

API 653 Inspection Report Builder

Figure AST-7. API 653 Inspection Report Builder Data Entry Form

To access the API 653 Inspection Report Builder from the home page choose [API 653 AST] then click on [Report Builder] button at bottom of page. Choose New Report [+] or Select Existing Report from the "Select Report " drop down menu.

Choosing New Report [+] user must enter a "Report No."

Begin report by entering data in cells as called for on the base page.

Choose Unitset (US, Metric or other) in upper right hand corner for other than the default (FieldSet = US Units) and enter all data as called for in that unit set.

Much of the numerical data entered on the report builder base page will be used in the calculations of sub forms, therefore enter all numerical data as specified without signifiers (i.e., "Nominal Diameter" should be enter as 25 not 25' or 25ft ect.). The "Original Plate Thickness" in lower left corner will display to the thousandths place for a professional appearance in the final report (i.e. [0.500]). The plate nominal thickness is what usually is entered here to be used for the starting thickness (nominal minus the mill under tolerance [0.010" for plate] is also a common entry here for more accurate corrosion rates).

The Age/Prev Insp. is a number not a date (i.e., 9, 20, 34, et) which will be used to calculate corrosion rates, therefore the "Original Plate Thickness" must correspond with the "Age/Prev Insp" value.

Entry data cells with [*] buttons next to them allows for additions to be entered for use in pull down menus that are not available. (i.e. Inspector or Service. This allows the user to build the data base with data for future usage. Many (not all) of these edits will be flagged to be approved by the development team as the data will become part of the universal program accessible to all users and must be technically accurate and in accordance with national standards (i.e., material stress values, product data values, et).

A link to the PDF Codes/Standards & File Cabinet libraries & Engineering Data is available in the upper left side for quick access to those resources.

Access to the extraneous AST Calculations is available via the Engineering Data where additional calculations apart from the report body may be needed. Click on Engineering Data tab and then select the calculation of interest. Note: if to be a part of the report they can be selected in the Appendices.

The cover text comes in with a default text that will automatically update with input data from the front page until the first time the base page save button is pressed after which it will have to be manually edited by the user; therefore it is best not to save until all the cells are populated on the report base page. Alternately, the user may delete the default text and enter other text as desired after the first save.

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

To do a spell check, place the cursing over any redlined text and right click to see choices for possible corrections.

As the user scrolls down the base page there is a "Pipe/Nozzle Practical tmins" table that will come up. These values default to the program practical tmin values but can be over written by the user. These values will be used throughout the program when evaluating the remaining life of the nozzles/piping components.

As the user continues to scrolls down the report base page there will be empty user data cells to input additional static data that will appear under the report data page 4 along with the given data that automatically populates. The user should experiment with these input data cells to see how it will appear on the data page.

Click on the [logo] button at the top of form to enter user company logo to appear on the reports (changing the logo is not global; all reports throughout the program will need to have the logo uploaded per report, it is best to save a copy of the logo and signatures in a folder under My Documents named "AA Toolbox Support" to facilitate the process in an expedient manner)

Click on the [Signature] button at the bottom of the form to enter user signature to appear on the reports (changing the signature is not global; all reports throughout the program will need to have the signature uploaded per report)


The [Plate Spec (Crs 1)] selection accesses a material list from API-650

Once all the report base page data cells are populated the user can proceed to the Appendices for Data Evaluations or Report Write-ups. **The user should always progress from left to column (and Appendix A to H) when entering data in sub forms as the program cascades information as the report is progressed.**

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

The front page report print (preview) (in pdf or word format) is limited to the fist four pages of the report (the printer icon with no designation).

The [Copy Report] is available to use when a user has several reports that have repetitive information and desires to duplicate a report to edit data that is different from the original report. Click on the [Copy Report] button and rename the report, This will copy all the front page data, the report write-up, the checklist and the component CML's. It does not copy the other Appendices. The user will now be in the new report to continue building the report.

A record may be deleted by clicking the  icon at the top right hand corner and confirming.



