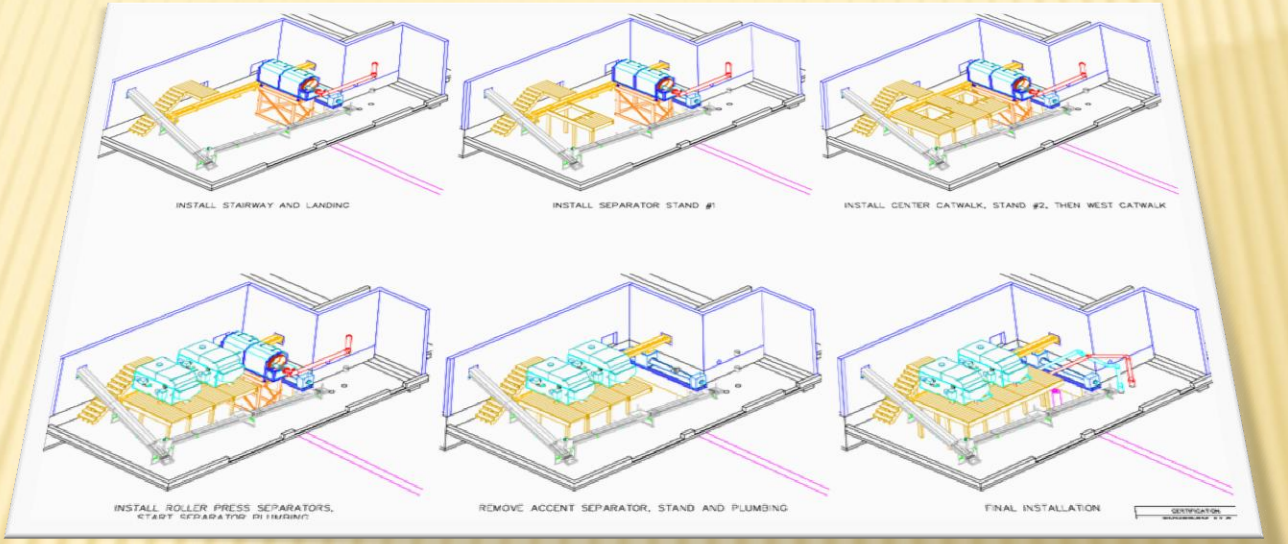
BE 463
Manure System Design



Advantages of 3D Modeling for Design of Manure Systems

PENNSTATE
1855

Advantages of 3D modeling

Quicker/easier design and revisions – change in one place and make minor touch ups on drawing sheets instead of changing multiple 2D views and making major touch ups

Automatic generation of parts lists/bill of materials
- Easy cost tracking/estimating for each phase/entire project

Better visualization for customers, field personnel, fabricators, and contractors
- Multiple isometric views
- Easy cross-sections of parts/assemblies
- Shaded/rendered models provide realistic representations, so there are no surprises

Can do a better job/include more details since it is easier to do

Disadvantages of 3D modeling

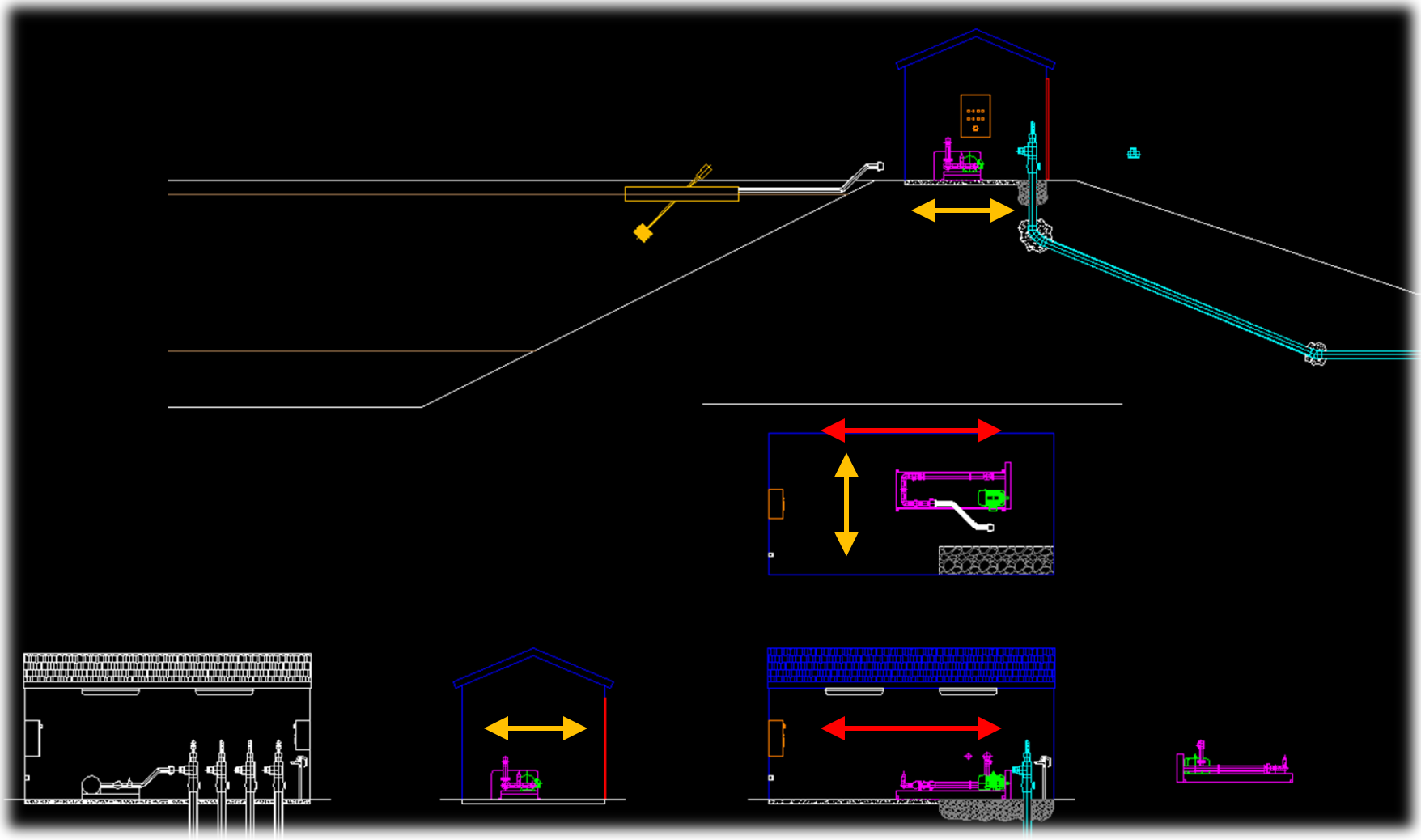
Initial learning curve – it takes time and practice, but it is not very difficult once you have started.

Initial time requirements to create new 3D content (if not already available)

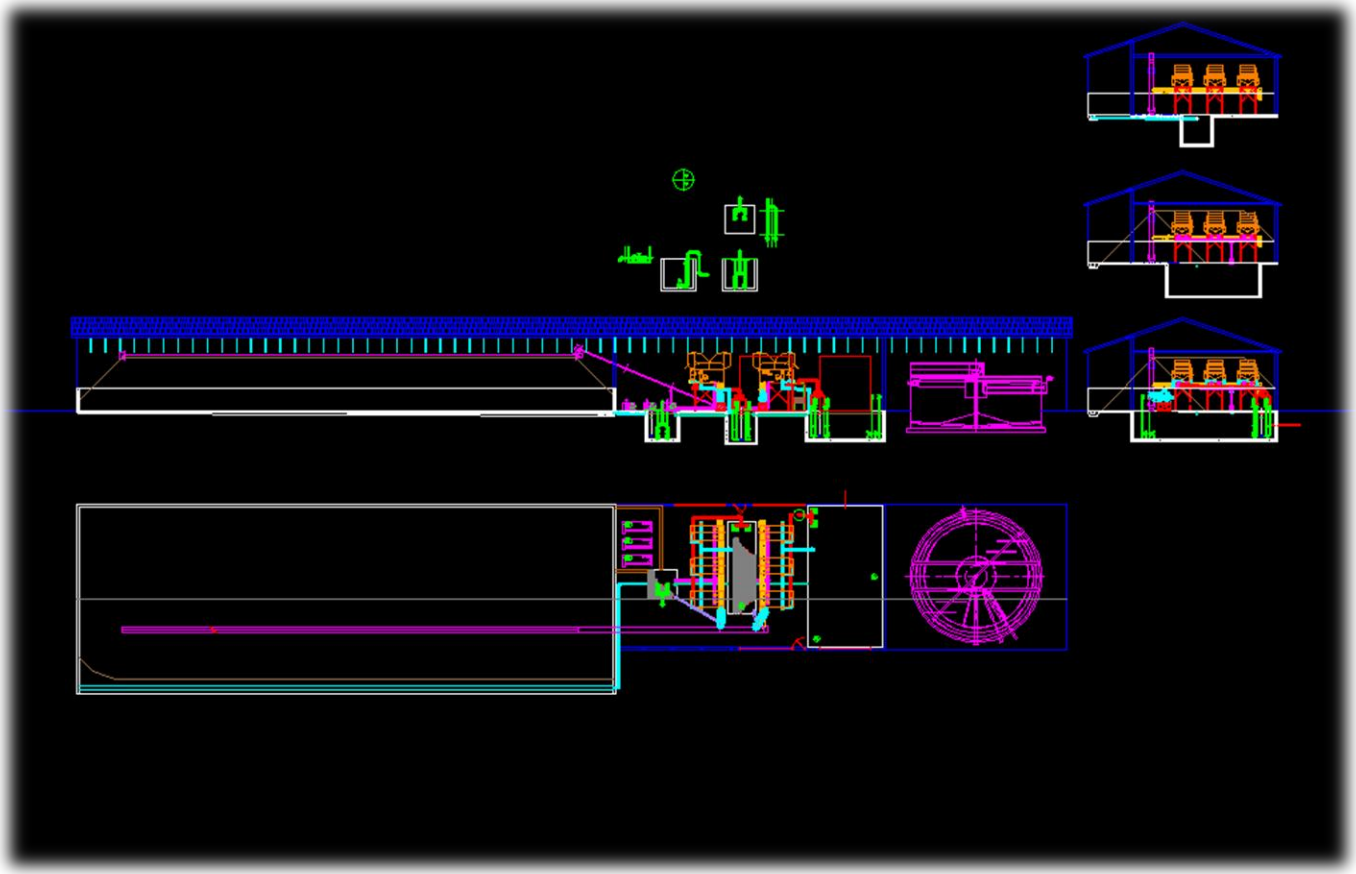
- However, once you have built your library, rapid design and revisions are possible!
- There is plenty of 3D content available online!
- It is easy to convert 2D drawings to 3D objects

These are excuses, the benefits far outweigh the costs!

Changes are easy in 2D using multiple views when revisions are made to simple layouts

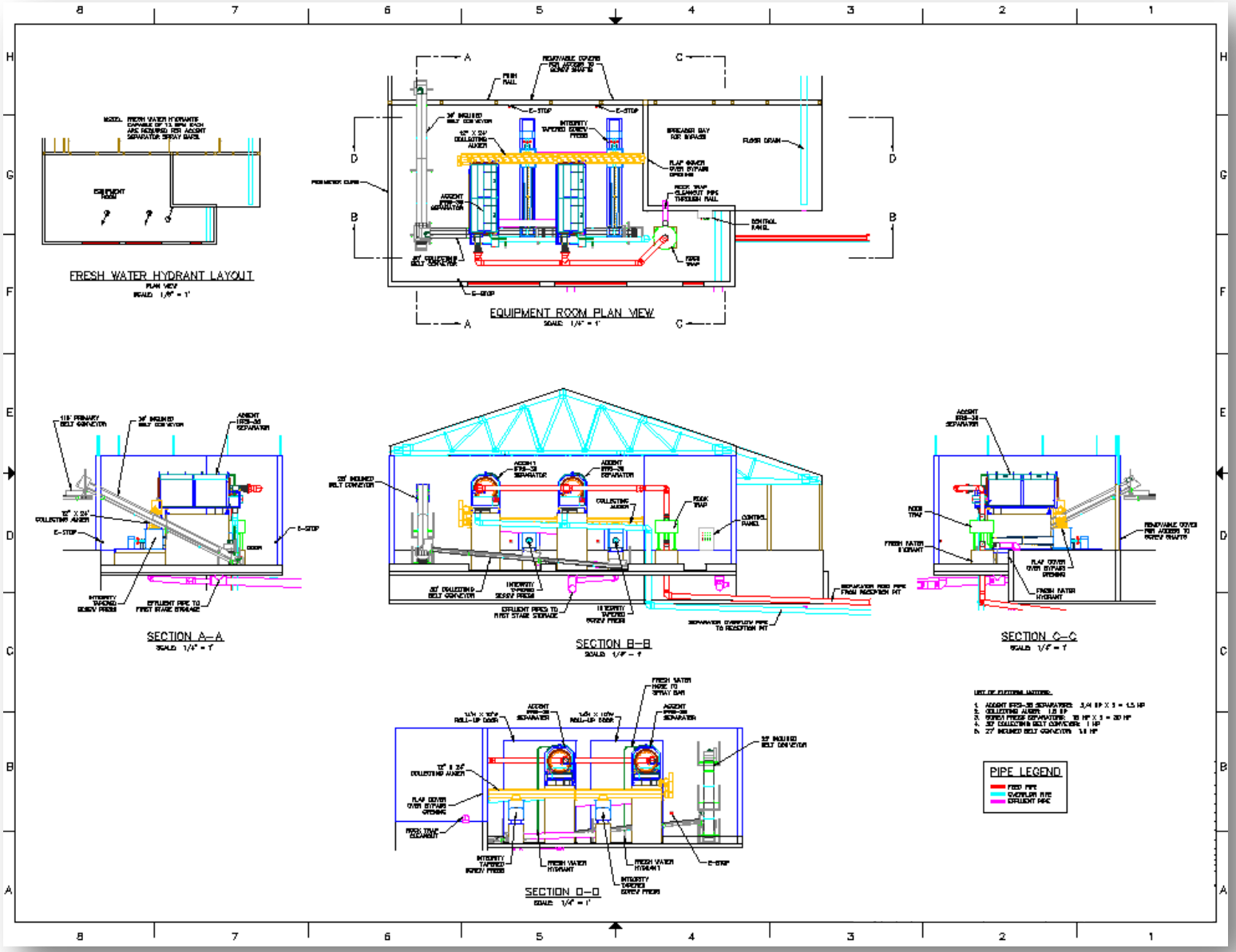


Changes become difficult to manage using multiple views when revisions are made to complex systems

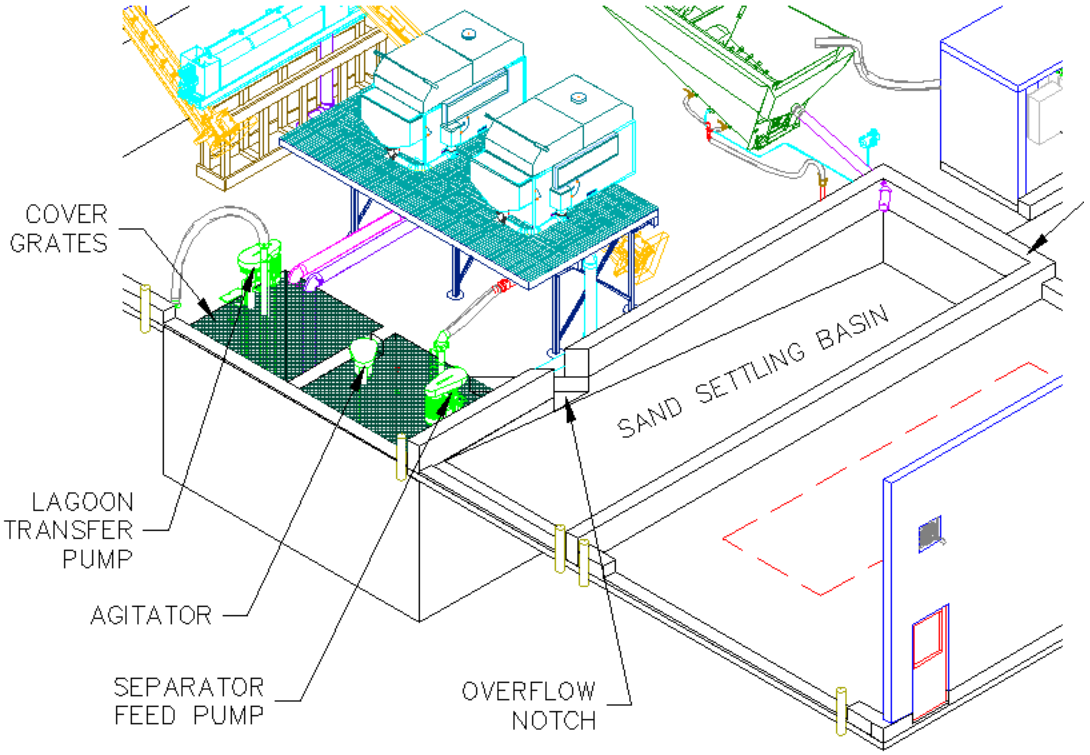


When an object is moved in a 3D model,
all drawing views get updated automatically

