

Sheridan | Architecture

# Exercise 12: Office/Warehouse roof steel quantity take-off

Structural Steel Framing

- a. Extracting the data
- b. Sorting by Steel members and elements
- c. Adding column headers
- d. Adding formulas
- e. Adding the Misc. steel estimate
- f. Calculating the deck

# Contents of this presentation

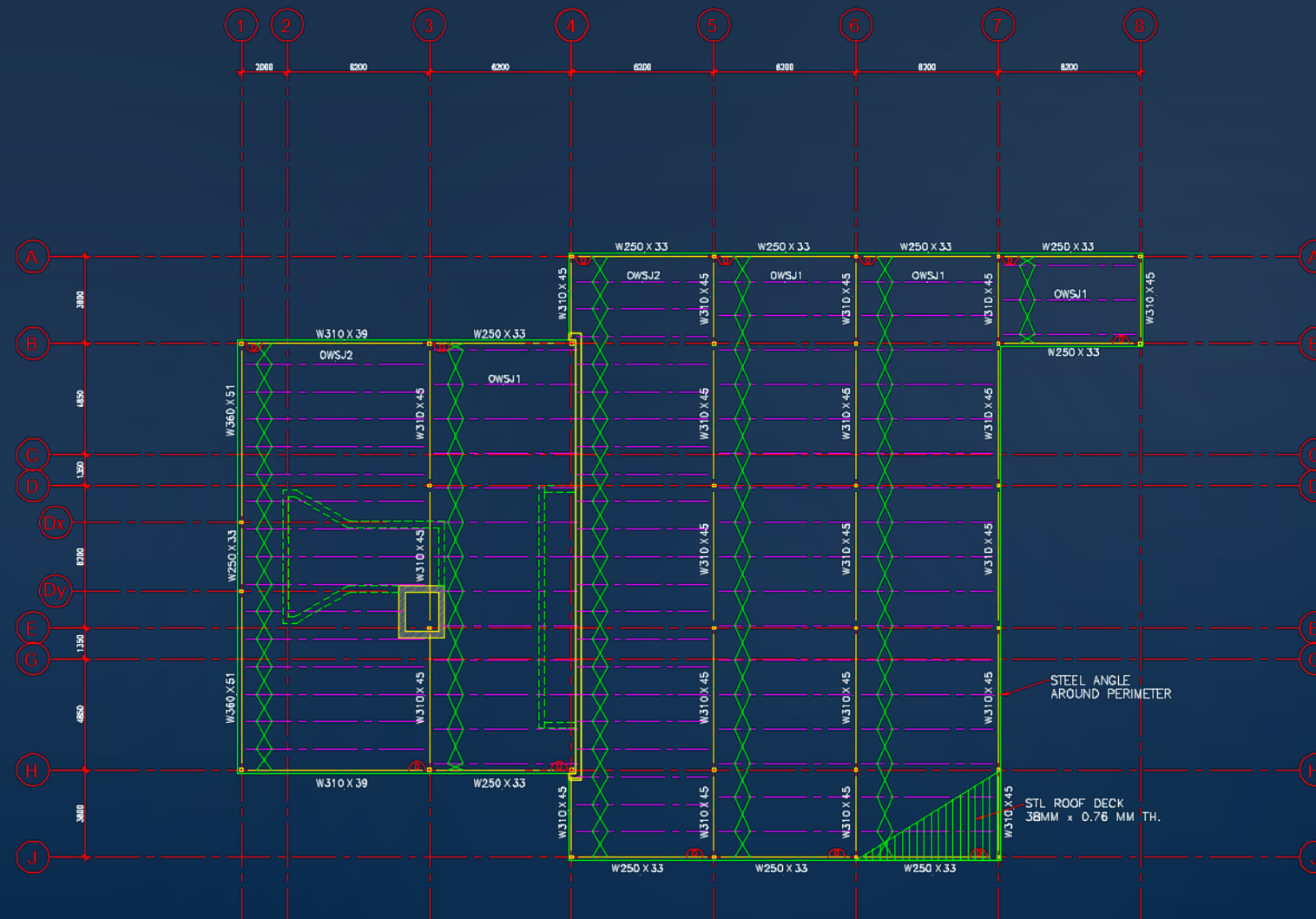
- You MUST hand in exercise 12 as a zip file with all the necessary files included.
- Your extracted data will be checked against the exercise 12 data in the assembled drawing – it must match.
- Do not copy the numbers from this presentation – except for the joist linear weight and steel deck weight.
- If you do not hand in the exercise12 files, the data extraction (dxe) template file, and the final excel file, this exercise will not be marked.

# Warning

- You MUST hand in exercise 12 as a zip file with all the necessary files included.
- Your extracted data will be checked against the exercise 12 data in the assembled drawing – it must match.
- Do not copy the numbers from this presentation – except for the joist linear weight and steel deck weight.
- If you do not hand in the exercise12 files, the data extraction (dxe) template file, and the final excel file, this exercise will not be marked.