Limited Preview Print Full Report

To preview and print the front page report section (first four pages in pdf or word format), click the limited print icon of the report (the printer icon with no designation) in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**

To print the full finished Report, click the printer icon with the "F" designation. Chose ether the pdf or the word file type. This will print the entire report including any appendices that were developed for the word file type and for the pdf file type will include any .pdf files that were attached in the appendix builder completely assembled and in the order of the appendix sections.



Sharing and Ownership of Reports, click on the group icon (with the 5 people standing) to view who has shared access to that report. To share a report the owner must pick the linked dots icon. A popup comes up where the owner (or administrator) can click on the person to share with, click on the [Share] button then [Close] button. The shared person can view the report but not edit it except they can some appendix functions. To transfer ownership, repeat the share process and then select them from the pull down in the popup and then click the [Make Owner] button. When selecting the Report from the Report Base Page there is an owner column that displayed the current owner. Users will only be able to view their own reports and any reports that have been shared with them.

Download/Upload Field Data Sheets. To download the templates - click on the [Download template](#) and/or [Checklist template](#) links in the top of the Report Base Page. click on the link that appears at the lower left corner of the screen that will open the field file (Excel file for the data entry and Word file for the checklist). Do a "save as" action and save to the project file for that inspection. Fill in the data pages, WriteUp, and Checklist in accordance with the applicable sections of this procedure. For the WriteUp, click on the section of interest, double click to place the curser where you want to start (to start typing or back space to delete etc.). To do a return - hold down the keyboard [alt] key and then press [enter] key. To upload the field templates - save all work and close out of the forms. At the top of the Report Base Page, click the [import] button, click the [choose file] button, navigate tot the template excel file of interest, click the [import file]. The report will automatically come in to the Open file. Click on save which update the Cover Text with the pertinent information. Continue to review and fill in the missing items on the Report Base Page (Logo, signature, Inspector of Record, etc.), the appendices and WriteUp page. It is recommended that the Check list(s) be printed to pdf and uploaded, otherwise select all of the contents and copy and paste into the appropriate report checklist appendix.

Report Appendix

The screenshot displays the 'API-653 Report Appendix Builder' web application. The interface includes a top navigation bar with 'API INSPECTORS TOOLBOX ENTERPRISE' and menu items like 'Design Codes', 'File Cabinet', 'Engineering Data', 'API-653 AST', and 'Contacts'. Below this is a header for 'API-653 Report Appendix Builder'. The main area contains four panels for Appendix A, B, C, and D. Each panel has a 'Subject' dropdown, an 'Upload Files' button, and a list of subjects with checkboxes. Appendix A is for 'Thickness Measurement Recv', Appendix B for 'Mechanical Integrity Calculations', Appendix C for 'Inspection Drawings', and Appendix D for 'Inspection Checklist'. At the top right, there are buttons for 'App. Subject' and 'App. Text'.

Figure AST-8. Report Appendix Builder

To access the Report Config. / Appendix page from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the dropdown menu then Click on the [Report Config. / Appendix] button at the bottom left.

The Report Appendix will automatically populate with the most common Appendix subjects associated with an API-653 OOS inspection.

This section is divided up with separate windows for building the report appendix.

The user should always progress from left to right (and Appendix A to H) when entering data in sub forms as the program cascades information as the report is progressed.

The Report Appendix subjects comes in with a default text that needs to be edited to reflect associated information. Alternately, the user may delete the default text and enter other text as desired.

The pull down menus for each of the data cells are for user options. To add more options click the [App. Subject] or [App Text] as desired.

The User should review each appendix and customize them according to relative need for the report (selected or deselecting relevant subjects) before starting the data input (especially under appendix A & B). To deselect a text click the pull down arrow of the text of interest and select the "Please Select" option. If an entire appendix is not related to the report, deselect that appendix (uncheck the "Applicable" check box in the upper right corner of the appendix).

