

(Figures shown in minutes and seconds)

■ Facts:

Basic AutoCAD has the same sheet set publishing tools as the Architecture toolset. However, the Architecture toolset does have other publishing tools built-in, which speeds up the publishing process. To save time, the drawings were published as DWF™ files, a medium developed by Autodesk as a portable document format.

The DWF's published from the Architecture toolset also contained all the necessary callouts required to link to the elevations, sections, and details in the project, making it easy for the recipient of the DWF's to locate referenced views by clicking on the appropriate callouts.

CONCLUSION

In this Architecture toolset productivity study, the nine design tasks analyzed were just a few examples of how the Architecture toolset can provide tools and workflows to make you more productive.

Project Tasks	AutoCAD (min:secs)	Architecture Toolset (min:secs)	Time Savings
1. Floor plans	265:00	135:00	50%
2. Elevations	195:00	51:00	75%
3. Reflected ceiling plans	80:00	60:00	25%
4. Building sections	218:00	77:00	65%
5. Sheet layouts	248:00	73:00	71%
6. Details	150:00	45:00	70%
7. Schedules	60:00	21:00	65%
8. Project modifications	55:00	32:00	42%
9. Coordination and publishing	75:00	48:00	36%
Total time	1346:00	542:00	
Overall time savings with the Architecture toolset			60%

(Figures shown in minutes and seconds)

With the Architecture toolset, it is possible to save about 60% of the 2D CAD working time when compared to basic AutoCAD®.*

The advantages of the Architecture toolset

Based on these nine-selected tasks, the Architecture toolset provides a level of productivity for architects that is not possible with general-purpose CAD applications such as basic AutoCAD. Because the Architecture toolset is built specifically for architectural design, you could realize immediate and substantial productivity benefits such as the ones discussed in this paper.

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