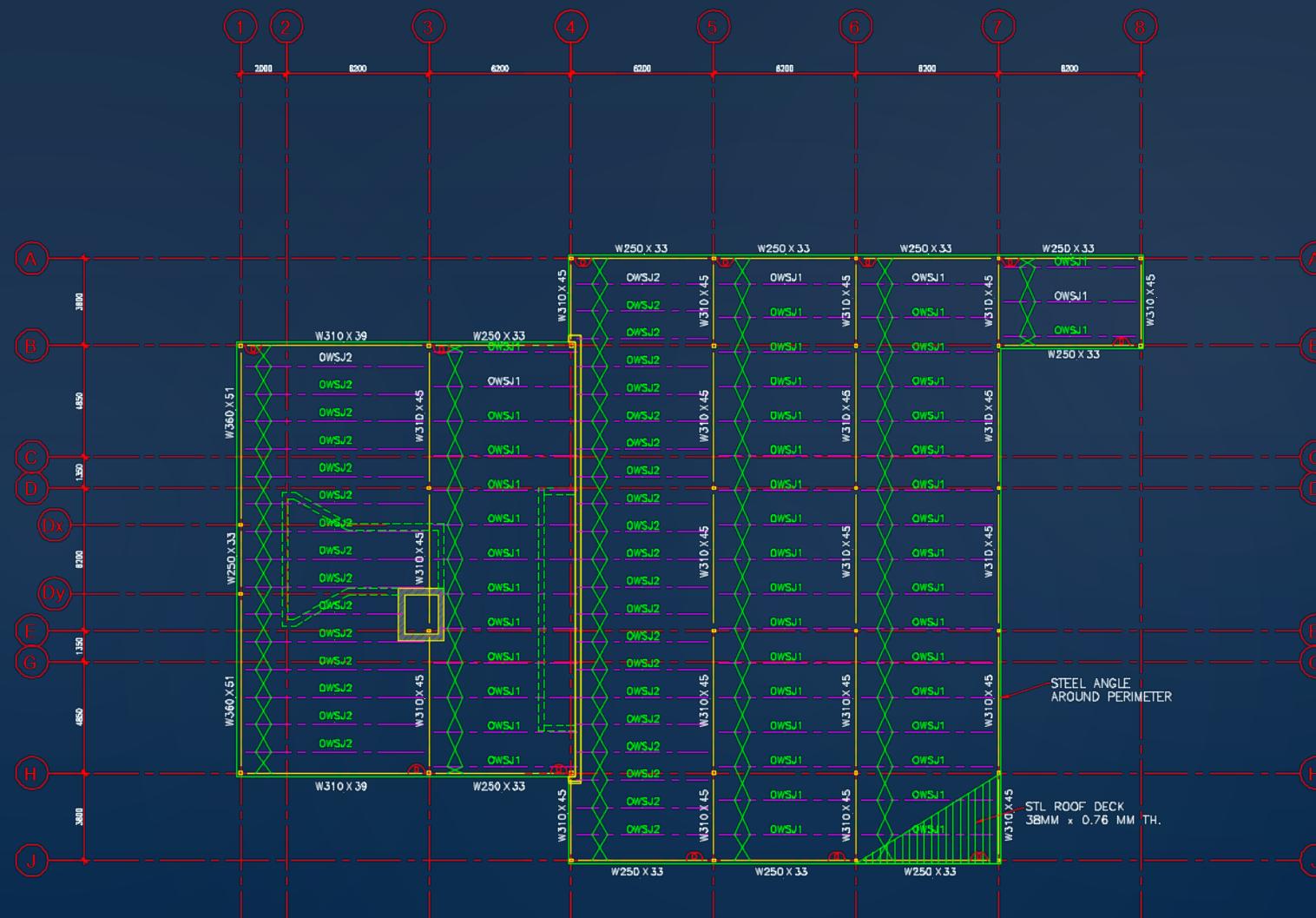
# Warning again

- The completed task 7 (ready for plotting) is shown.