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

To add more choices the App. Subject or App. Text pull downs, click the [App. Subject] or [App. Text] Button at the upper right corner. Select the Appendix of interest, write in the new Subject/Text, click Add New Subject/Text. You will need to hit the

refresh (the icon in the upper right corner with 2 circular arrows) to see the new subject/text.

To move from the Appendix back to the report base page click on the back arrow in the upper right corner.

Report Component Corrosion Monitoring location (CML) Record

Component TML Record

www.processskybox.com/API653AST/ComponentTMLRecord.aspx?q=17011&ReportNo=15222.TC

API INSPECTORS TOOLBOX ENTERPRISE

Design Codes File Cabinet Engineering Data API-653 AST API-510 PV Insp API-570 Pipe Insp Contact Us

Report No: 15222 TC Report Date: 10/20/2015 Actual Plate Thicknesses (tact) (inch): Refresh

Client Name: NRG Tank No: Tank C

Insp date: 10/20/2015 Age/Prev Insp (year): 41 Year Built: 1974

Report: 15222 TC Roof: 0.176 Floor:

Crs 1: 1.067 Crs 3: 0.743 Crs 5: 0.373 Crs 7:

Crs 2: 0.913 Crs 4: 0.551 Crs 6: 0.318 Crs 8:

Download Template Add multiple rows Add Export CML's Import CML's Choose File No file chosen

AST Component TML Record Edit Comp. CML Data Edit CML CML Data Delete Multiple

CML	Component	Location	tact (inch)
001	Shell Crs 1	Q1	1.109
002	Shell Crs 1	Q2	1.111
003	Shell Crs 1	Q3	1.102
004	Shell Crs 1	Q4	1.109
005	Shell Crs 1	Drop # 1	1.067
006	Shell Crs 2	Drop # 1	0.913
007	Shell Crs 3	Drop # 1	0.743
008	Shell Crs 4	Drop # 1	0.551
009	Shell Crs 5	Drop # 1	0.373
010	Shell Crs 6	Drop # 1	0.318
011	Roof	X Leg 1A	0.180
012	Roof	X Leg 1B	0.176
013	Roof	X Leg 2A	0.176

001 Shell Crs 1 Q1 1.109

+ Save Duplicate Delete Print Back Delete Multiple

tact (inch)

New/Save/Duplicate/Delete/Print/Back

Figure AST-9. Component CML Data Entry Form

To access the Report Component CML Data Form from the home page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the pull down menu, Click on the [Report Appendix] then select the [Component TML Record] button (page icon with star in middle) under Appendix A.

Begin entering data in cells in the "Component TML Record" data section as called for.

The CML will auto populate.

"Component" entries should reflect single description per component (i.e. all data from shell course one should be have "Shell Crs 1" entered in this field).

"Location" entries should describe a location were a set of thickness measurement (tml's) were taken on that component (i.e., Chime Q1-Q2 where the "Chime" is in reference to the bottom 6" of the first shell course just above the "chime" (the floor extension past the shell) and Q1 indicates the first quadrant of the circumference as laid out and identified on the CAD drawings).

+ Save Duplicate Delete Print Back Delete Multiple

tact (inch)

New/Save/Duplicate/Delete/Print/Back

Entries into the CML records may be entered by adding one at a time or once the first line is entered the user may duplicate that one equal to the amount of CML points (not including Nozzle CML Points) or number of like components and then editing CML numbers and data as needed by selecting the checkbox next to the CML of interest and clicking the duplicate icon.

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.


Click on the [CML Data] button to enter thickness readings in accordance with the unit designation chosen on the report base page. Each CML can receive up to 6 tml points (but may be less). The last entry is for the value that may be used to calculate the corrosion rates and remaining life. That entry is normally the lowest reading of that CML (tml set). Note that the CML descriptions appear at the top of the form to identify what CML is being edited. Close this data form when completed to return to the Component CML Sub form.