Better Visualization

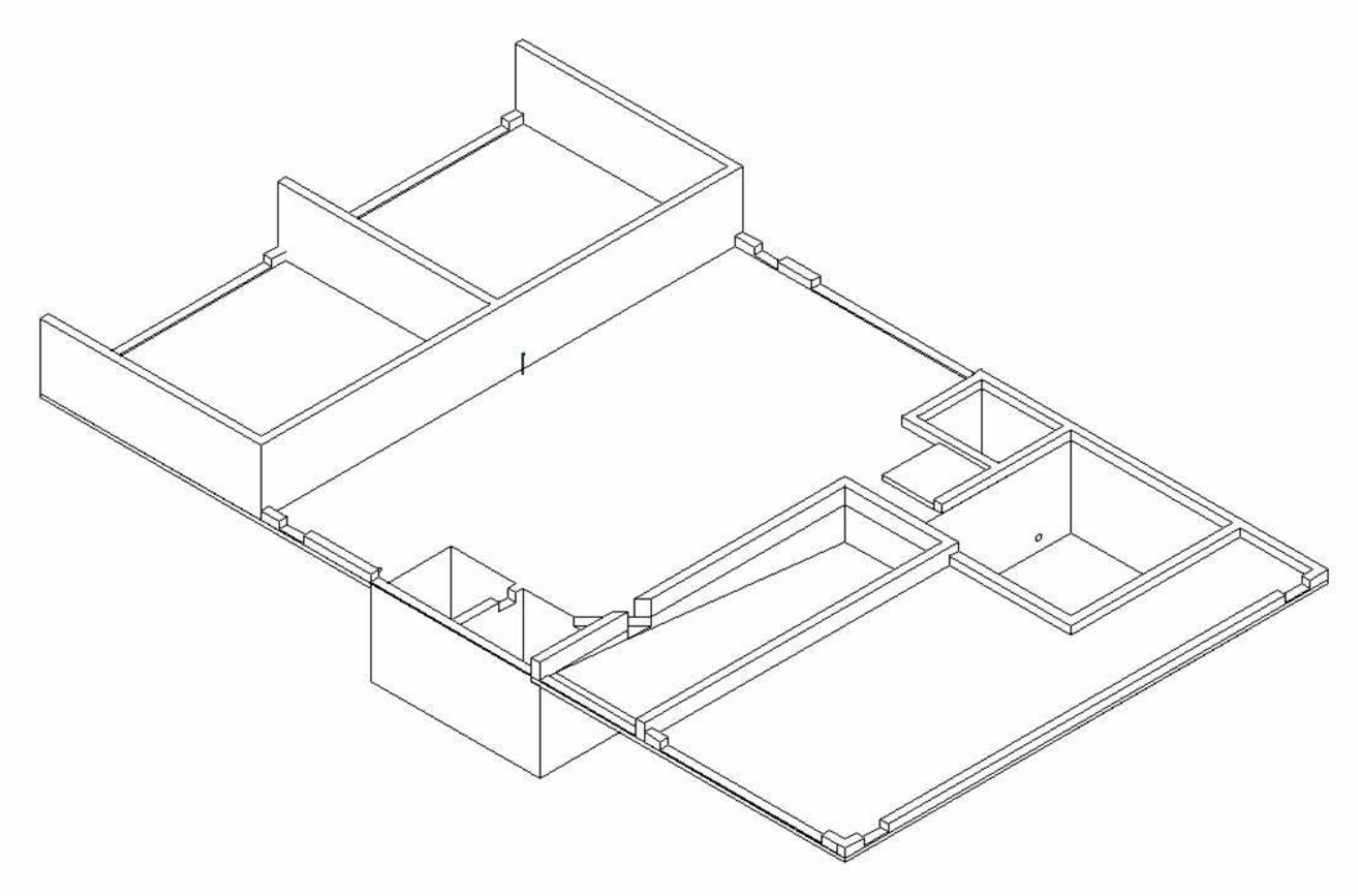


Better Visualization



EQUIPMENT ROOM TANK DETAILS

Complex concrete layouts



Quick and easy area and volume measurements

Include More Details

If you don't draw it, they won't include it!

Safety equipment

-Ladders, fire extinguishers, safety harnesses, first aid kit

-Warning signs, electrical disconnects, E-stop buttons, weathertight connectors, flexible conduit

-Ventilation fans and openings

Include drawing notes, and use additional drawing sheets for these details if necessary

Detailed drawing notes

Integrity Construction Notes - Notepad

File Edit Format View Help

NOTES:

1. IN CASE OF A CONFLICT BETWEEN THESE DRAWINGS AND NATIONAL OR LOCAL CODES OR REGULATIONS, FOLLOW THE RULE THAT PROVIDES THE GREATEST FACTOR OF SAFETY.
2. CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING ALL DIMENSIONS AND ELEVATIONS SHOWN ON DRAWINGS PRIOR TO CONSTRUCTION.
3. ANY CHANGES TO BUILDING OR EQUIPMENT LAYOUT MUST BE SENT TO NCS IN WRITING AND APPROVED PRIOR TO IMPLEMENTATION. ANY CHANGES TO EQUIPMENT NOT SUPPLIED BY NCS MUST BE SENT TO NCS IN WRITING WELL ENOUGH IN ADVANCE OF EQUIPMENT INSTALLATION TO MAKE NECESSARY CHANGES OR ADJUSTMENTS TO SYSTEM.
4. REMOVE ALL CONSTRUCTION DEBRIS FROM SEPARATOR BUILDING AND SOLIDS STACKING/COMPOSTING AREAS PRIOR TO SYSTEM OPERATION.
5. ALL PIPES TO BE ON 3% SLOPE FOR DRAINAGE UNLESS OTHERWISE SPECIFIED.
6. MAKE ALL CONNECTIONS TO INTEGRITY SEPARATORS USING FERNCO OR EQUIVALENT COUPLINGS.
7. FRESH WATER SPIGOTS CAPABLE OF 10 GPM SHOULD BE LOCATED IN SEPARATOR BUILDING.
8. INSTALL 120V RECEPTACLES THROUGHOUT BUILDING AS REQUIRED BY NATIONAL OR LOCAL CODES OR REGULATIONS.
9. INSTALL RAIN GUTTERS AND DIVERT ROOF RUNOFF AWAY FROM SOLIDS STACKING PAD.
10. SAFETY RAILINGS MUST BE INSTALLED AROUND RECEPTION PIT. PUMP SUMPS MUST BE COVERED AT ALL TIMES BY SAFETY COVER GRATING. WARNING SIGNS MUST BE POSTED ON BUILDING ACCESS DOORS AND AT VISIBLE LOCATIONS INSIDE BUILDING.
11. GRATING CAPABLE OF SUPPORTING LOADER TRAFFIC MUST BE INSTALLED OVER STACKING PAD FLOOR DRAIN.
12. SEPARATOR STANDS TO BE PROVIDED BY CONTRACTOR. WALKWAY/PLATFORM SHOULD BE CONSTRUCTED AROUND SEPARATORS TO FACILITATE SAFE AND EASY MAINTENANCE. STANDS MUST BE DESIGNED SO THAT FEED/OVERFLOW/EFFLUENT PIPING IS UNOBSTRUCTED. SOLIDS CONVEYING AUGERS MAY BE SUPPORTED FROM SEPARATOR STAND FRAMEWORK.
13. PERFORM PRESSURE/LEAK TESTS ON ALL PIPES IN ACCORDANCE WITH NATIONAL OR LOCAL CODES AND STANDARDS. REPEAT TESTING SIX MONTHS AFTER END OF CONSTRUCTION IS RECOMMENDED.

LIGHTING:

1. DUE TO A DAMP AND DUSTY ENVIRONMENT, EITHER TYPE UF OR NONMETALLIC CONDUIT MAY BE USED FOR WIRING. ALL CABLE OR CONDUIT MUST BE ATTACHED TO INTERIOR SURFACES OF THE BUILDING AND MAY NOT BE CONCEALED IN THE WALLS, CEILING, OR ATTIC. CABLE CAN BE USED, BUT MUST BE INSTALLED IN A LOCATION WHERE IT CANNOT BE DAMAGED. ALL LIGHT FIXTURES MUST HAVE A GASKET, BE FABRICATED OF CORROSION RESISTANT MATERIALS, AND BE RATED FOR WET LOCATIONS (WATERTIGHT). MORE DETAILED INFORMATION CONCERNING CODE REQUIREMENTS FOR WIRING IN AGRICULTURAL BUILDINGS IS PROVIDED IN THE AGRICULTURAL WIRING HANDBOOK (NFEC, 1993) AND FARM BUILDINGS WIRING HANDBOOK (MWPS, 1992).
2. SUGGESTED LIGHTING = 1.6 WATTS/SQ.FT. OR AS REQUIRED BY NATIONAL OR LOCAL CODES OR REGULATIONS.

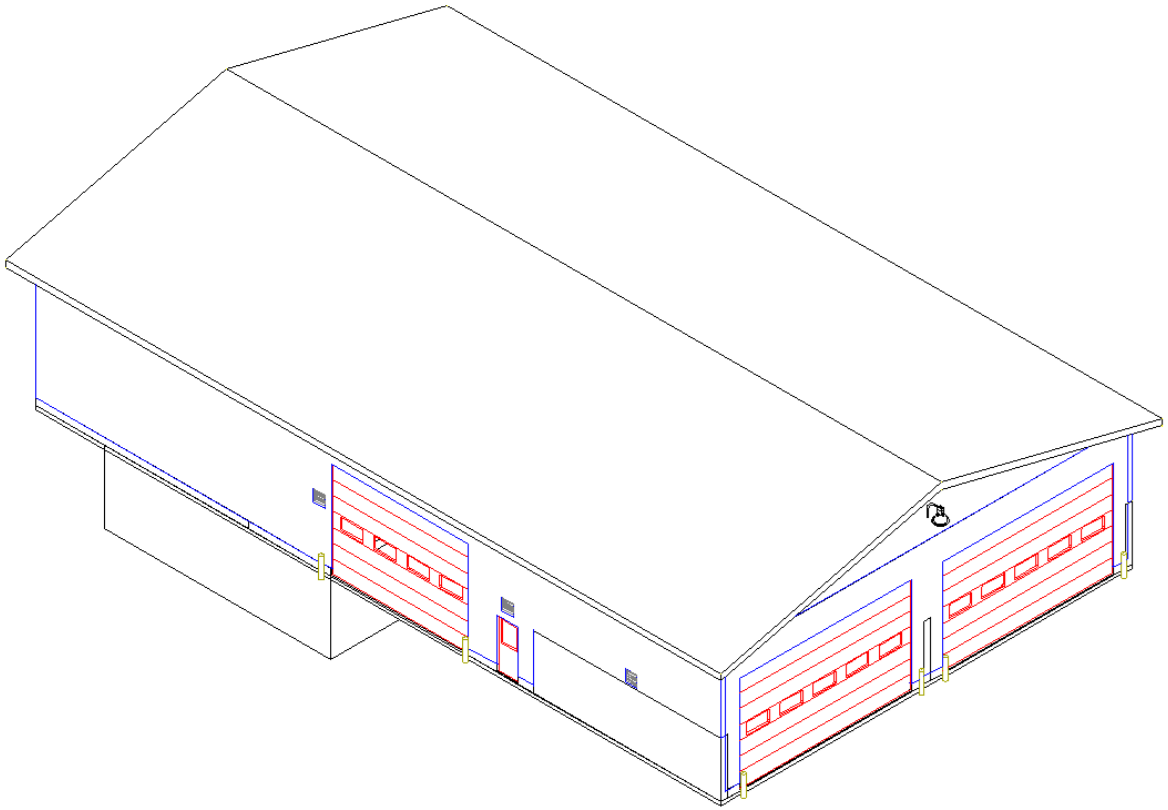
HEATING:

1. SEPARATOR BUILDING MUST BE INSULATED AND HEATED DURING WINTER TO PREVENT FREEZING.
2. INSTALL SINGLE-PHASE 230V GFCI RECEPTACLES ADJACENT TO EACH SEPARATOR FOR UTILITY HEATERS.

VENTILATION:

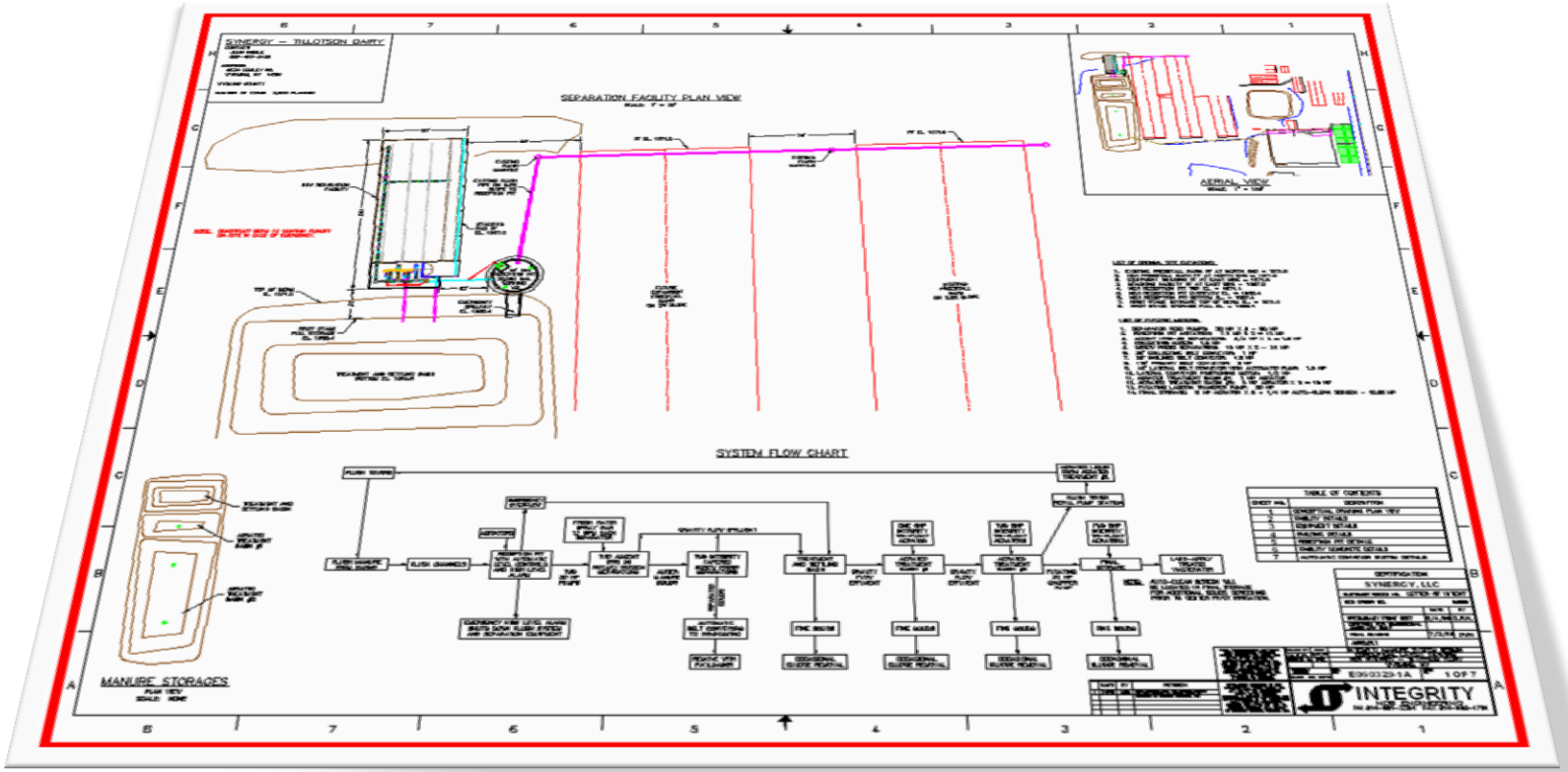
1. NEGATIVE PRESSURE VENTILATION SYSTEM MUST BE INSTALLED TO VENT MANURE GASES. FANS SHOULD BE CONTROLLED BY AN AUTOMATIC TIMER AND MUST ACHIEVE FOUR AIR EXCHANGES PER HOUR (x CFM TOTAL) MINIMUM OR AS REQUIRED BY NATIONAL OR LOCAL CODES OR REGULATIONS. FRESH AIR INLETS SHOULD BE LOCATED ALONG WEST WALL OF BUILDING TO PREVENT DRAWING FRESH AIR ACROSS RECEPTION PIT OR OPEN MANURE STORAGES. EXHAUST FANS SHOULD BE LOCATED BOTH HIGH AND LOW ON WALLS TO VENT GASES THAT ARE LIGHTER OR HEAVIER THAN AIR. IF EXHAUST FANS ARE INSTALLED ON WINDWARD SIDE OF BUILDING, WINDBREAK HOODS MUST BE INSTALLED.
2. PLACE SIGNS WARNING OF NOXIOUS GASES ON BUILDING DOORS AND AT VISIBLE LOCATIONS INSIDE BUILDING.
3. MAINTAIN THE VENTILATION SYSTEMS BY FREQUENTLY REMOVING DUST ACCUMULATIONS FROM EXHAUST FANS, FAN SHUTTERS, AND AIR INLET SCREENS.
4. IN ADDITION TO AUTOMATIC TIMER CONTROLS, VENTILATION FANS MUST BE WIRED TO RUN WHEN BUILDING LIGHTS ARE TURNED ON AND WHEN RECEPTION PIT AGITATORS AND PUMPS ARE OPERATING.
5. INSTALL AN ALARM SYSTEM TO WARN OF POWER FAILURES THAT WOULD AFFECT THE MECHANICAL VENTILATION SYSTEM. CHECK AND MAINTAIN ALARM SYSTEM AND POWER UNIT ON A WEEKLY BASIS. DO NOT ENTER BUILDING IF ALARM INDICATES THAT VENTILATION SYSTEM HAS FAILED.