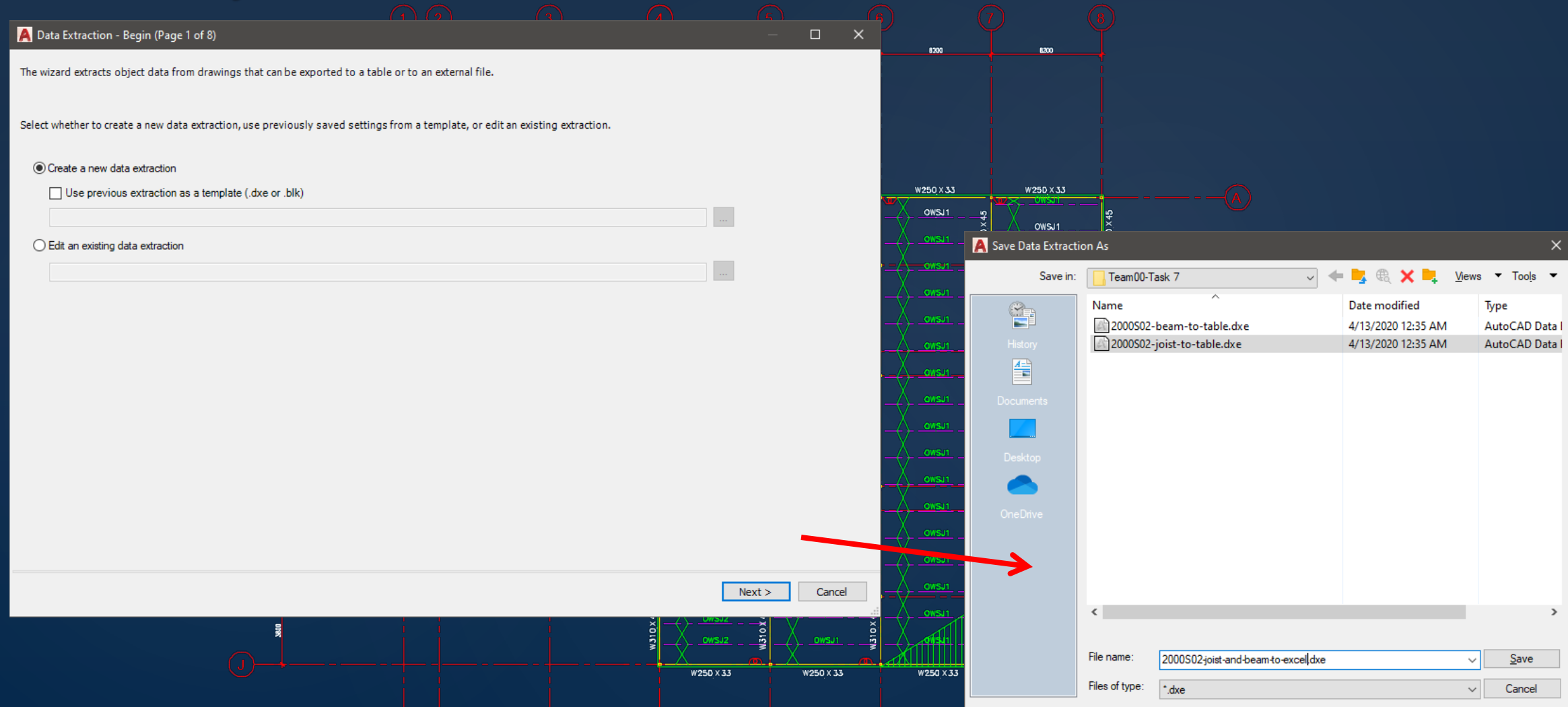
# Extracting the data

- Make sure that all the layers containing attributes or blocks are NOT frozen.



# Extracting the data

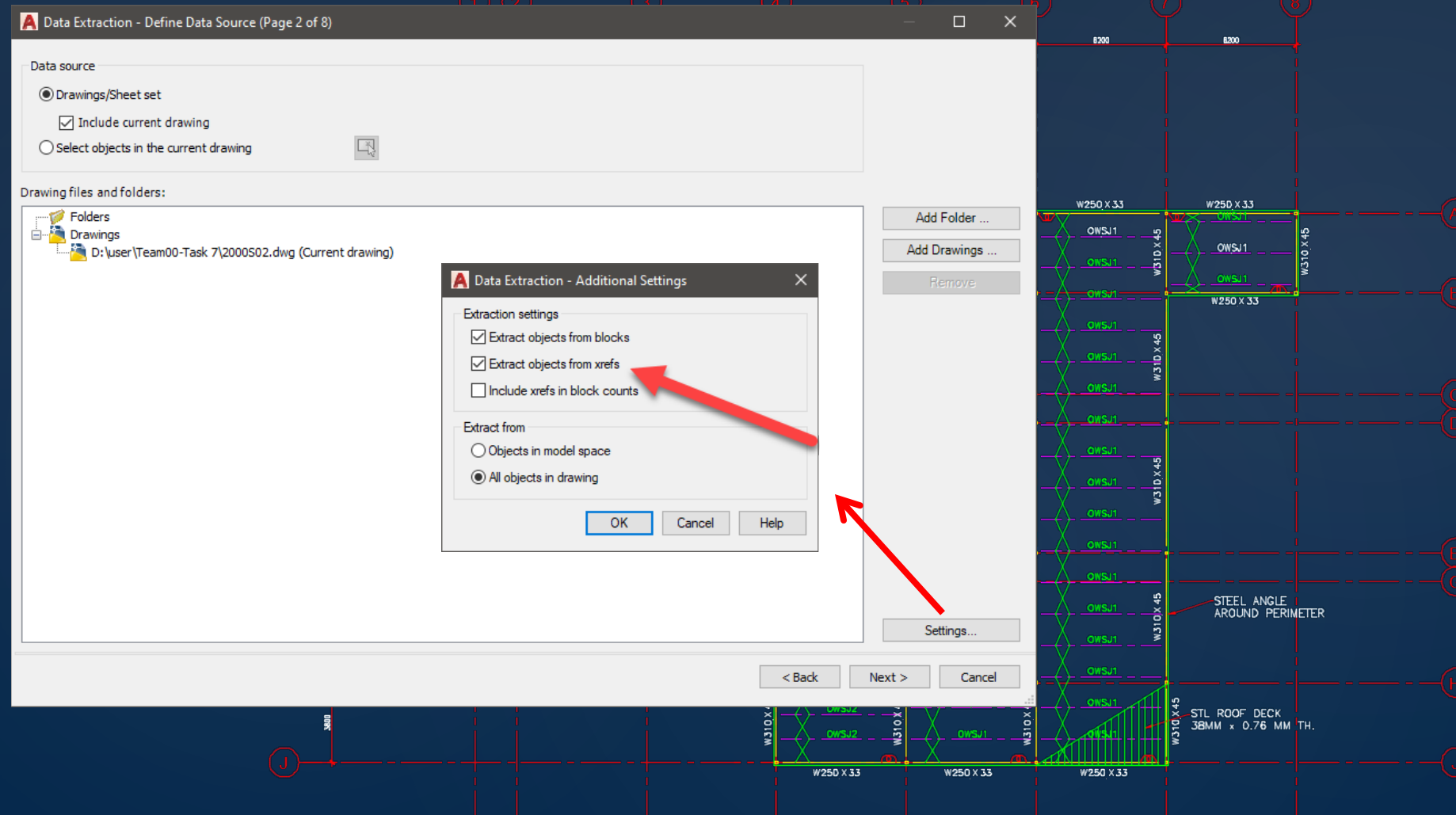
- Using the dataextraction command, extract the beam and joist data.