At this point the user must make a determination as to the actual thickness value to be entered in the “Actual Plate Thickness (t act)” section at the top for each component. Normally, regardless of the location on the component, the lowest of the tact values for that component is the value to be entered into the associated data cell in the “Actual Plate Thickness (t act)” section. If there is a corroded section that has been evaluated for hoop stress, the resulting average thickness may be entered in place of the lowest reading.

Much of the numerical data entered in this sub form will be used in the calculations sub forms, therefore enter all numerical data as specified. The “tml” values must be entered specifically using at least the ones place (enter 0 if below 1”) and to the thousandths place for a professional appearance in the final report (i.e. [0.500]).

The [Edit Component Data] or [Edit CML] buttons are available to edit values or text in the report if a value was entered erroneously and needs to be deleted from the cell or an alternate value is required with less placements.

The CML's have an [Import] & [export] component for importing data logged data utilizing MS Excel or to export form one report into another report. Once the CML components are developed the user can click on the [Export CML's] button and export the data set to an excel spreadsheet where it can be populated with data from a data log file (copy and paste to the spread sheet) or for an import to a different report. The spread sheet can then be imported via the [Import CML's] button where you have to click the [choose file] button and attach the spread sheet and then click the [Import CML's] button to bring into the report. The CML will overwrite (replace) any CML with the an identical number. The report number column in the spreadsheet must be identical to the report number of the report it is being imported into. Also, the same steps can be taken to export a data set from one report to the other, simply export, change the report number to the desired report and import back into the program.

A record may be deleted by clicking the  icon at the top right hand corner and confirming.



To print, click the print icon in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**



Click the back arrow at the top right to return to the Appendix page for next step.

Report Nozzle Corrosion Monitoring location (CML) Record

API INSPECTORS TOOLBOX ENTERPRISE

Design Codes File Cabinet Engineering Data API-653 AST API-510 PV Insp API-570 Pipe Insp Contact Us

Report No: 15222.TC Report Date: 10/20/2015 Tank No: Tank C Build Date: 1974

Client Name: NRG Insp date: 10/20/2015 Age/Prev Insp (year): 41

Download Template X Export CML's Import CML's Choose File No file chosen

AST Nozzle/Pipe TML Record

Pipe Stds Edit CML US CML Data Delete Multiple

CML #	Age (year)	Comp ID	Size (inch)	Location	t Nominal (inch)	Service	tact (inch)
015	41	24" MW	24	A	0.500	Manway	0.525
016	41	3/4" Nozzle	0.75	B	0.000	Gauge	
017	41	3" Nozzle	3	C	0.300	Sample	0.287
018	41	2" Nozzle	2	D	0.000	Product	
019	41	2" Nozzle	2	E	0.000	Product	
020	41	2" Nozzle	2	F	0.000	Product	
021	41	2" Nozzle	2	G	0.000	Product	
022	41	2" Nozzle	2	H	0.000	Product	
023	41	2" Nozzle	2	I	0.000	Product	
024	41	2" Nozzle	2	J	0.000	Product	
025	41	2" Nozzle	2	K	0.000	Product	
026	41	2" Nozzle	2	L	0.000	Product	

Figure AST-10. Nozzle CML Data Entry Form

To access the Report Nozzle CML Data Form from the home page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Report Appendix] then select [Nozzle TML Record] button under Appendix A.

Begin entering data in cells in the “AST Nozzle/Pipe TML Record” data section as called for.

The CML will auto populate and continue the CML number from the last Component CML entry.

The Age is a number not a date (i.e., 9, 20, 34, et) which will be used to calculate corrosion rates, and defaults to the tank age entered in the report base page but can be entered to be replaced.

“Comp ID” entries should reflect the nozzle description such as 24" MW or 4" Nozzle, or 1" Cplng.

“Size” enter all numerical data (NPS) as specified without signifiers (i.e., 2, 6, 8 not 2" or 6in etc.).

“Location” entries should designate an ID that identifies it on the drawing (i.e., A, B, C or MW1, N1, N2, N3 et). Will default to “A” to give a starting ID but can be entered in to replace.