Better Drawing Management

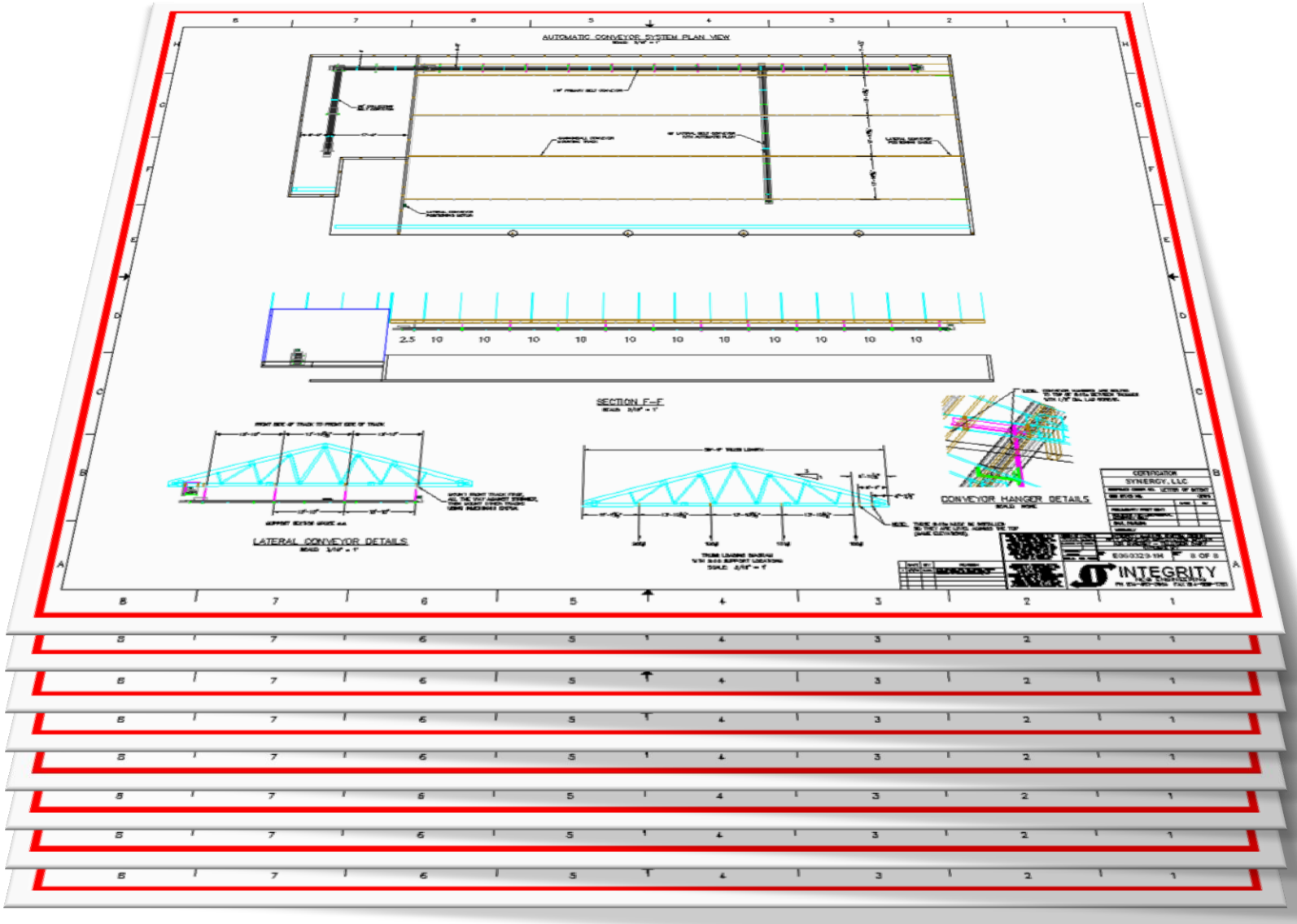


Everything is in one place in this model

Information Management



Information Overload



Microsoft Excel

Home | Insert | Page Layout | Formulas | Data | Review | View | Acrobat

Normal | Page Layout | Page Break Preview | Custom Views | Full Screen — Workbook Views

Ruler | Gridlines | Message Bar | Formula Bar | Headings — Show/Hide

Zoom | 100% | Zoom to Selection — Zoom

New Window | Arrange All | Freeze Panes | Split | Hide | Unhide | View Side by Side | Synchronous Scrolling | Reset Window Position | Save Workspace | Switch Windows — Window

Macros — Macros

C16

Tillotson Auger Parts List - 060628_DWH.xls [Compatibility Mode]

Tillotson Lateral Belt Conveyor Parts List - 060717_DWH.xls [Compatibility Mode]

Tillotson Lateral Conveyor Positioning Drive Parts List - 060717_DWH.xls [Compatibility Mode]

Tillotson Lateral Conveyor Wire Rope Festoon Parts List - 080725_DWH.xls [Compatibility Mode]

Tillotson Primary Belt Conveyor Parts List - 060717_DWH.xls [Compatibility Mode]

Tillotson_Lateral_Conveyor_Positioning_Drive_Parts_List___060717_DWH.xls [Compatibility Mode]

Tillotson Cannonball Track Parts List - 060717_DWH.xls [Compatibility Mode]

Tillotson Collecting Belt Conveyor Parts List - 060717_DWH.xls [Compatibility Mode]

Parts List for Collecting Belt Conveyor for Tillotson

DWH -7/17/06

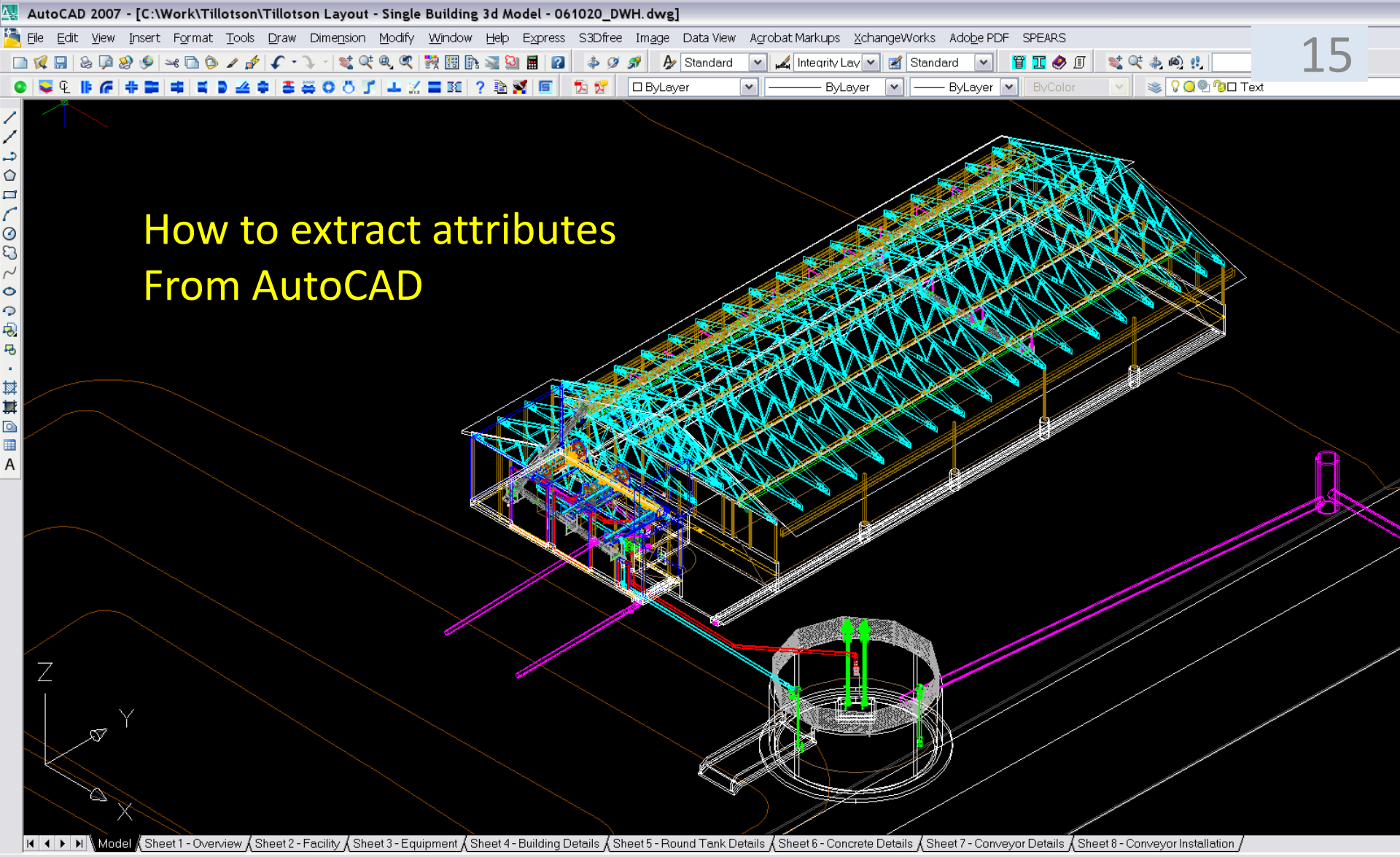
Metko 1360 Belt Conveyor

Bulk Length 29.5 ft

Overall Length 31.5 ft

3D modeling makes tracking changes easier

Supplier	P/N	Quantity	Description	Weight	Total #
Metko	M-8000	1	Metko Drive Package for 5/8" motor shaft dia. less supports (includes idler unit and end hopper)	175	175
Metko	M-8003	1	Metko 2.5 ft Conveyor Section	13	13
Metko	M-8002	1	Metko 5 ft Conveyor Section	32	32
Metko	M-8001	2	Metko 10 ft Conveyor Section	69	138
Metko	M-8009	1	Metko Belt Support Section Splice	9	9
Metko	M-8008	1	Metko Section Splice	4	4
Metko	M-8004	3	Metko Splice Parts Box	3	9
Metko	M-8021	1	Metko Horizontal Hopper with Feed Guide (Flow Through)	12	12
Metko	MA-219	2	Metko 2.5 ft Snap-On Cover		
Metko	MA-222	2	Metko 2.5 ft Seal Strips		
Metko	MA-151	2	Metko 10 ft Snap-On Cover		
Metko	MA-224	2	Metko 10 ft Seal Strips		
Metko	MA-221	3	Seal Strip Splice Box		
Metko	M-8011	1	Metko Rotating Brush	10	10
Metko	M-8010	3	Metko Support Frame	21	63
Metko	MA-184	59 FT	Metko Smooth Belting		
Motion	M3546	1	Baldor M3546 1hp NEMA 56 frame 208-230/460V 3-phase electric motor (5/8" shaft dia.)	31	31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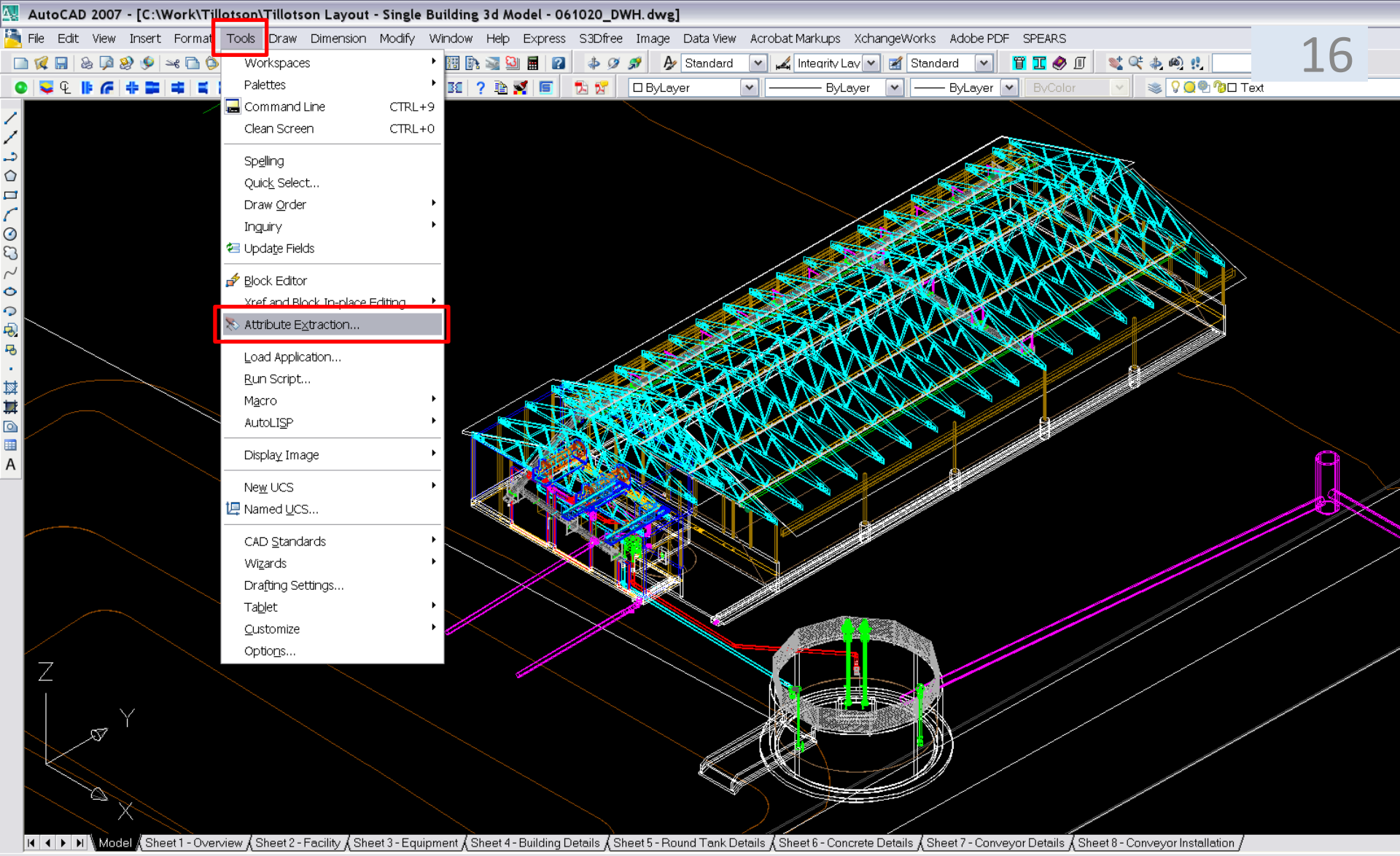
File Edit View Insert Format Tools Draw Dimension Modify Window Help Express S3Dfree Image Data View Acrobat Markups XchangeWorks Adobe PDF SPEARS
How to extract attributes
From AutoCAD
Z
Y
X
Model
Sheet 1 - Overview
Sheet 2 - Facility
Sheet 3 - Equipment
Sheet 4 - Building Details
Sheet 5 - Round Tank Details
Sheet 6 - Concrete Details
Sheet 7 - Conveyor Details
Sheet 8 - Conveyor Installation
Command: Specify opposite corner:
Command: z
ZOOM
Specify corner of window, enter a scale factor (nX or nXP), or
[All/Center/Dynamic/Extents/Previous/Scale/Window/Object] <real time>:
Specify opposite corner: Regenerating model.
Command:
SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL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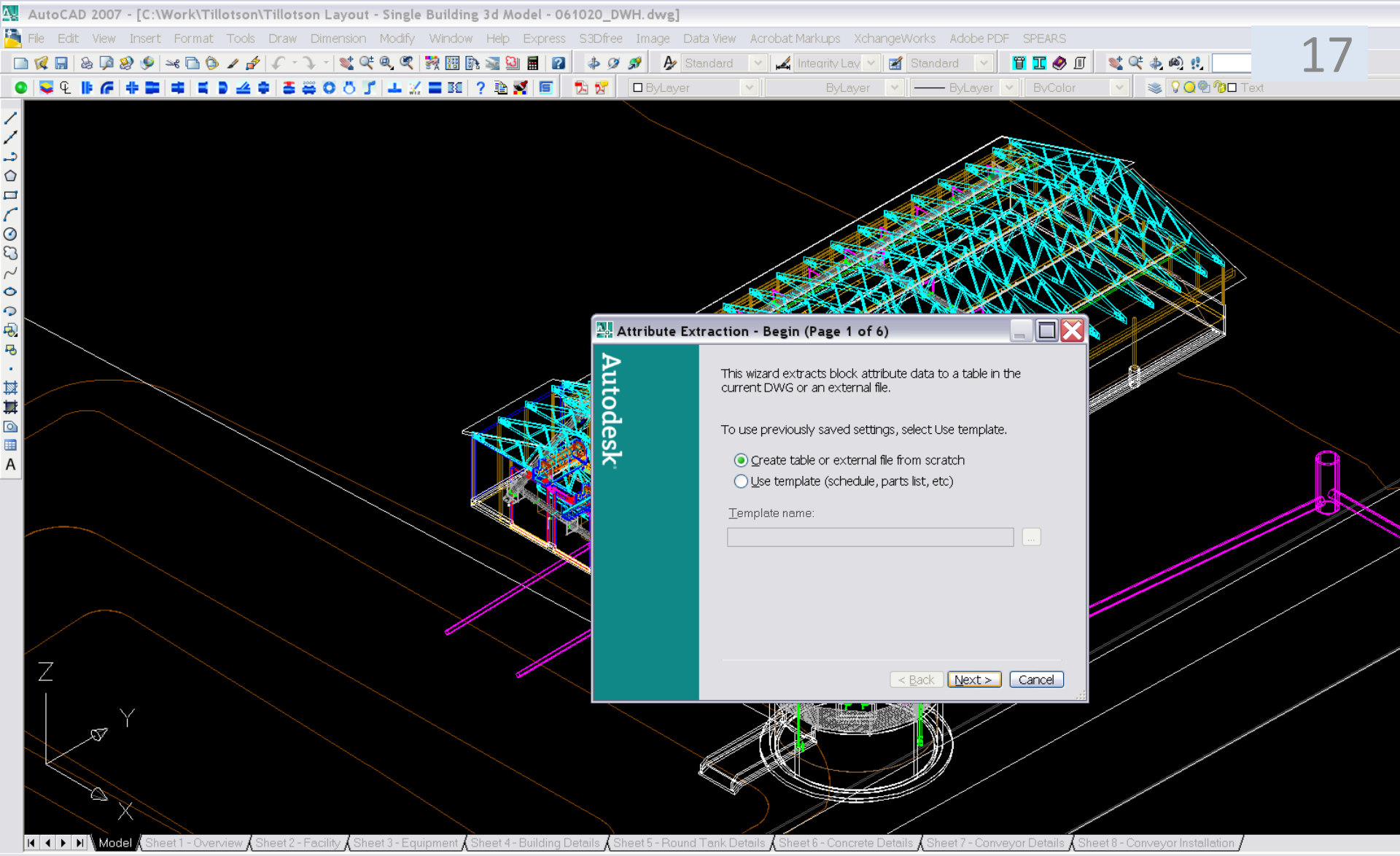
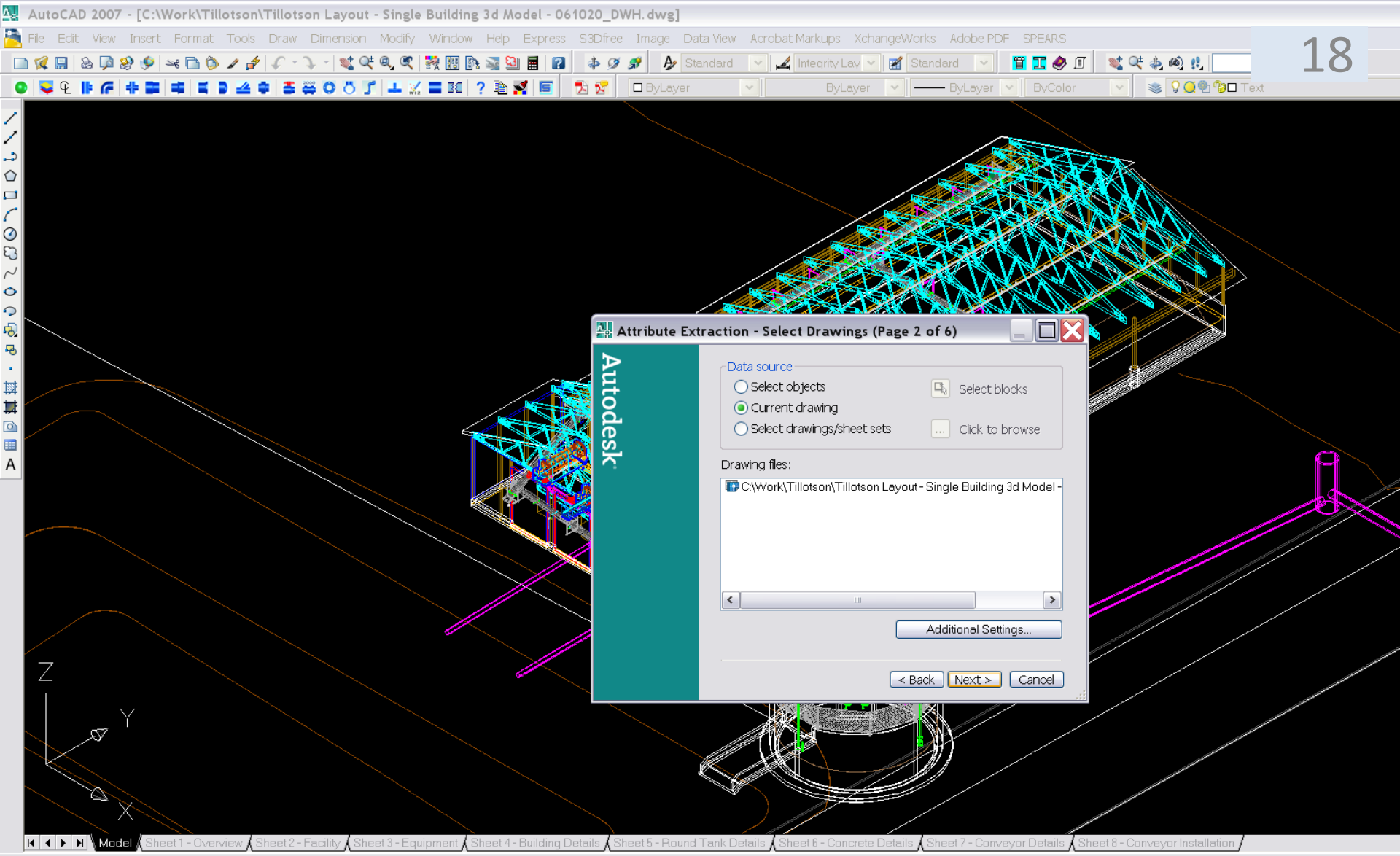
File Edit View Insert Format Tools Draw Dimension Modify Window Help Express S3Dfree Image Data View Acrobat Markups XchangeWorks Adobe PDF SPEARS
Workspaces
Palettes
Command Line CTRL+9
Clean Screen CTRL+0
Spelling
Quick Select...
Draw Order
Inquiry
Update Fields
Block Editor
Xref and Block In-place Editing
Attribute Extraction...
Load Application...
Run Script...
Macro
AutoLISP
Display Image
New UCS
Named UCS...
CAD Standards
Wizards
Drafting Settings...
Tablet
Customize
Options...
Z
Y
X
Model
Sheet 1 - Overview
Sheet 2 - Facility
Sheet 3 - Equipment
Sheet 4 - Building Details
Sheet 5 - Round Tank Details
Sheet 6 - Concrete Details
Sheet 7 - Conveyor Details
Sheet 8 - Conveyor Installation
Command: <Switching to: Model>
Restoring cached viewports.
Regenerating 1026 modified entities.
Command:
Command:
Command: _eattext
Command:
Extracts attributes from blocks into a separate file: EATTEXT
start
Tillotson
AutoCAD 2007 ...
Microsoft Power...
Microsoft Of...