# Extracting the data



- Using the dataextraction command, extract the beam and joist data.



# Extracting the data

- Using the dataextraction command, extract the beam and joist data.

Data Extraction - Select Objects (Page 3 of 8)

Select the objects to extract data from:

Objects

Object	Display Name	Type
<input checked="" type="checkbox"/> BeamData	BeamData	Block
<input checked="" type="checkbox"/> BeamData	BeamData	Block
<input type="checkbox"/> gridbubble	gridbubble	Block
<input type="checkbox"/> HSS127x127	HSS127x127	Block
<input type="checkbox"/> HSS127x127	HSS127x127	Block
<input checked="" type="checkbox"/> OWSJData	OWSJData	Block
<input checked="" type="checkbox"/> OWSJData	OWSJData	Block

Preview

Display options

Display all object types     Display blocks with attributes only

Display blocks only     Display objects currently in-use only

Display non-blocks only

< Back    Next >    Cancel

W250 X 33    W250 X 33    W250 X 33

OWSJ1    OWSJ1    OWSJ1

W310 X 45    W310 X 45    W310 X 45

STL ROOF DECK  
38MM x 0.76 MM TH.

STEEL ANGLE  
AROUND PERIMETER

# Extracting the data

- Using the dataextraction command, extract the beam and joist data.

The screenshot shows a 'Data Extraction - Select Properties' dialog box. The dialog has a title bar with a close button. Below the title bar, it says 'The following properties were found based on the objects you selected.' and 'Select the properties you want to extract. (Explore the right-click menu for additional options.)'. There are two main sections: 'Properties' and 'Category filter'. The 'Properties' section contains a table with columns 'Property', 'Display Name', and 'Category'. The 'Category filter' section has checkboxes for '3D Visualization', 'Attribute', 'Drawing', 'General', 'Geometry', and 'Misc'. At the bottom of the dialog are buttons for '< Back', 'Next >', and 'Cancel'. The background is a structural drawing with a grid of beams and joists. Labels include 'W250 X 33', 'W310 X 45', 'OWSU1', 'OWSU2', 'STL ROOF DECK 38MM x 0.76 MM TH.', and 'STEEL ANGLE AROUND PERIMETER'. Grid lines are labeled with letters A through J and numbers 1 through 8.

Property	Display Name	Category	
<input checked="" type="checkbox"/>	BEAMDEPTH	BEAMDEPTH	Attribute
<input checked="" type="checkbox"/>	BEAMLENGTH	BEAMLENGTH	Attribute
<input checked="" type="checkbox"/>	BEAMTYPE	BEAMTYPE	Attribute
<input checked="" type="checkbox"/>	BEAMWT	BEAMWT	Attribute
<input checked="" type="checkbox"/>	JOISTLENGTH	JOISTLENGTH	Attribute
<input checked="" type="checkbox"/>	JOISTTYPE	JOISTTYPE	Attribute

# Extracting the data

- Using the dataextraction command, extract the beam and joist data.

Data Extraction - Refine Data (Page 5 of 8)

In this view you can reorder and sort columns, filter results, add formula columns, and create external data links.

Count	Name	BEAMDEPTH	BEAMLENGTH	BEAMTYPE	BEAMWT	JOISTLENGTH	JOISTTYPE
1	OWSJData					5940	OWSJ1
1	OWSJData					7003	OWSJ2
1	BeamData	250	3000	W	33		
2	BeamData	360	7800	W	51		
2	BeamData	310	8200	W	39		
4	OWSJData					6200	OWSJ2
9	BeamData	310	3800	W	45		
10	BeamData	250	6200	W	33		
12	OWSJData					6473	OWSJ1
12	BeamData	310	6200	W	45		
14	OWSJData					8200	OWSJ2
17	OWSJData					5967	OWSJ2
37	OWSJData					6200	OWSJ1

Combine identical rows  
 Show count column  
 Show name column

- Remove the name column.
- Rearrange the columns.
- Sort by beamdepth

# Extracting the data

- Using the dataextraction command, extract the beam and joist data.

Data Extraction - Refine Data (Page 5 of 8)

In this view you can reorder and sort columns, filter results, add formula columns, and create external data links.

Count	BEAMTYPE	BEAMDEPTH	BEAMWT	BEAMLENGTH	JOISTTYPE	JOISTLENGTH
4					OWSJ2	6200
37					OWSJ1	6200
17					OWSJ2	5967
1					OWSJ1	5940
12					OWSJ1	6473
14					OWSJ2	8200
1					OWSJ2	7003
1	W	250	33	3000		
10	W	250	33	6200		
9	W	310	45	3800		
12	W	310	45	6200		
2	W	310	39	8200		
2	W	360	51	7800		