“t Nominal” entries are normally derived from the original nozzle specs. This value is used for the tprev value for the remaining life calculations. The users may opt to enter a previous thickness measurement instead of the nominal thickness for more accurate corrosion rates.

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

The [Pipe Stds] button is available to determine the nominal thickness of the Nozzle.



New/Save/Duplicate/Delete/Print/Back

Entries into the CML records may be entered by adding one at a time or after the first one is entered the user may duplicate that one equal to the amount of CML points (not including Component CML Points) or number of like components and then editing CML numbers and data as needed by selecting the checkbox next to the CML of interest and clicking the duplicate icon.


Click on the [CML Data] button to enter thickness readings in accordance with the unit designation chosen on the base page. Each CML can receive up to 4 tml points (but may be less). The last entry is for the value to be used to calculate the corrosion rates and remaining life. That entry is normally the lowest reading of that CML (tml set). Note that the CML descriptions appear at the top of the form to identify what CML is being edited. Close this data form when completed to return to the Nozzle CML Sub form.

The CML's have an [Import] & [export] component for importing data logged data utilizing MS Excel. Once the CML components are developed the user can click on the [Export CML's] button and export the data set to an excel spreadsheet where it can be populated with data from a data log file (copy and paste to the spread sheet). The spread sheet can then be imported via the [Import CML's] button where you have to click the [choose file] button and attach the spread sheet and then click the [Import CML's] button to bring into the report. The CML will overwrite (replace) any CML with the an identical number. The report number column in the spreadsheet must be identical to the report number of the report it is being imported into. Also, the same steps can be taken to export a data set from one report to the other, simply export, change the report number to the desired report and import back into the program.

Much of the numerical data entered in this sub form will be used in other calculation sub forms, therefore enter all numerical data as specified. The “tml” values must be entered specifically using at least the ones place (enter 0 if below 1”) and to the thousandths place for a professional appearance in the final report (i.e. [0.500]).

The [Edit CML] button is available to edit the CML data if a value was entered erroneously and needs to be deleted from the cell or an alternate value is required with less placements.

Enter data cells with [*] buttons next to them allows for additions to be entered for use in pull down menus that are not available. (i.e. Component ID, Service). This allows the user to build the data base with data for future usage.

A record may be deleted by clicking the  icon at the top right hand corner and confirming.



To print, click the print icon in upper right hand corner. NOTE: Click on save icon in upper right hand corner before selecting print preview.



Click the back arrow to return to the Appendix page for next step.

Report Shell Calculations

Tank Shell Minimum Thickness Calculations

Report No. 15222.TC D (ft) 162.50 G 0.99 Date 10/20/2015
 Client NRG Fill height (ft) 48.0 E 0.85 Tank No. Tank C
 Initials Jeff Walling Temp. (degF) 200 Age 41

$t_{min} = \frac{2.6D(H-1)G}{SE}$

Course	Material	Crs H (ft)	H (ft)	S (psi)	ALT S	tprev (inch)	tact (inch)	tmin (inch)	alt tmin	Ca (inch)	Cr (inch/Yr)	RL (year)	FH _c (ft)
Course 1	Unknown	8	48.00	23600		1.000	1.067	0.980		0.087	0.00000	>40	52.17
Course 2	Unknown	8	40.0	23600		0.937	0.913	0.813		0.100	0.00059	170	52.79
Course 3	Unknown	8	32.0	26000		0.750	0.743	0.587		0.156	0.00017	915	56.26
Course 4	Unknown	8	24.0	26000		0.500	0.551	0.435		0.116	0.00000	>40	54.11
Course 5	Unknown	8	16.0	26000		0.375	0.373	0.284		0.089	0.00005	1827	52.71
Course 6	Unknown	8	8.0	26000		0.313	0.318	0.132		0.186	0.00000	>40	57.80
Course 7	--Select--												
Course 8	--Select--												

Select Year 1980-Present Table 4-2, Joint Efficiencies

Standard	Year	Edition	Joint Type	E	Appl/Limits
API-650	1980-Present	7th&Later	Butt	1.00	Basic Std

NOTES: (Table 4-2)
 a) Full double lap welded. b) Full fillet welded with at least 25% intermittent full fillet opposite side; k = % of intermittent weld expressed in decimal form. c) Single butt welded joints with a back-up bar were permitted from the years 1936 to 1940 and 1948 to 1954. d) Single lap welded only.