AutoCAD 2007 - [C:\Work\Tillotson\Tillotson Layout - Single Building 3d Model - 061020_DWH.dwg]
Attribute Extraction - Begin (Page 1 of 6)
Autodesk
This wizard extracts block attribute data to a table in the current DWG or an external file.
To use previously saved settings, select Use template.
Create table or external file from scratch
Use template (schedule, parts list, etc)
Template name:
< Back
Next >
Cancel
Model
Sheet 1 - Overview
Sheet 2 - Facility
Sheet 3 - Equipment
Sheet 4 - Building Details
Sheet 5 - Round Tank Details
Sheet 6 - Concrete Details
Sheet 7 - Conveyor Details
Sheet 8 - Conveyor Installation
Regenerating 1026 modified entities.
Command:
Command:
Command: _eattext
Command:
Command:
SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL
start
Tillotson
AutoCAD 2007 ...
Microsoft Power...
Microsoft Of...


AutoCAD 2007 - [C:\Work\Tillotson\Tillotson Layout - Single Building 3d Model - 061020_DWH.dwg]
Attribute Extraction - Select Drawings (Page 2 of 6)
Autodesk
Data source
Select objects
Current drawing
Select drawings/sheet sets
Select blocks
Click to browse
Drawing files:
C:\Work\Tillotson\Tillotson Layout - Single Building 3d Model -
Additional Settings...
< Back
Next >
Cancel
Model
Sheet 1 - Overview
Sheet 2 - Facility
Sheet 3 - Equipment
Sheet 4 - Building Details
Sheet 5 - Round Tank Details
Sheet 6 - Concrete Details
Sheet 7 - Conveyor Details
Sheet 8 - Conveyor Installation
Regenerating 1026 modified entities.
Command:
Command:
Command: _eattext
Command:
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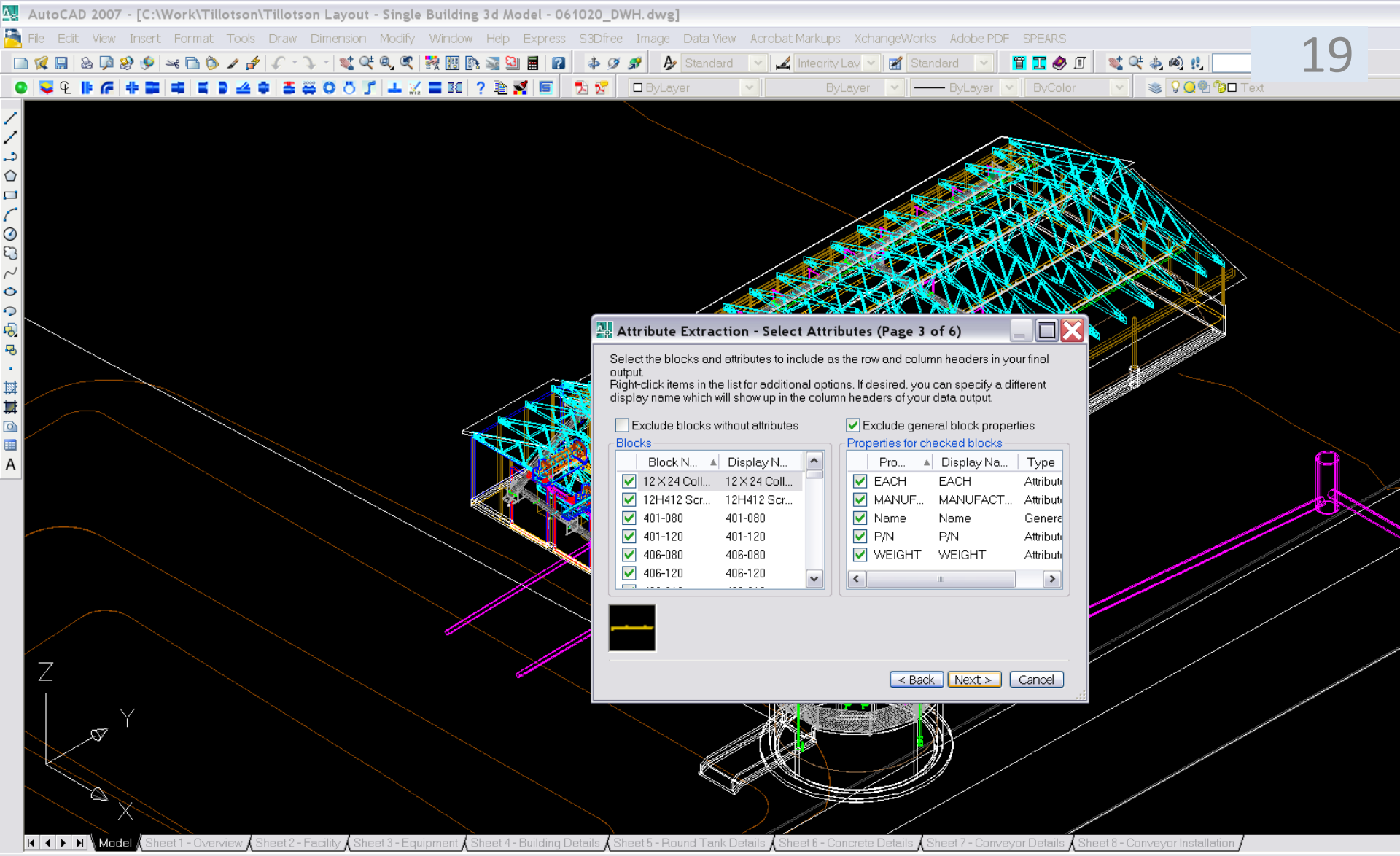
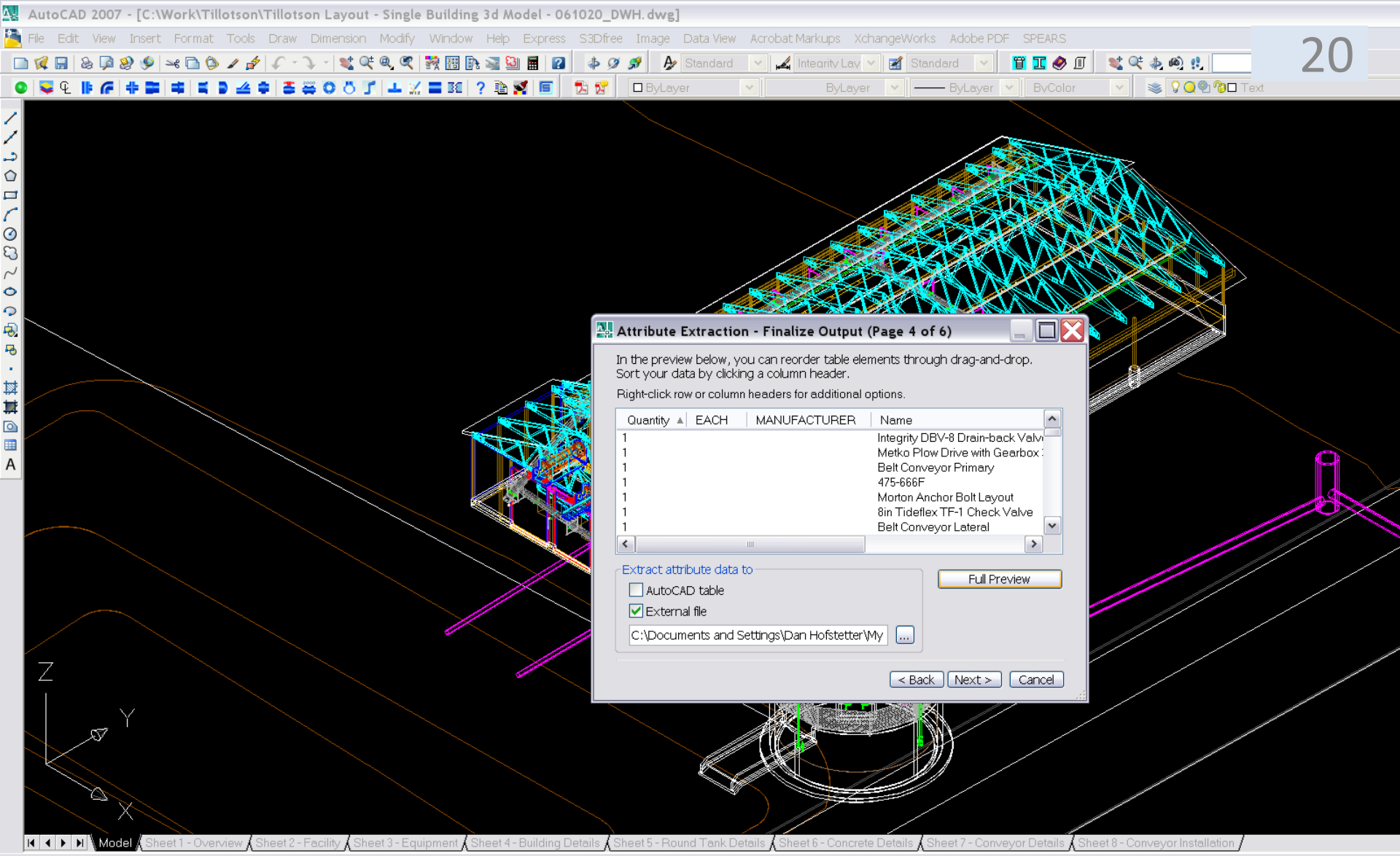
SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL
start
Tillotson
AutoCAD 2007 ...
Microsoft Power...
Microsoft Of...




```
Regenerating 1026 modified entities.
Command:
Command:
Command: _eattext
Command:
Command:
```

-6.86083E+03, 2.910473E+04, 0'-0.000000" SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL

start | Tillotson | AutoCAD 2007 ... | Microsoft Power... | Microsoft Of...


AutoCAD 2007 - [C:\Work\Tillotson\Tillotson Layout - Single Building 3d Model - 061020_DWH.dwg]
Attribute Extraction - Finalize Output (Page 4 of 6)
In the preview below, you can reorder table elements through drag-and-drop.
Sort your data by clicking a column header.
Right-click row or column headers for additional options.
Quantity
EACH
MANUFACTURER
Name
1 Integrity DBV-8 Drain-back Valv
1 Metko Plow Drive with Gearbox
1 Belt Conveyor Primary
1 475-666F
1 Morton Anchor Bolt Layout
1 8in Tideflex TF-1 Check Valve
1 Belt Conveyor Lateral
Extract attribute data to
AutoCAD table
External file
C:\Documents and Settings\Dan Hofstetter\My
Full Preview
< Back
Next >
Cancel
Model
Sheet 1 - Overview
Sheet 2 - Facility
Sheet 3 - Equipment
Sheet 4 - Building Details
Sheet 5 - Round Tank Details
Sheet 6 - Concrete Details
Sheet 7 - Conveyor Details
Sheet 8 - Conveyor Installation
Regenerating 1026 modified entities.
Command:
Command:
Command: _eattext
Command:
Command:
-6.86083E+03, 2.910473E+04, 0'-0.000000"
SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL
start
Tillotson
AutoCAD 2007 ...
Microsoft Power...
Microsoft Of...