Combine identical rows  
 Show count column  
 Show name column

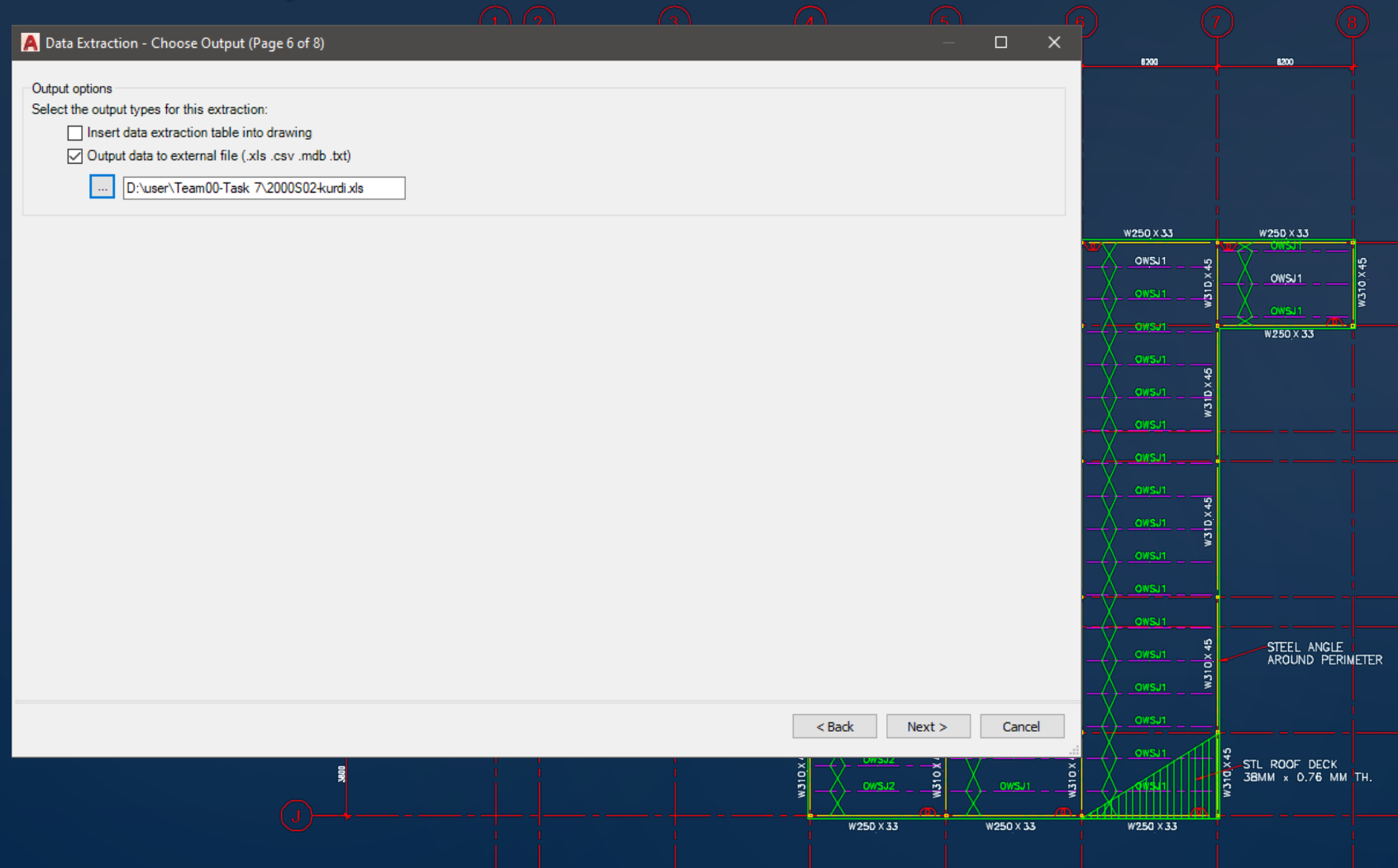
Link External Data...  
Sort Columns Options...  
Full Preview...

< Back   Next >   Cancel

- Remove the name column.
- Rearrange the columns.
- Sort by beamdepth

# Extracting the data

- Using the dataextraction command, extract the beam and joist data.



- Output the data to an external file called **20xxS02-\*\*\*\*** where xx is your team number and \*\*\*\* is your loginname.

# Extracting the data

- Sort the results by joists and beams (beams are already sorted), and then sort the joists.

Count	BEAMTYPE	BEAMDEP	BEAMWT	BEAMLEN	JOISTTYPE	JOISTLENGTH
4					OWSJ2	6200
37					OWSJ1	6200
17					OWSJ2	5967
1					OWSJ1	5940
12					OWSJ1	6473
14					OWSJ2	8200
1					OWSJ2	7003
1 W	250	33	3000			
10 W	250	33	6200			
9 W	310	45	3800			
12 W	310	45	6200			
2 W	310	39	8200			
2 W	360	51	7800			

Count	BEAMTYPE	BEAMDEP	BEAMWT	BEAMLEN	JOISTTYPE	JOISTLENGTH
4					OWSJ2	6200
37					OWSJ1	6200
17					OWSJ2	5967
1					OWSJ1	5940
12					OWSJ1	6473
14					OWSJ2	8200
1					OWSJ2	7003

Count	BEAMTYPE	BEAMDEP	BEAMWT	BEAMLEN	JOISTTYPE	JOISTLENGTH
37					OWSJ1	6200
1					OWSJ1	5940
12					OWSJ1	6473
4					OWSJ2	6200
17					OWSJ2	5967
14					OWSJ2	8200
1					OWSJ2	7003

# Sorting by Steel members and elements





- Type in the correct column headers for the joists and beams.
- Move the joist type and length columns.