Figure AST-12. Shell Calculations

To access the Report Shell Calculations from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [AST Shell RL Calculations] button under Appendix B.

Begin performing Shell Calculations by entering remaining data in cells as called for in accordance with the unit designation chosen on the Report Base Page.

Variable definitions are given in table at bottom right and can be accessed via the pull down menu. Click in the definition box and use vertical scroll to read all text.

The fill height value is normally the tank height which may be decreased if the remaining life or tmin value is not acceptable for any of the courses. If that is the case, the fill height and governing course should be noted in the note section provided at the bottom.

The joint efficiency can be determined from Table 4-2 in lower left hand corner.

The material selection accesses a material list from API-650 but other material may be entered. If a material not on the default list is used then the material stress will have to be entered via the yellow cell under [Alt S] next to the default stress (S) cell. Clicking on the [Alt S] button will accesses the programs material table which extracts it stress values from the material list module (based on ASME Section 2 Part D). User must select the material from the pull down which, once chosen, the form will

automatically calculate the stress values to be used for the applicable courses in accordance with API-653. The user will then have to enter the resulting values into the associated cells. New material not on the list may be entered into the Materials form via the Engineering Data module from the front page to be available for use in the shell calculations forms and sub forms.


Where there are circumstances that require the use of an alternate tmin, (i.e. using the nominal minus the corrosion allowance to determine tmin) the user may enter that value in the yellow cell under Alt tmin. This value will override the calculated tmin.


“Crs H” is the measured height of the course of interest in feet, do not use tick (') marks for feet, just enter the number [8]) and is used to calculate H (Fill height minus all Crs H values below course of interest)

Age variable is from entry made on the main page and is a single number (i.e. 4, 10, 13, 20 etc.), not a date.

Notes may be entered if necessary in the lower right hand corner. Notes will appear on the bottom of the second page of the calculation report.

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

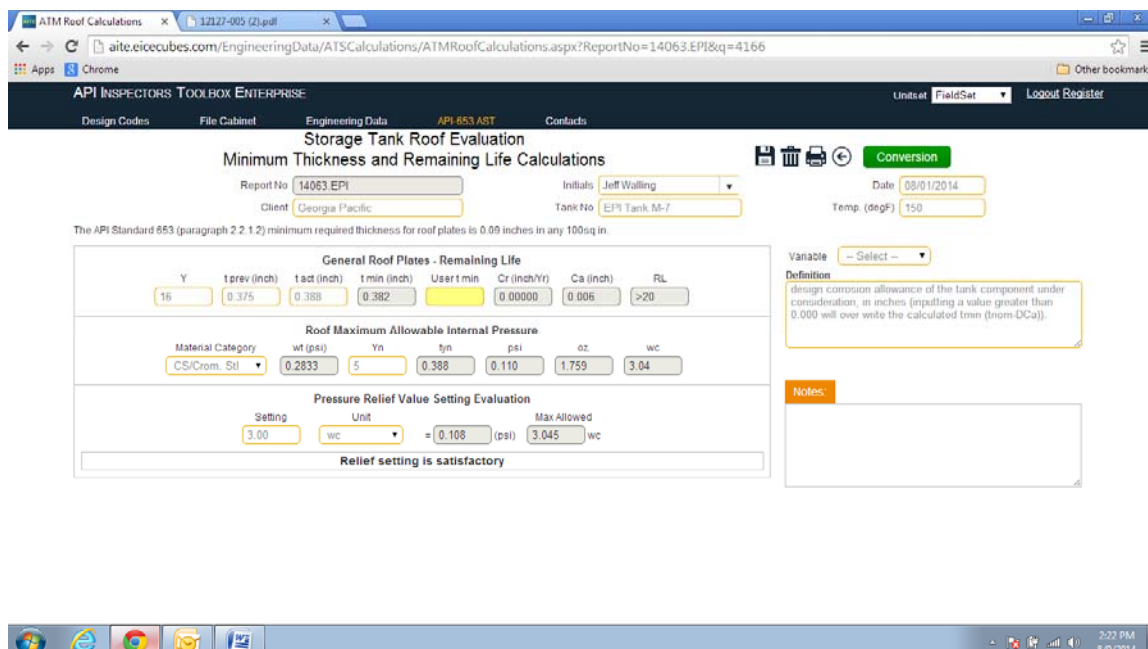
A record may be deleted by clicking the  icon at the top right hand corner and confirming.