Tillotson Layout - Single Building 3d Model - 061020_DWH.xls [Compatibility Mode] - Microsoft Excel

Home | Insert | Page Layout | Formulas | Data | Review | View | Acrobat

Normal | Page Layout | Page Break Preview | Custom Views | Full Screen — Workbook Views

Ruler | Gridlines | Message Bar | Formula Bar | Headings — Show/Hide

Zoom | 100% | Zoom to Selection — Zoom

New Window | Arrange All | Freeze Panes | Split | Hide | Unhide | View Side by Side | Synchronous Scrolling | Reset Window Position | Save Workspace | Switch Windows — Window

Macros — Macros

J51

	A	B	C	D	E	F	G	H	I	J	K	L
1	Quantity	EACH	MANUFACTURER	Name	P/N	WEIGHT						
35	2			408-010								
36	2			Metko Hanging Support Frame 3d Model								
37	2			429-120F								
38	2			439-130								
39	2			Accent Flighting								
40	2			Houle 4in Pump 16 ft 30hp with Agitation Nozzle 3d Model								
41	2			Baltor EM3546 3d Model								
42	2			401-120								
43	2			12H412 Screw Shaft								
44	2			FT12 Auger Trough Foot								
45	2			Metko 10 ft Conveyor Top Cover 3d Model								
46	3			Boiler Drain Valve 5-710 3d Model								
47	3			401-080								
48	3			851-080								
49	3			417-080								
50	3			Emergency Stop 3d Model								
51	3			854-080								
52	4			Baldor M3550T 3d Model								
53	4		Metko	Metko 2.5 ft Conveyor Section 3d Model	M-8003	13						
54	4			Metko Belt Support Section Splice 3d Model								
55	4			E-Stop Pushbutton 3d Model								
56	4			Custom Lateral Conveyor Hanger 3d Model								
57	4			Metko 1.5 hp Drive Unit 3d Model								
58	5			Metko Feed Hopper 3d Model								
59	5			48' S.C. 2090 Truss 3d Model								
60	5			Metko Take-up Unit 3d Model								
61	6			Metko Floor Support Frame 3d Model								
62	7			429-080								
63	8			Cannonball Delrin Trolley with 9.5in Pendant Bolt 711533 3d Model								
64	8			Metko Belt Support Section Splice 3d Model OLD								
65	8			Metko Section Splice 3d Model								
66	8			CB2-212-HT Auger Coupling Bolt								
67	10			Fence Section								
68	10			406-080								
69	10			SKF Pillow Block Bearing SY1TR 3d Model								
70	11			Custom Side Hanger for Metko Conveyors 3d Model								
71	11			Metko Side Hanging Support Frame 3d Model								
72	18			60' S.C. 3090 Truss 3d Model								
73	19		Metko	Metko 10 ft Conveyor Section 3d Model	M-7001	69						
74	24			Cannonball Bolt-Hung Track 20ft 711890 3d Model								

You can choose which components get extracted from the model

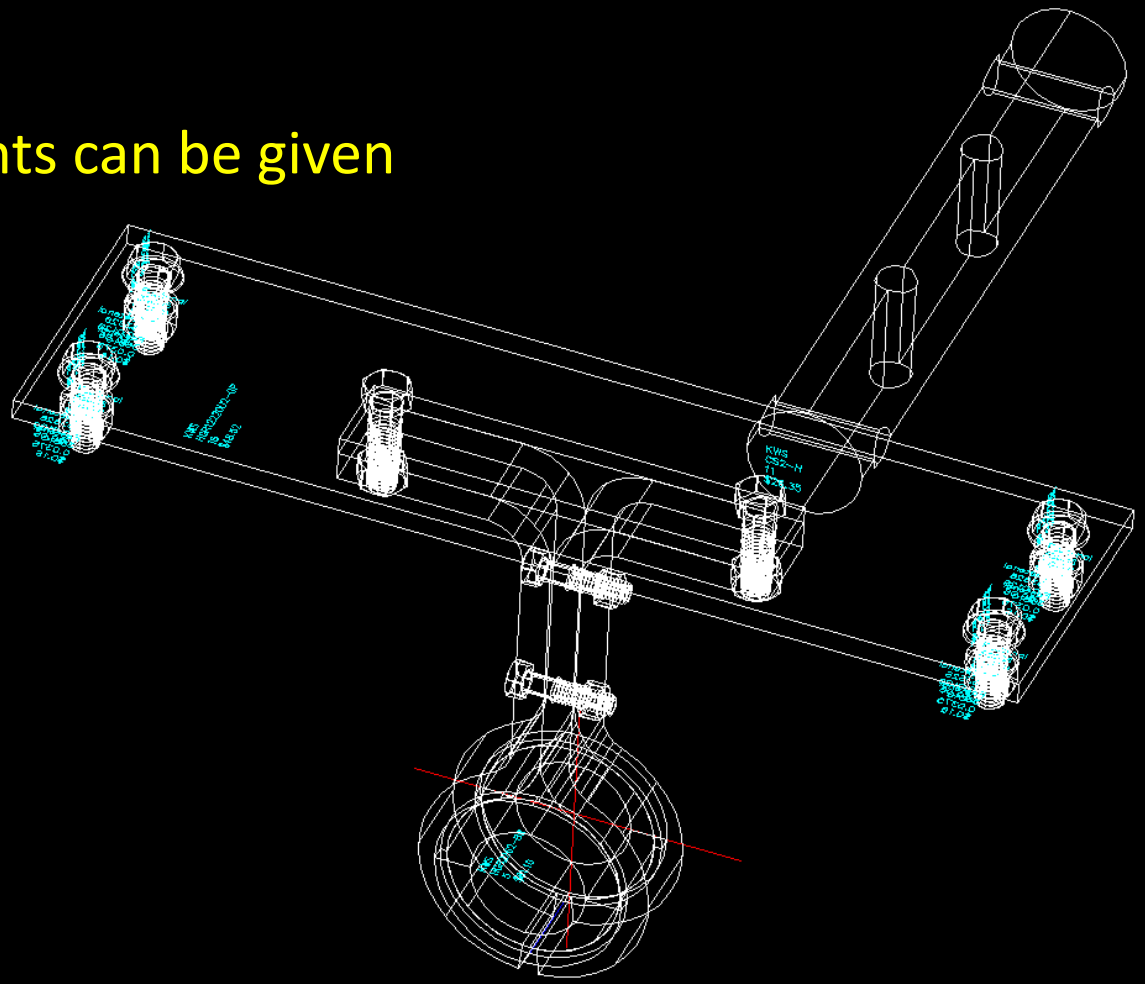
AutoCAD 2007 - [C:\Work\Components\Augers\12in Auger Components 3d Model - 070814_DWH.dwg]

File Edit View Insert Format Tools Draw Dimension Modify Window Help Express S3Dfree Image Data View Acrobat Markups XchangeWorks Adobe PDF SPEARS