	A	B	C	D	E	F	G	H
1								
2	<b>1. Joists</b>							
3	Count	BEAMTYP	BEAMDEP	BEAMWT	BEAMLEN	JOISTTYP	JOISTLENGTH	
4	37			14.5		OWSJ1	6200	
5	1			14.5		OWSJ1	5940	
6	12			14.5		OWSJ1	6473	
7	4			16		OWSJ2	6200	
8	17			16		OWSJ2	5967	
9	14			16		OWSJ2	8200	
10	1			16		OWSJ2	7003	
11								
12								
13	<b>2. Beams</b>							
14								
15	1 W		250	33	3000			
16	10 W		250	33	6200			
17	9 W		310	45	3800			
18	12 W		310	45	6200			
19	2 W		310	39	8200			
20	2 W		360	51	7800			
21								

	A	B	C	D	E	F	G	H
1								
2	<b>1. Joists</b>							
3	Quantity			Linear Weight		Type	Length	
4	37			14.5		OWSJ1	6200	
5	1			14.5		OWSJ1	5940	
6	12			14.5		OWSJ1	6473	
7	4			16		OWSJ2	6200	
8	17			16		OWSJ2	5967	
9	14			16		OWSJ2	8200	
10	1			16		OWSJ2	7003	
11								
12								
13	<b>2. Beams</b>							
14	Quantity	Type	Depth	Linear Wei	Length			
15	1 W		250	33	3000			
16	10 W		250	33	6200			
17	9 W		310	45	3800			
18	12 W		310	45	6200			
19	2 W		310	39	8200			
20	2 W		360	51	7800			
21								

	A	B	C	D	E	F	G	H
1								
2	<b>1. Joists</b>							
3	Quantity	Type		Linear Weight	Length			
4	37	OWSJ1		14.5	6200			
5	1	OWSJ1		14.5	5940			
6	12	OWSJ1		14.5	6473			
7	4	OWSJ2		16	6200			
8	17	OWSJ2		16	5967			
9	14	OWSJ2		16	8200			
10	1	OWSJ2		16	7003			
11								
12								
13	<b>2. Beams</b>							
14	Quantity	Type	Depth	Linear Weight	Length			
15	1 W		250	33	3000			
16	10 W		250	33	6200			
17	9 W		310	45	3800			
18	12 W		310	45	6200			
19	2 W		310	39	8200			
20	2 W		360	51	7800			
21								

# Adding Column Headers

- The formula for total weight is simple:  

$$\text{quantity} * \text{linear weight} * \text{length} / 1000$$

	A	B	C	D	E	F	G	H
1								
2	<b>1. Joists</b>							
3	Quantity	Type		Linear Weight	Length			
4	37	OWSJ1		14.5	6200			
5	1	OWSJ1		14.5	5940			
6	12	OWSJ1		14.5	6473			
7	4	OWSJ2		16	6200			
8	17	OWSJ2		16	5967			
9	14	OWSJ2		16	8200			
10	1	OWSJ2		16	7003			
11								
12								
13	<b>2. Beams</b>							
14	Quantity	Type	Depth	Linear Weight	Length			
15	1	W	250	33	3000			
16	10	W	250	33	6200			
17	9	W	310	45	3800			
18	12	W	310	45	6200			
19	2	W	310	39	8200			
20	2	W	360	51	7800			
21								

	A	B	C	D	E	F	G
1							
2	<b>1. Joists</b>						
3	Quantity	Type		Linear Weight	Length	Total	
4	37	OWSJ1		14.5	6200	3326.3	
5	1	OWSJ1		14.5	5940	86.13	
6	12	OWSJ1		14.5	6473	1126.302	
7	4	OWSJ2		16	6200	396.8	
8	17	OWSJ2		16	5967	1623.024	
9	14	OWSJ2		16	8200	1836.8	
10	1	OWSJ2		16	7003	112.048	
11							
12							
13	<b>2. Beams</b>						
14	Quantity	Type	Depth	Linear Weight	Length		
15	1	W	250	33	3000	99	
16	10	W	250	33	6200	2046	
17	9	W	310	45	3800	1539	
18	12	W	310	45	6200	3348	
19	2	W	310	39	8200	639.6	
20	2	W	360	51	7800	795.6	
21							

- Format the total data to one decimal, and add the total sums for the beams and joists.

	A	B	C	D	E	F	G	H
1								
2	<b>1. Joists</b>							
3	Quantity	Type		Linear Weight	Length	Total		
4	37	OWSJ1		14.5	6200	3326.3		
5	1	OWSJ1		14.5	5940	86.1		
6	12	OWSJ1		14.5	6473	1126.3		
7	4	OWSJ2		16	6200	396.8		
8	17	OWSJ2		16	5967	1623.0		
9	14	OWSJ2		16	8200	1836.8		
10	1	OWSJ2		16	7003	112.0		
11								
12								
13	<b>2. Beams</b>							
14	Quantity	Type	Depth	Linear Weight	Length			
15	1	W	250	33	3000	99.0		
16	10	W	250	33	6200	2046.0		
17	9	W	310	45	3800	1539.0		
18	12	W	310	45	6200	3348.0		
19	2	W	310	39	8200	639.6		
20	2	W	360	51	7800	795.6		
21								
22								<b>8507.4 kg</b>
23								
24								
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- There is no standard formula for Misc. Steel (the bridging, steel plates, connecting rods, perimeter angle etc...)
- Every firm seems to have their own homegrown formulas.

- One solution is to take 5% of the total weight of the beams and joists.