 To print, click the print icon in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**



Click the back arrow to return to the Appendix page for next step.

Report Roof Calculations



API INSPECTORS TOOLBOX ENTERPRISE

Design Codes File Cabinet Engineering Data API-653 AST Contacts

Unit: at FieldSet Logout Register

Storage Tank Roof Evaluation

Minimum Thickness and Remaining Life Calculations

Report No: 14063 EPI Initials: Jeff Walling

Client: Georgia Pacific Tank No: EPI Tank M-7

The API Standard 653 (paragraph 2.2.1.2) minimum required thickness for roof plates is 0.09 inches in any 100sq in

Conversion Date: 08/01/2014 Temp (degF): 150

Y	t prev (inch)	t act (inch)	t min (inch)	User t min	Cr (inch/Yr)	Ca (inch)	RL
16	0.375	0.388	0.382		0.00000	0.006	>20

Roof Maximum Allowable Internal Pressure

Material Category: CS/Crom. Std wt (psi): 0.2933 Yn: 5 tyn: 0.388 psi: 0.110 oz: 1.759 wc: 3.04

Pressure Relief Value Setting Evaluation

Setting: 3.00 Unit: wc = 0.108 (psi) Max Allowed: 3.045 wc

Relief setting is satisfactory

Variable: --Select--

Definition: design corrosion allowance of the tank component under consideration, in inches (inputting a value greater than 0.000 will over write the calculated tmin (from DCA)).

Notes:

Figure AST-13. Roof Calculations

To access the Report Roof Calculations from the home page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [AST Roof RL Calculations] button under Appendix B.

Begin performing Roof Calculations by entering remaining data in cells as called for in accordance with the unit designation chosen on the base page.


Variable definitions are given in table to the right and can be accessed via the pull down menu.

A [conversions] button is available to the user at the top right of the page.

Results that are not within guidelines for an AST type tank will flag “Yellow” and a text message will appear to suggest directives.

Notes may be entered if necessary at the bottom of the data page. Notes will appear on the bottom of the page of the calculation report.

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

A record may be deleted by clicking the  icon at the top right hand corner and confirming.