Standard | Integrity Lay | Standard

ByLayer | ByLayer | ByLayer | ByColor

3D components can be given attributes



Model Layout1

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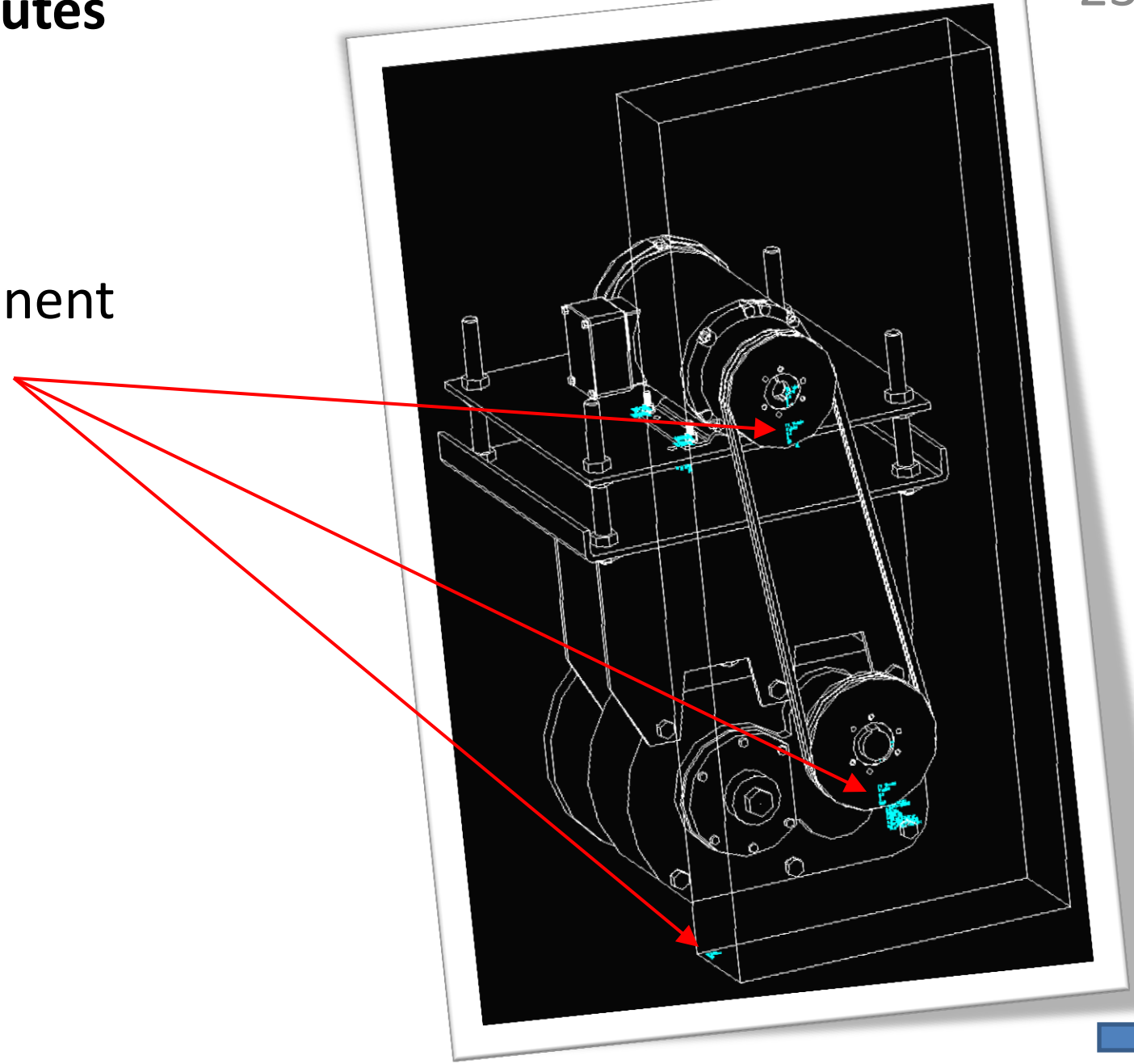
Command: regen
Regenerating model.
Command:
Command: Specify opposite corner:
Command: *Cancel*
Command: *Cancel*
Command:
```

3.392977E+02, -6.23998E+02, 0'-0.000000" SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL

Block Attributes

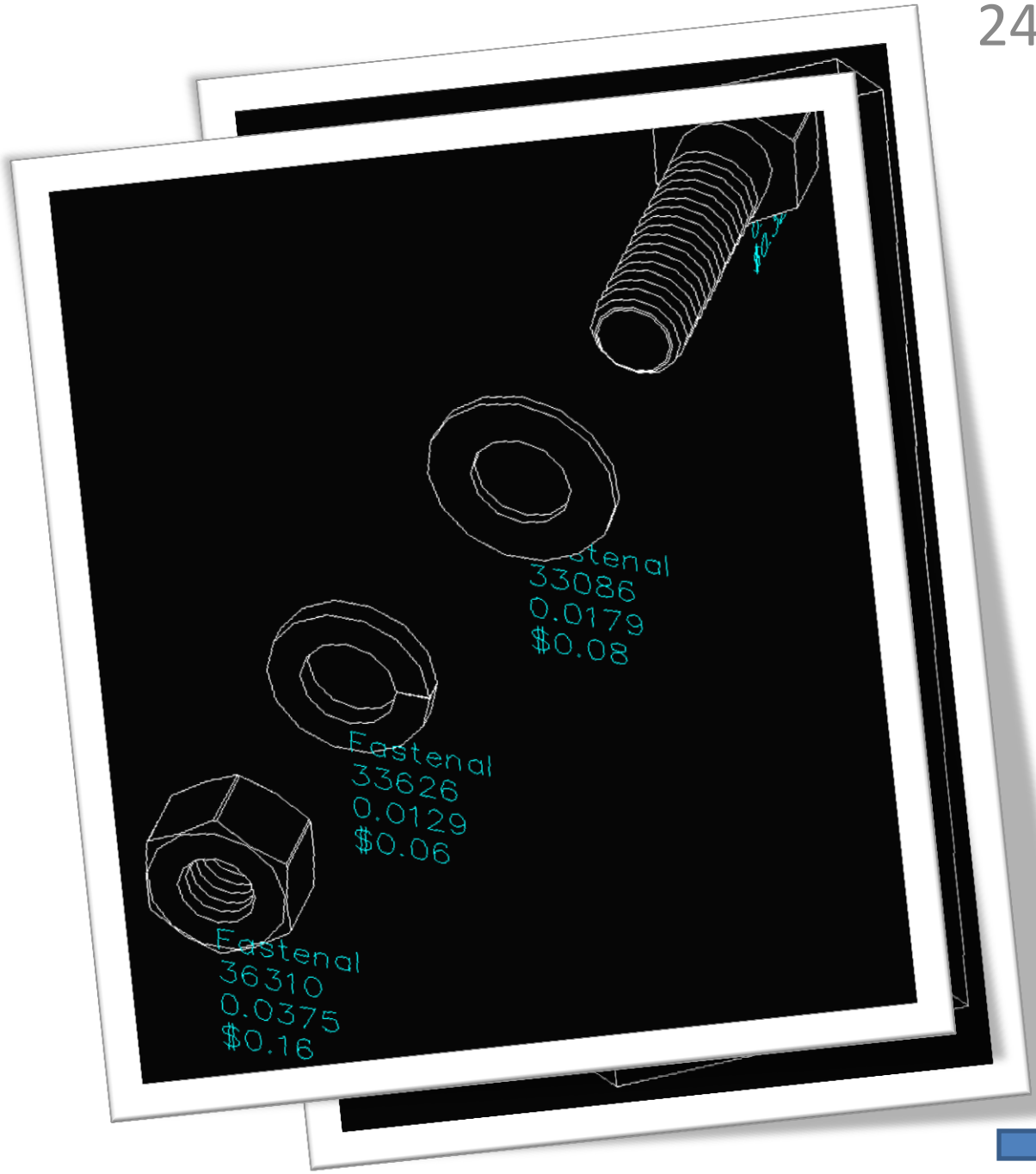
Each component has its own attributes



Block Attributes

Each component has its own attributes

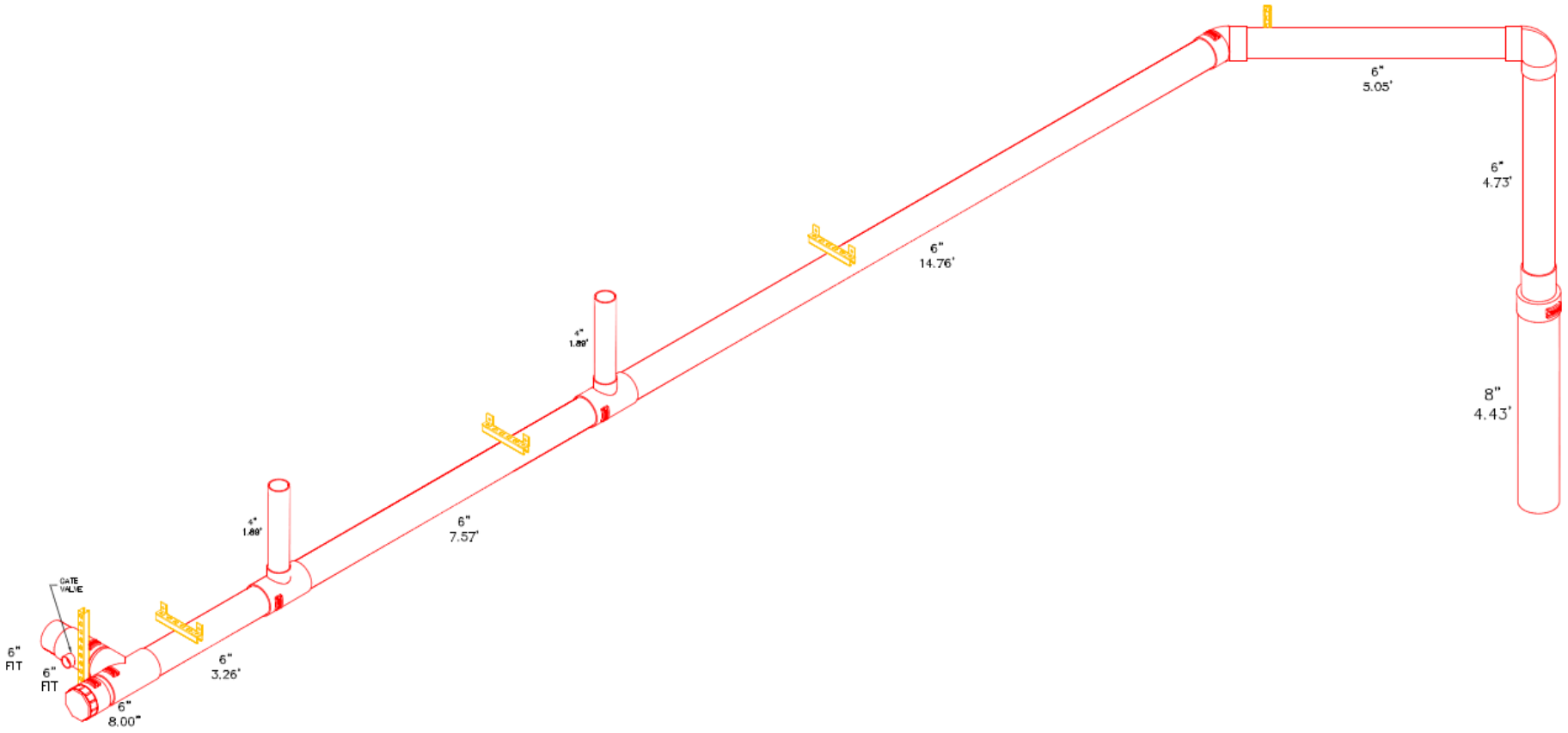
You decide which attributes to include



Sources for 3D CAD Content

- 3D Content Central
- ThomasNet (the Thomas Register)
- GrabCAD
- McMaster-Carr
- Manufacturer websites
  - Baldor, Dodge, SKF, Parker
- Many others…

If you design piping systems…



If you design piping systems…

Hill Haven Plumbing Parts List - All Pipes - 081103_DWH.txt - Notepad

File Edit Format View Help

Spears Process Pipe and Fitting Ver. 1.4.10-2007.NET - Drawing Summary Report

Monday, November 03, 2008 08:31

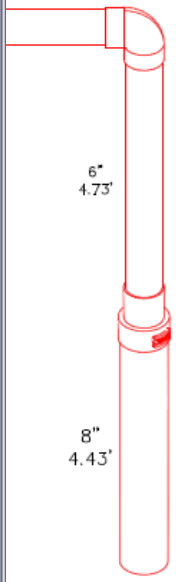
Fitting Summary:

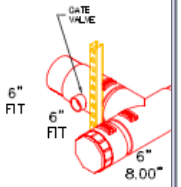
PART NO.	SIZE	QTY	DESCRIPTION	Weight(lbs)	PRICE(US$)
417-060	6"	10	ELBOW(SXS45)	34.89	549.10
466E-532	6"X4"	4	SADDLE(SINGLE-SLIP-EPDM-ZINC)	20.48	306.12
466E-585	8"X6"	8	SADDLE(SINGLE-SLIP-EPDM-ZINC)	75.74	1033.04
417-040	4"	4	ELBOW(SXS45)	5.01	88.92
401-060	6"	2	TEE(SXSXS)	12.66	170.48
429-585	8"X6"	1	RED-COUP(SXS)	4.36	46.64
406-080	8"	10	ELBOW(SXS90)	86.70	1397.10
435-060	6"	3	ADAPTER(SXF)	3.91	106.98
450-060	6"	2	PLUG(MIPT)	3.40	84.00
447-080	8"	1	CAP(SLIP)	4.35	64.17
Totals		45		251.50	$3846.55

Piping Summary:

PART NO.	SIZE	QTY	Length(ft)	Volume(gals)	Weight(lbs)	PRICE(US$)
SCH40-060	6"	24	37.65	56.51	133.29	549.35
SCH40-040	4"	8	10.63	7.03	21.37	88.01
SCH40-080	8"	13	103.58	269.18	550.01	2268.40
Totals		45	151.86	332.72	704.67	$2905.76

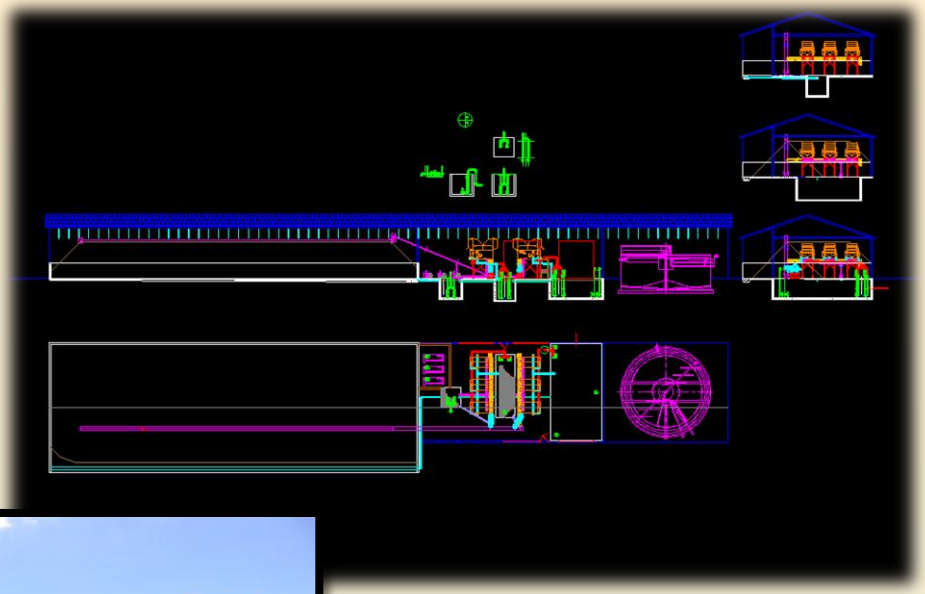
Note: Contact Spears for any weights or prices that are listed "NA".
Prices are Spears list prices and may not be current.

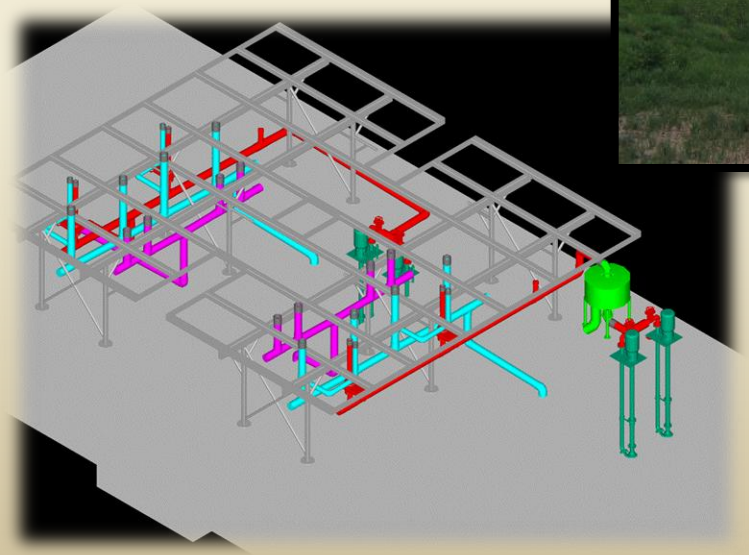


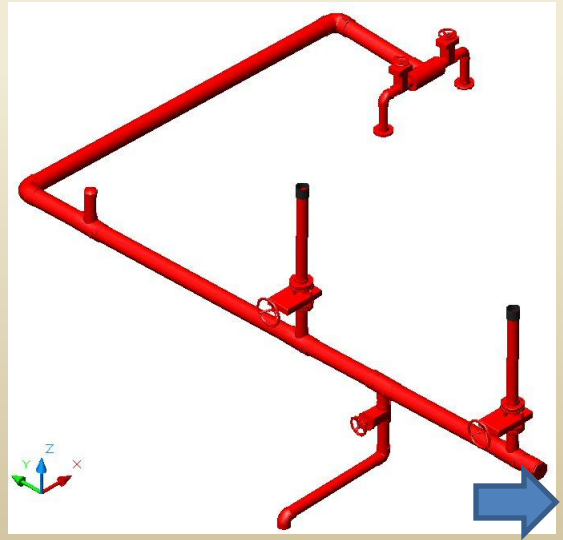


…A free AutoCAD add-in can be requested, **http://www.spears.com**

3D modeling project example #1







Pre-fabricated floor decking = drop-in installation, no cutting required


INTEGRITY
SEPARATOR


3.87
3.34
3.34
3.34
3.34
2.59
2.59
2.59
2.59
2.14
2.13
2.14
2.13
2.14
1.29
1.0
1.0
0.8
0.8
0.8
0.8
0.68
0.46
.46


PELIGRO
PELIGRO
3.14'
1.30'

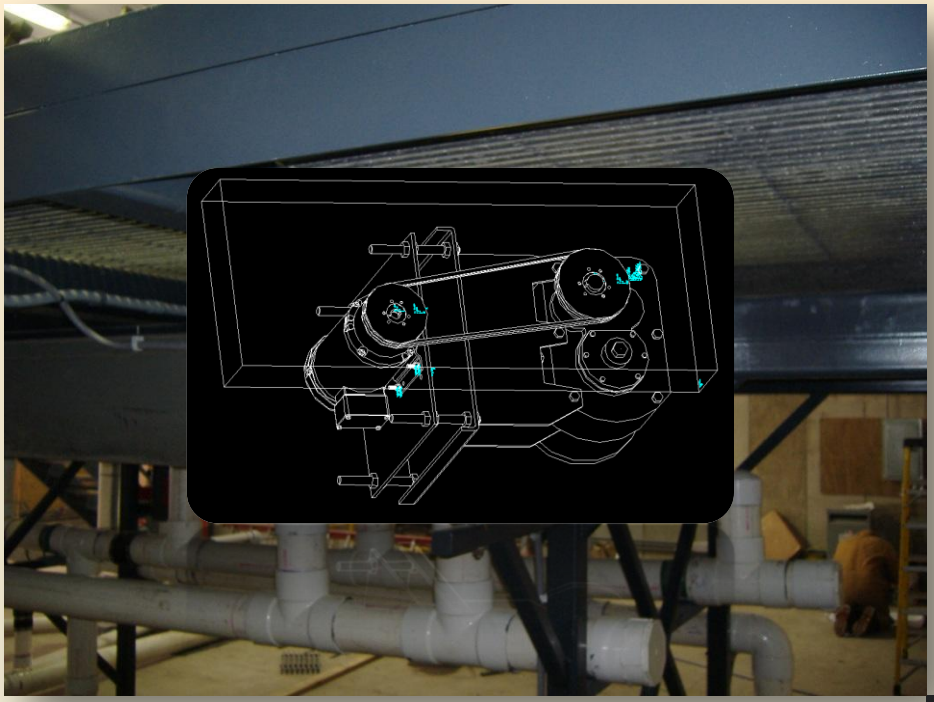
Pre-installed pipe stubs in correct locations for future separators

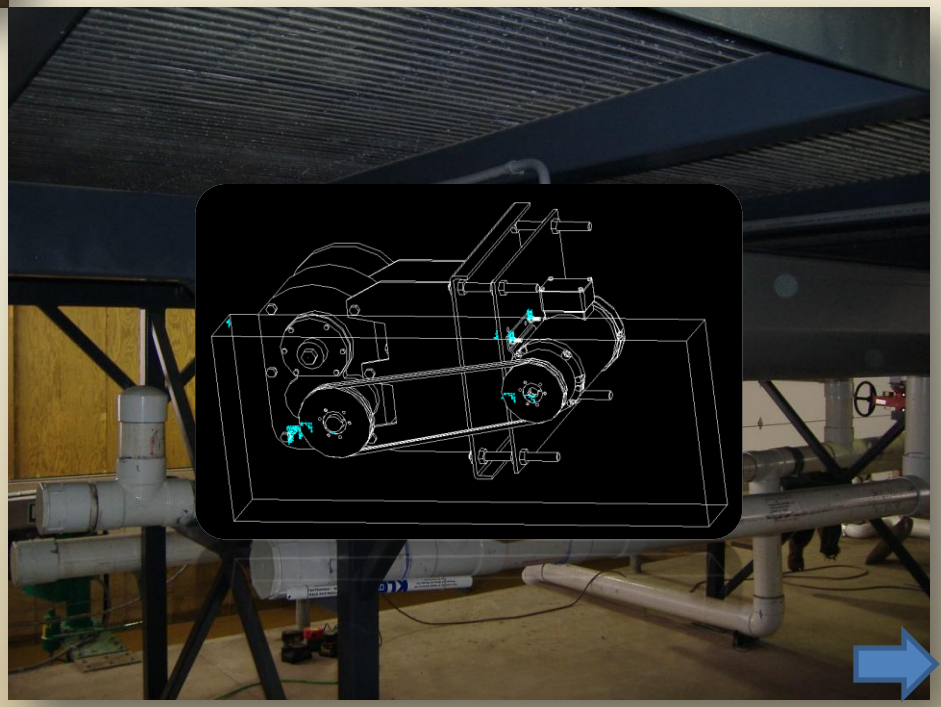

CREATLINE
PPFA

Where to locate the opening prior to installation?

Routing a pipe over a conveyor

Different orientation of drives

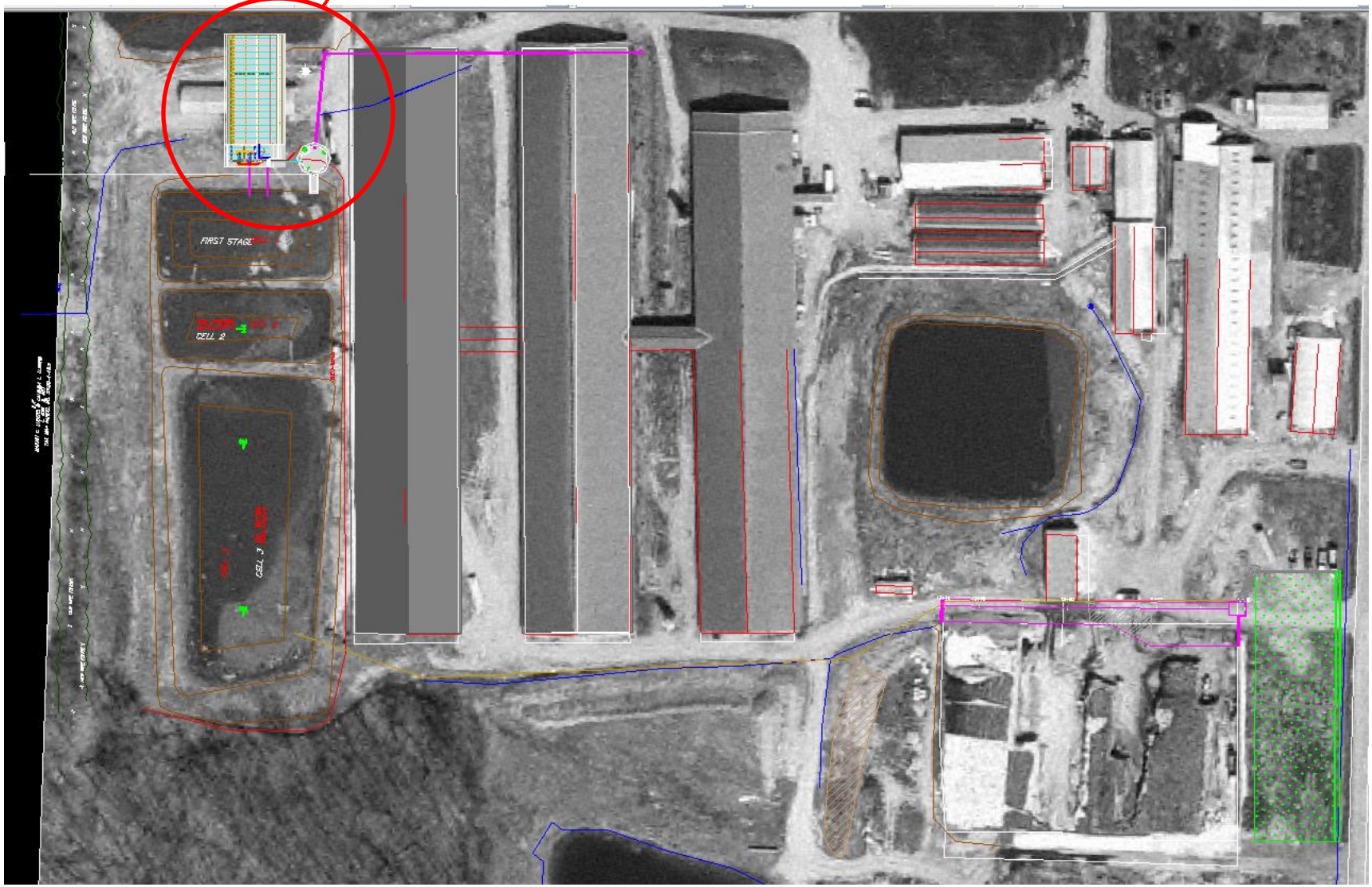




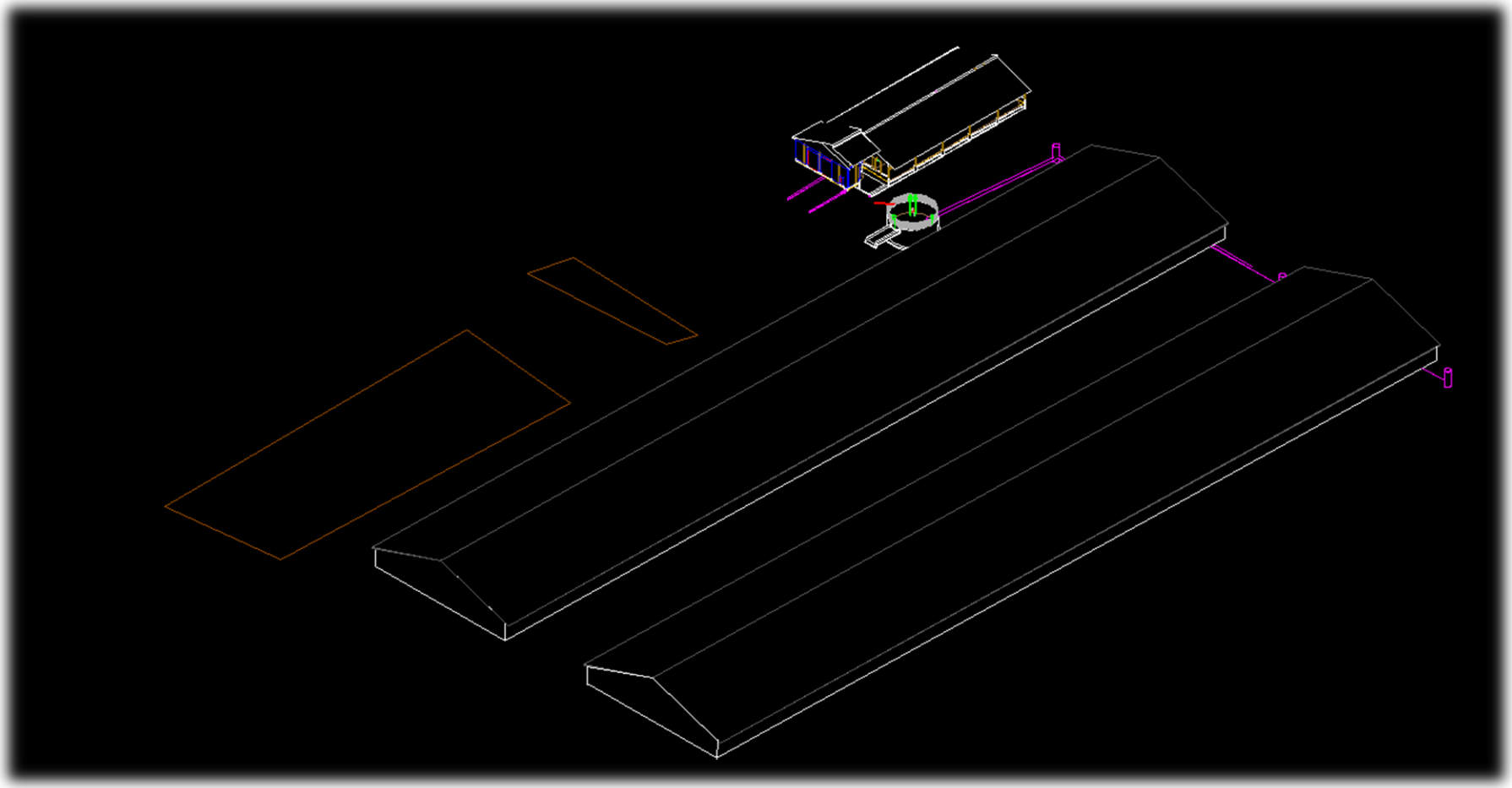
Why it pays to have control over the entire design process

3D modeling project example #2

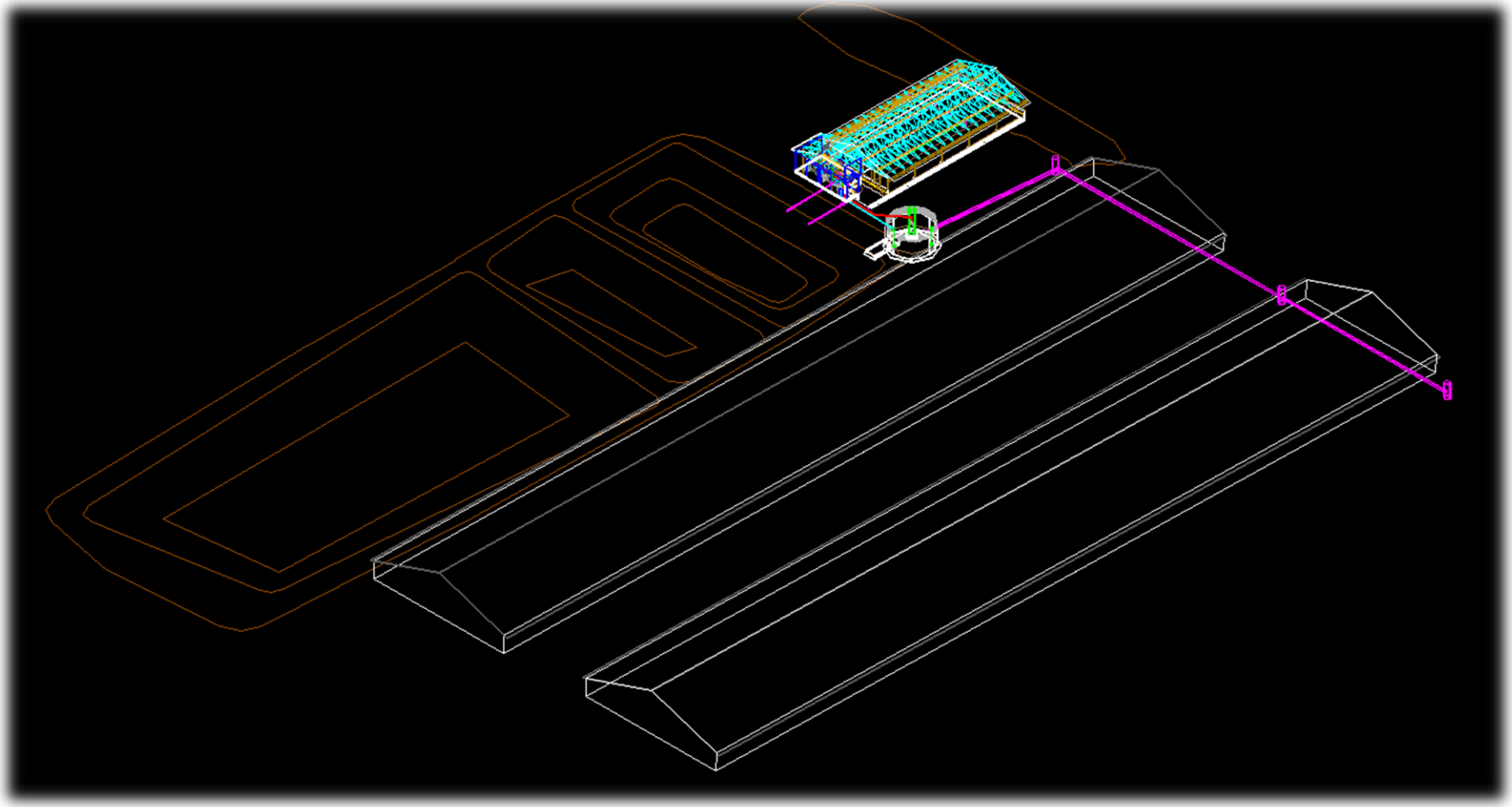
Solids Separation Facility



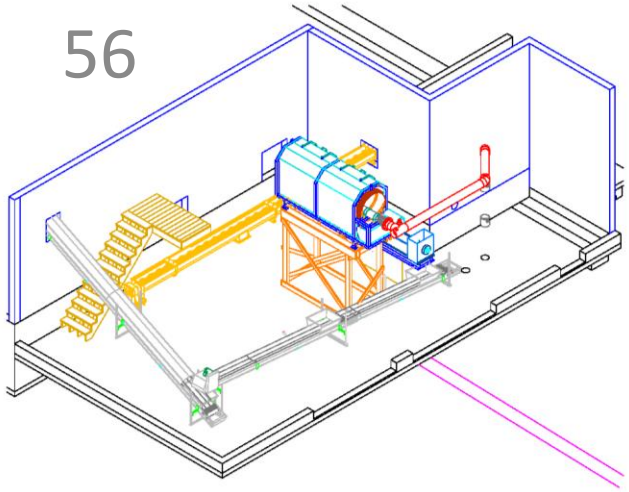
Hidden view for simple conceptual visualization



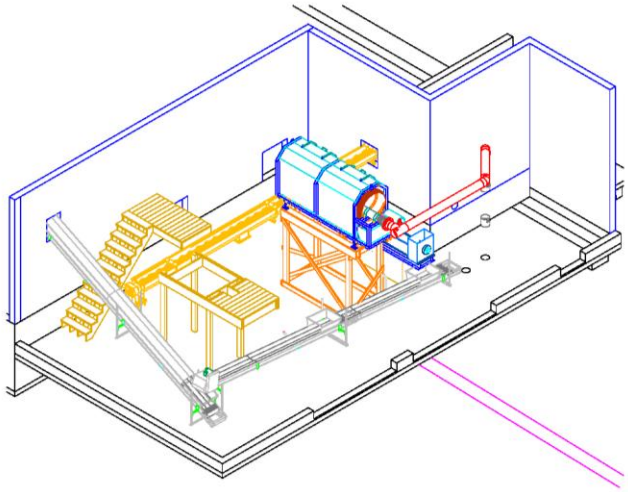
Wireframe view shows model complexity



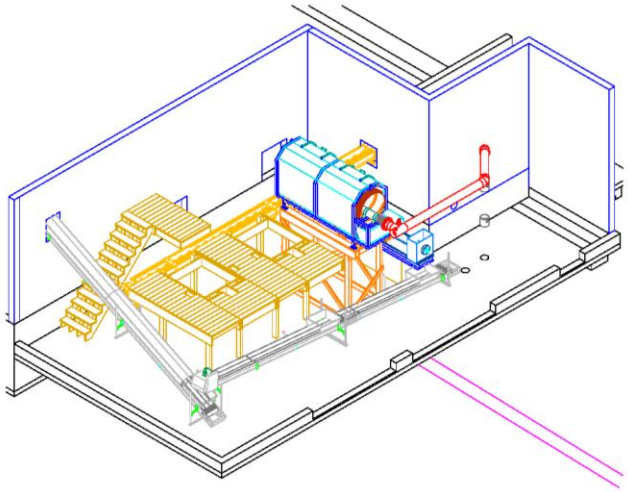
Everything is in one place in this model



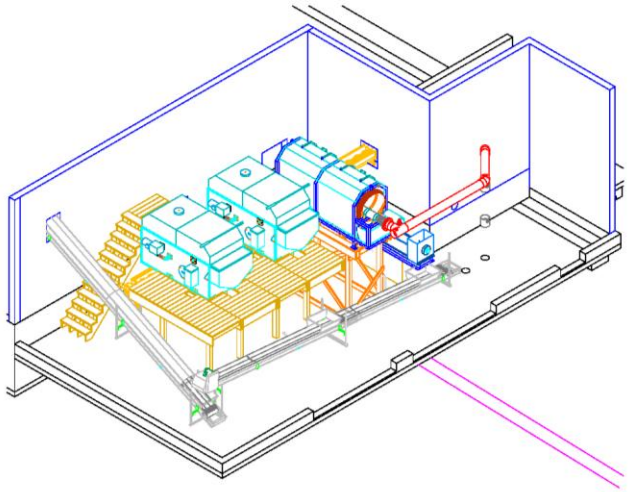
INSTALL STAIRWAY AND LANDING