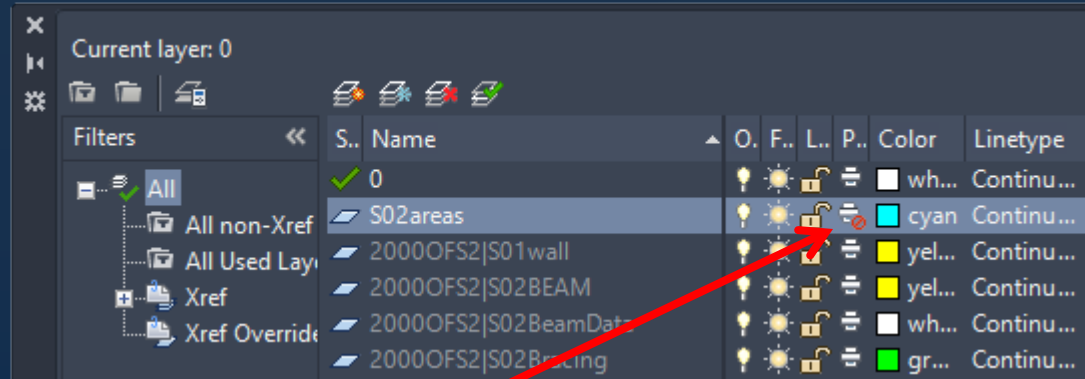
	A	B	C	D	E	F	G	H
1								
2	<b>1. Joists</b>							
3	Quantity	Type		Linear Weight	Length	Total		
4	37	OWSJ1		14.5	6200	3326.3		
5	1	OWSJ1		14.5	5940	86.1		
6	12	OWSJ1		14.5	6473	1126.3		
7	4	OWSJ2		16	6200	396.8		
8	17	OWSJ2		16	5967	1623.0		
9	14	OWSJ2		16	8200	1836.8		
10	1	OWSJ2		16	7003	112.0		
11								
12						<b>8507.4 kg</b>		
13	<b>2. Beams</b>							
14	Quantity	Type	Depth	Linear Weight	Length			
15	1	W	250	33	3000	99.0		
16	10	W	250	33	6200	2046.0		
17	9	W	310	45	3800	1539.0		
18	12	W	310	45	6200	3348.0		
19	2	W	310	39	8200	639.6		
20	2	W	360	51	7800	795.6		
21								
22						<b>8467.2 kg</b>		
23								

	A	B	C	D	E	F	G	H
10	1	OWSJ2		16	7003	112.0		
11								
12						<b>8507.4 kg</b>		
13	<b>2. Beams</b>							
14	Quantity	Type	Depth	Linear Weight	Length			
15	1	W	250	33	3000	99.0		
16	10	W	250	33	6200	2046.0		
17	9	W	310	45	3800	1539.0		
18	12	W	310	45	6200	3348.0		
19	2	W	310	39	8200	639.6		
20	2	W	360	51	7800	795.6		
21								
22						<b>8467.2 kg</b>		
23								
24	<b>3. Miscellaneous Steel</b>							
25						<b>=(F12+F22)*0.05</b>		
26								
27								
28								

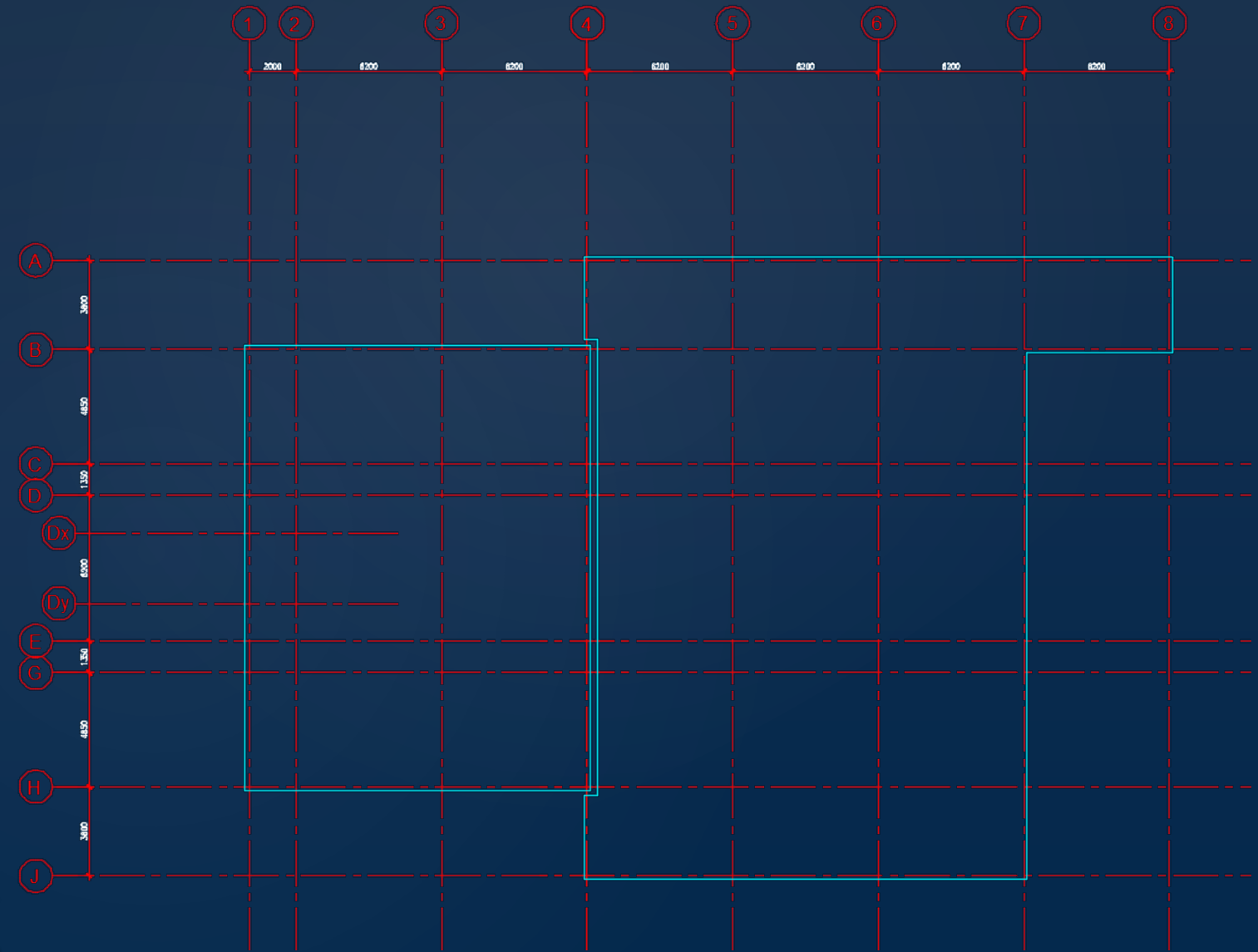
	A	B	C	D	E	F	G	H
10	1	OWSJ2		16	7003	112.0		
11								
12						<b>8507.4 kg</b>		
13	<b>2. Beams</b>							
14	Quantity	Type	Depth	Linear Weight	Length			
15	1	W	250	33	3000	99.0		
16	10	W	250	33	6200	2046.0		
17	9	W	310	45	3800	1539.0		
18	12	W	310	45	6200	3348.0		
19	2	W	310	39	8200	639.6		
20	2	W	360	51	7800	795.6		
21								
22						<b>8467.2 kg</b>		
23								
24	<b>3. Miscellaneous Steel</b>							
25						<b>848.7 kg</b>		
26								
27								
28								

# Adding the Misc. Steel Estimate

- To calculate the weight of the steel deck, draw two polylines around the perimeter angle and the walls.



- Create a new layer called S02areas, make it non plottable, and draw the polylines.



# Calculating the Deck

- Enter the steel deck areas in Excel.
- The deck weight is 1.6psf (pounds per square foot)

- So after conversion the deck weight is 7.81 kg/m<sup>2</sup>

	A	B	C	D	E	F	G	H
10	1	OWSJ2		16	7003	112.0		
11								
12						<b>8507.4 kg</b>		
13	<b>2. Beams</b>							
14	Quantity	Type	Depth	Linear Weight	Length			
15	1	W	250	33	3000	99.0		
16	10	W	250	33	6200	2046.0		
17	9	W	310	45	3800	1539.0		
18	12	W	310	45	6200	3348.0		
19	2	W	310	39	8200	639.6		
20	2	W	360	51	7800	795.6		
21								
22						<b>8467.2 kg</b>		
23								
24	<b>3. Miscellaneous Steel</b>							
25						<b>848.7 kg</b>		
26								
27								
28								

	A	B	C	D	E	F	G	H
22						<b>8467.2 kg</b>		
23								
24	<b>3. Miscellaneous Steel</b>							
25						<b>848.7 kg</b>		
26								
27	<b>4. Steel Deck</b>							
28								
29		Office roof:		278.736	m2			
30		Warehouse roof:		513.018	m2			
31								
32		<b>Total roof</b>		<b>791.754</b>	<b>m2</b>			
33								
34		Deck unit weight		7.81	kg/m2			
35								
36						<b>Total</b>	<b>6183.6 kg</b>	
37								
38								

# Calculating the Deck

# The Final Result

	A	B	C	D	E	F	G
1	<b>Roof Steel Take-off</b>						
2							
3	<b>1. Joists</b>						
4	Quantity	Type		Linear Weight	Length	Total	
5	37	OWSJ1		14.5	6200	3326.3	
6	1	OWSJ1		14.5	5940	86.1	
7	12	OWSJ1		14.5	6473	1126.3	
8	4	OWSJ2		16	6200	396.8	
9	17	OWSJ2		16	5967	1623.0	
10	14	OWSJ2		16	8200	1836.8	
11	1	OWSJ2		16	7003	112.0	
12							
13						Total	<b>8507.4 kg</b>
14	<b>2. Beams</b>						
15	Quantity	Type	Depth	Linear Weight	Length		
16	1	W	250	33	3000	99.0	
17	10	W	250	33	6200	2046.0	
18	9	W	310	45	3800	1539.0	
19	12	W	310	45	6200	3348.0	
20	2	W	310	39	8200	639.6	
21	2	W	360	51	7800	795.6	
22							
23						Total	<b>8467.2 kg</b>
24							
25	<b>3. Miscellaneous Steel</b>						
26						Total	<b>848.7 kg</b>
27							
28	<b>4. Steel Deck</b>						
29							
30		Office roof:		278.736	m2		
31		Warehouse roof:		513.018	m2		
32							
33		<b>Total roof</b>		<b>791.754</b>	<b>m2</b>		
34							
35		Deck unit weight		7.81	kg/m2		
36							
37						Total	<b>6183.6 kg</b>
38							
39							

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