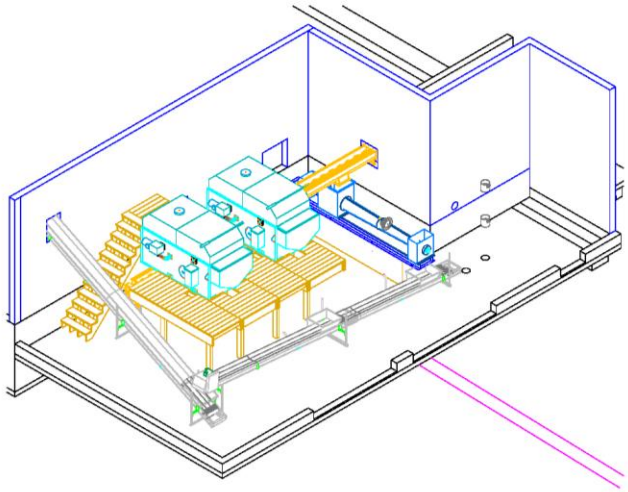
INSTALL SEPARATOR STAND #1



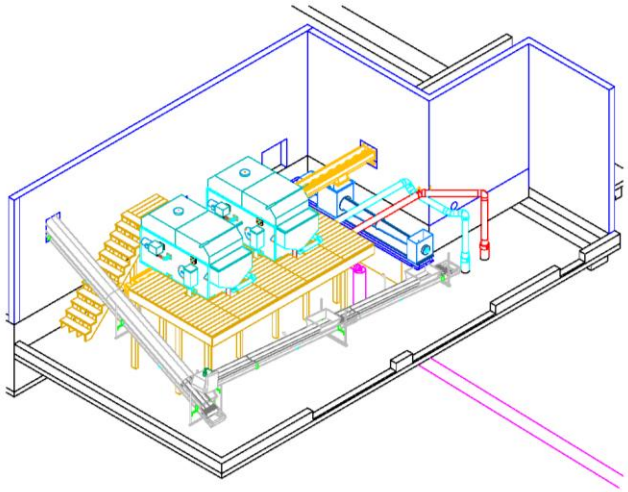
INSTALL CENTER CATWALK, STAND #2, THEN WEST CATWALK



INSTALL ROLLER PRESS SEPARATORS,
START SEPARATOR PLUMBING

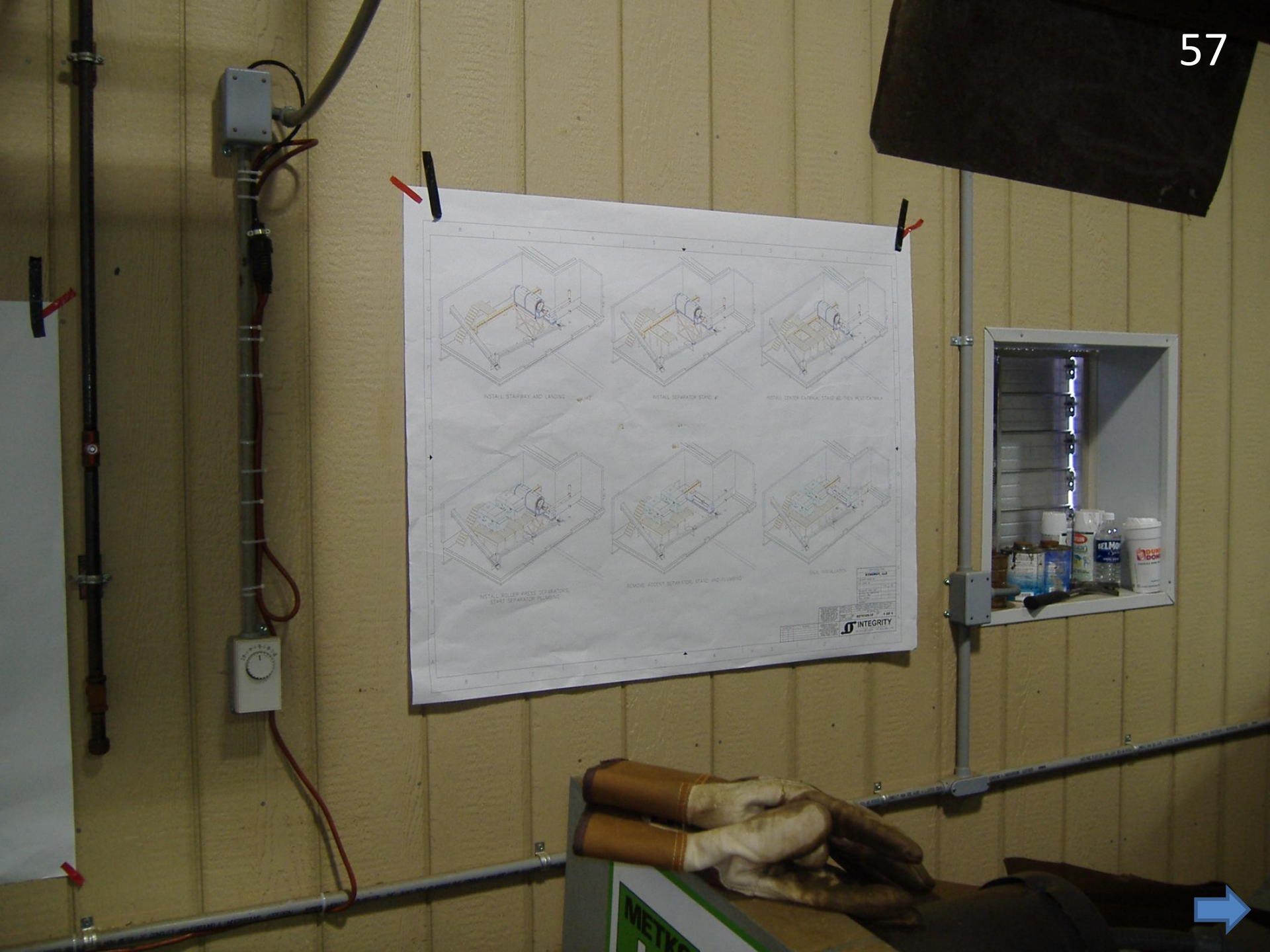


REMOVE ACCENT SEPARATOR, STAND AND PLUMBING



FINAL INSTALLATION

Planning to replace existing equipment with minimal downtime


INTEGRITY

TILLOTSON DAIRY - INSTALLATION TASK LIST

1. Fix Bent Hydrant and Clear area for Separator #1
2. Locate and arrange all hardware for stand/leg assembly
   a. Bolts & Hardware
   b. Post anchors, concrete anchors
3. Measure and locate stairway from existing TSP stand, check reference dimensions from walls
4. Install stairway level, lag north stringer to wall of building, anchor lower end to floor, install temporary intermediate legs for support
5. Lift stairway landing into position and support temporarily, measure and cut legs to length, drill and bolt legs to landing
   Lag landing to north wall of building, make sure legs are plumb and anchor legs to floor
7. Install diagonal bracing as required to steady landing
8. connect stairway to landing using joist hangers and screws, remove intermediate legs if necessary.
9. Use laser transit to measure elevation at top of landing - will use this to position all other platforms
10. Remove collecting auger drive and auger end plate.
11. Remove 4' section from collecting auger located outside of building.
12. Install 4' section on collecting auger at drive end inside building
13. Reinstall collecting auger drive, rotated 180-degrees from original position (motor hanging upside-down)

P. 1

TILLOTSON DAIRY - INSTALLATION TASK LIST

14. Measure and locate separator #1 stand, lift into position and set elevation at top of decking = top of landing
15. Measure and cut legs to length, drill and bolt legs to separator #1 stand
16. Make sure legs are plumb, recheck stand position and anchor to floor
17. Install diagonal bracing as required to steady stand
18. Lift center catwalk section into position, bolt west side to separator #1 stand, level and check elevation, install temporary legs on east side for support
19. Lift separator #2 stand into position
20. Bolt west side of separator #2 stand to center catwalk yet and level top of stand
21. Measure and cut legs to length, move stand over as required to bolt legs on, drill and bolt legs to separator #2 stand
22. Note: Use longer bolts to bolt through catwalk and separator stand and legs on west side
23. Make sure legs are plumb, recheck stand position, and anchor to floor
24. Install diagonal bracing as required to steady stand
25. Remove temporary legs from east side of center catwalk
26. Lift west catwalk into position, bolt east side to separator #1 stand, level and check elevation
27. measure and cut legs to length, drill and bolt legs to west side of west catwalk
28. Make sure legs are plumb, recheck stand position and anchor to floor
29. Install diagonal bracing as required to steady catwalk
30. Lift separators into position, lag to stands

P. 2

TILLOTSON DAIRY - INSTALLATION TASK LIST

31. Install electrical conduit for separators, pull wires, connect separators using flexible conduit with loop for gearbox movement
32. Install separator control panel on wall, connect to separator wiring and existing system control panel
33. Install thermostat controls for belt conveyors
34. Change pump controls - pressure to amps
35. Install splash guards for separators over collecting auger
36. Build guard/access cover over auger @ stairs
37. Install pickets and railing around platform and stairway
38. Mount 2X12 Facia board to separator platforms
39. Locate and arrange pipe and fittings for separator plumbing, hangers, hardware, primer, glue, etc.
40. Cut pipes to length
41. Cut strut channel to length for hangers
42. Connect rear and side overflows for each separator
43. Assemble feed, overflow, effluent manifolds for each separator
44. Install separator plumbing as much as possible with Accent separator still in-place (stop at east end of separator #2 stand
45. Support piping using strut channel and angle brackets, lag to stand

P. 3

TILLOTSON DAIRY - INSTALLATION TASK LIST

46. Shut down Accent separator
47. Disconnect and remove Accent plumbing
48. Disconnect Accent wiring and remove conduit/wires
49. Remove Accent separator from building, clean up and prepare for truck pickup
50. Remove Accent discharge splash guards from auger and associated framing materials
51. Disassemble and remove Accent stand and concrete anchors if in the way
52. Lift east catwalk section into position, bolt west side to separator #2 stand level and check elevation
53. measure and cut legs to length, drill and bolt legs to west side of west catwalk
54. Make sure legs are plumb, recheck stand position, and anchor to floor
55. Install diagonal bracing as required to steady catwalk
56. Continue separator plumbing; connect to existing pipes
57. Start up roller press separators, make any necessary adjustments, tune system
    a. Reprogram PLC if necessary
    b. Adjust TSP speed and air pressure as necessary
    c. Change pulley size on separator feed pump for higher flow rate
    d. Adjust separator weirs

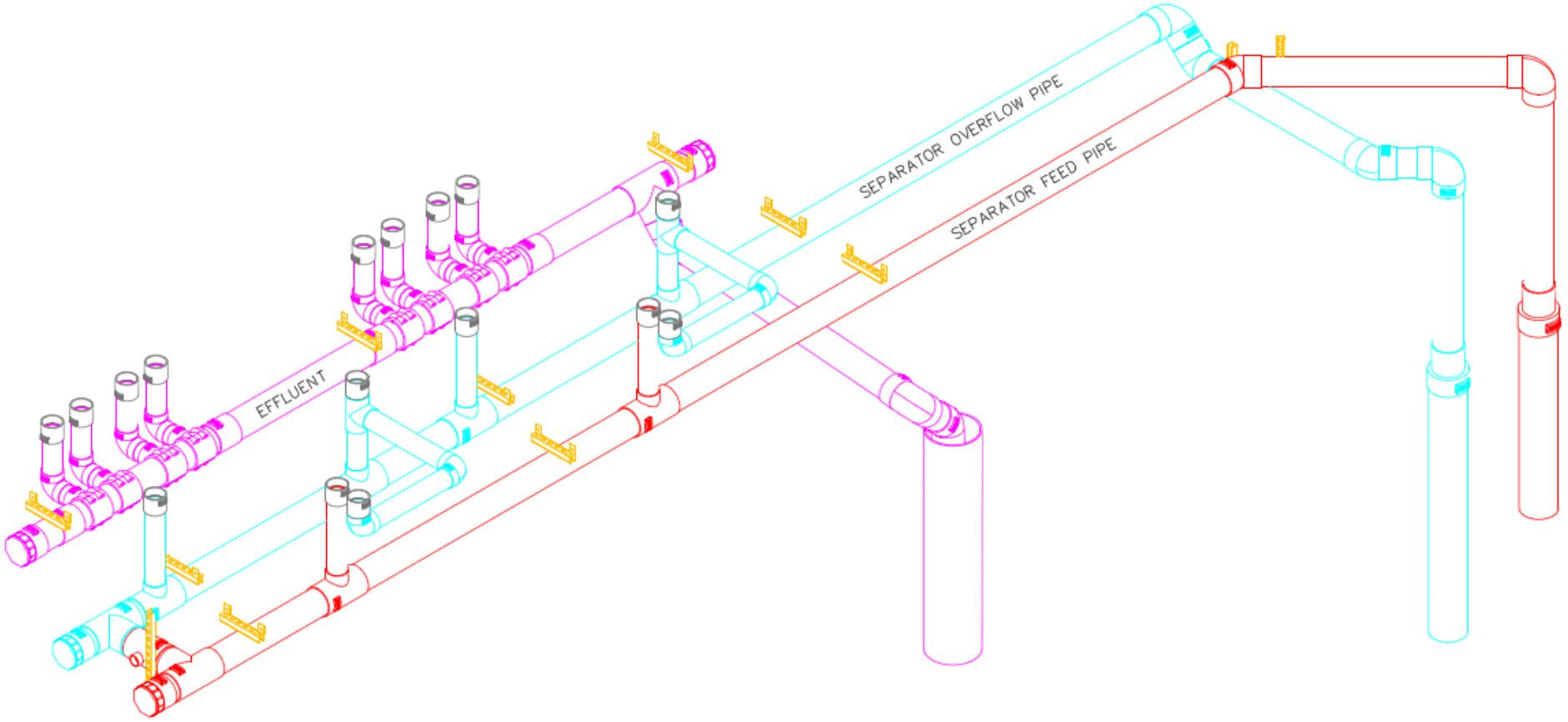
P. 4

TILLOTSON DAIRY - INSTALLATION TASK LIST

58. Box-in stands with T-111 plywood sheathing if necessary - take measurements and buy materials in Batavia
59. Install PulseJet pump in pump shed, connect to existing Z-pipe, install electrical controls and connect to power, test
60. See John Rudgers about lateral plow performance and adjust if necessary
61. Test Emergency spillway in reception pit to find depth at which barns back-up with manure.
    a. Figure out depth increase required for spillway to prevent manure backing-up into the barns
62. Compile extra parts/materails and load onto the trailer

P. 5

Pipe Routing: Planned

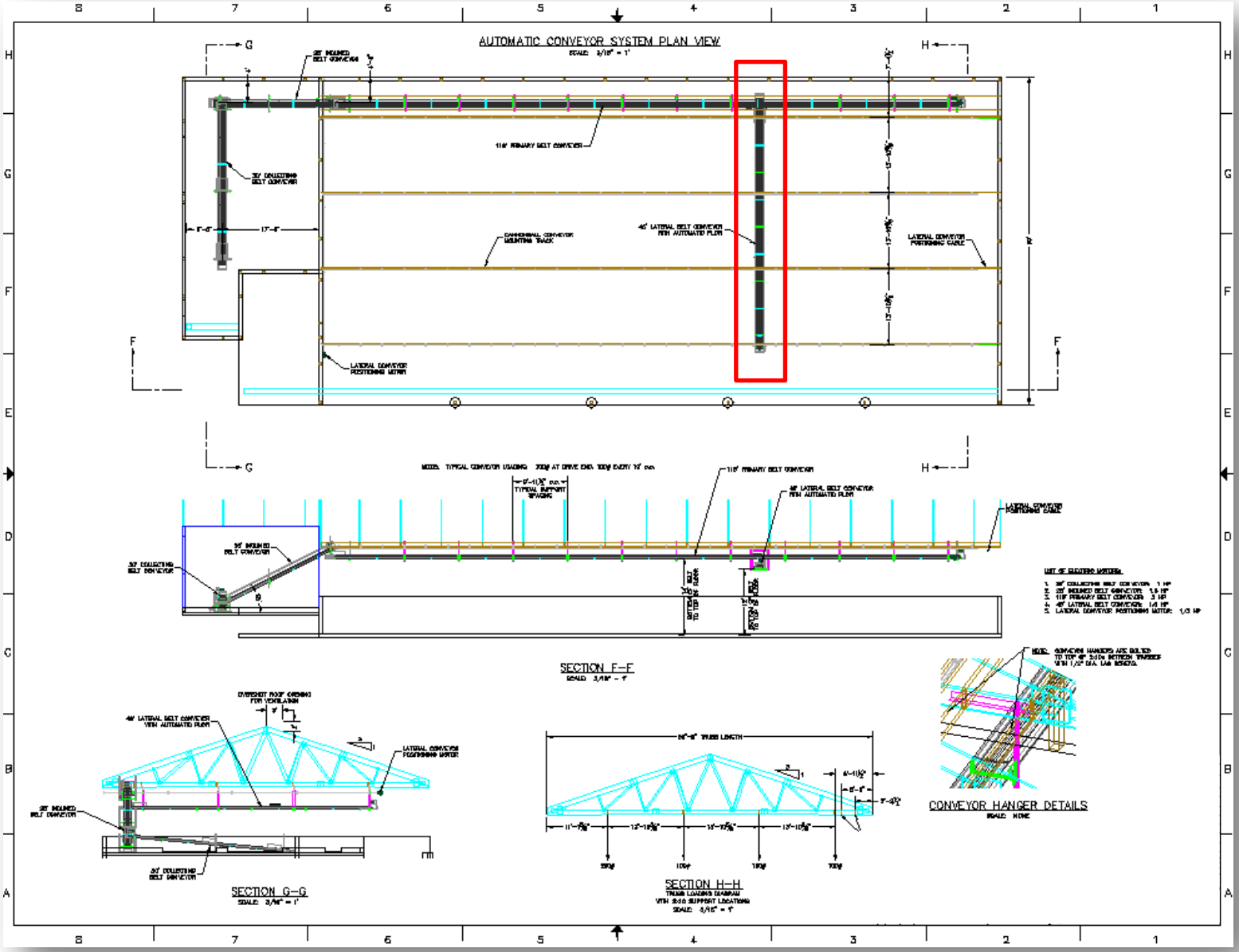


Pipe Routing: Installed

There were no surprises, and all needed hardware was on-hand

3D Conveyor Design

3D Conveyor Design



Limitations of 3D modeling

Computing power: Large 3D models may require a lot of power, particularly if a high level of detail is required

You, as the designer, can still make mistakes

Workarounds

Turn off what you don't need – just display the outer shell

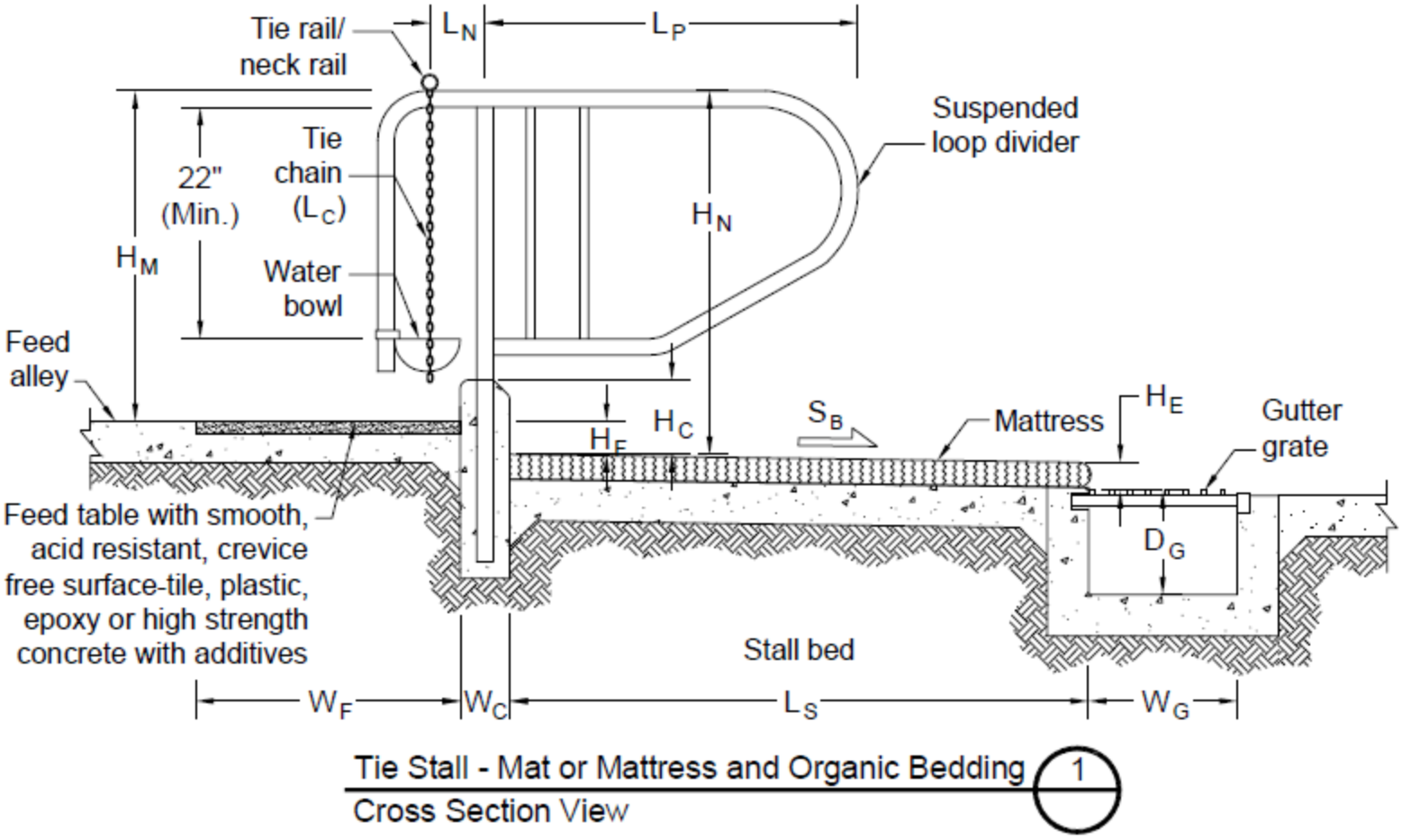
- Internal parts, hardware, etc.
- Easy to do in Solidworks by opening assemblies as "lightweight"

Get a faster computer! Buy or build (less expensive)
- Six+ core CPU, lots of RAM, SSD, Quadro/FireGL graphics

3D: Other Possibilities

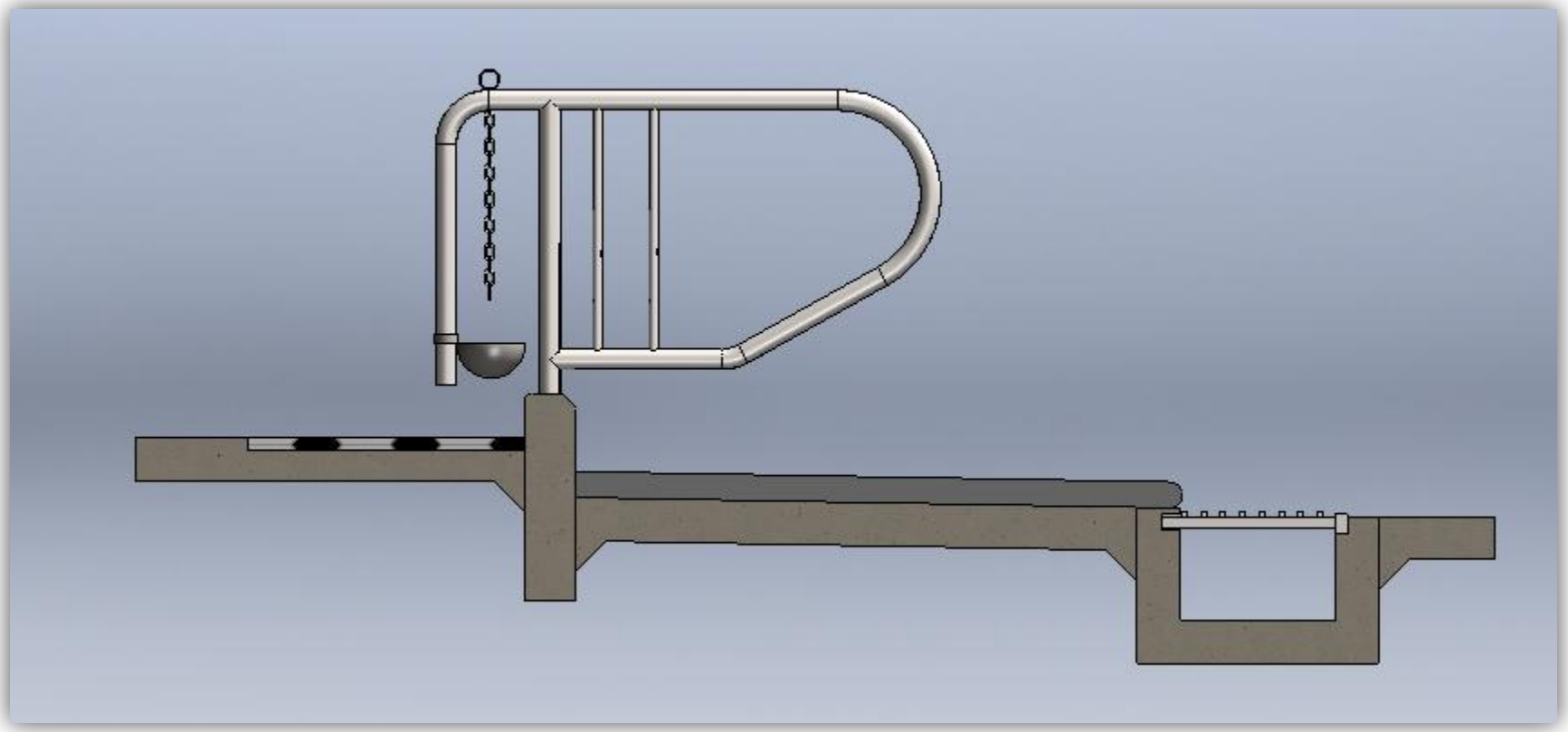
- Walk-through videos of facility
- Simulation and analysis
- More!

3D example: Tie stall barn layout



Tie Stall - Mat or Mattress and Organic Bedding (1)

Cross Section View



3D Example in Solidworks: Using the model