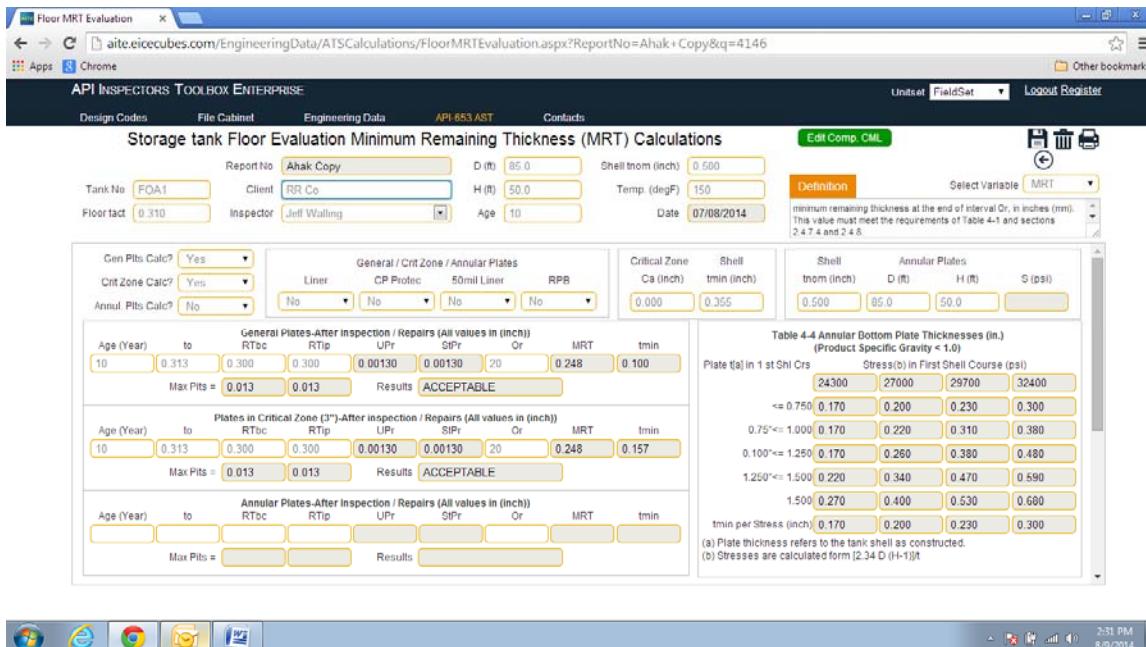


To print, click the print icon in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**



Click the back arrow to return to the Appendix page for next step.

Report Floor MRT Calculations



The screenshot displays the 'API INSPECTORS TOOLBOX ENTERPRISE' interface for 'Storage tank Floor Evaluation Minimum Remaining Thickness (MRT) Calculations'. The form includes the following sections:

- Header:** Design Codes, File Cabinet, Engineering Data, API-653 AST, Contacts. Includes 'Edit Comp. CML' button and icons for save, delete, and print.
- Form Fields:**
 - Report No: Ahak Copy
 - Tank No: FOA1
 - Client: RR Co
 - Inspector: Jeff Walling
 - Age: 10
 - Date: 07/08/2014
 - Shell tnom (inch): 0.500
 - H (ft): 50.0
 - Temp (degF): 150
- General / Crit Zone / Annular Plates:**
 - Gen Pits Calc?: Yes
 - Crit Zone Calc?: Yes
 - Annul. Pits Calc?: No
 - Liner: No
 - CP Protec: No
 - 50mil Liner: No
 - RPB: No
 - Critical Zone Ca (inch): 0.000
 - Shell tmin (inch): 0.365
- General Plates-After Inspection / Repairs (All values in (inch)):**

Age (Year)	to	RTbc	RTip	UPr	SPr	Or	MRT	tmin
10	0.313	0.300	0.300	0.00130	0.00130	20	0.248	0.100
Max Pits =		0.013		0.013		Results: ACCEPTABLE		
- Plates in Critical Zone (3")-After inspection / Repairs (All values in (inch)):**

Age (Year)	to	RTbc	RTip	UPr	SPr	Or	MRT	tmin
10	0.313	0.300	0.300	0.00130	0.00130	20	0.248	0.157
Max Pits =		0.013		0.013		Results: ACCEPTABLE		
- Annular Plates-After Inspection / Repairs (All values in (inch)):**

Age (Year)	to	RTbc	RTip	UPr	SPr	Or	MRT	tmin
Max Pits =						Results:		
- Table 4-4 Annular Bottom Plate Thicknesses (in.) (Product Specific Gravity < 1.0)**

Plate (a) in 1st Shl Crs	Stress (b) in First Shell Course (psi)	24300	27000	29700	32400
<= 0.750	0.170	0.200	0.230	0.300	
0.75" <= 1.000	0.170	0.220	0.310	0.380	
1.000" <= 1.250	0.170	0.260	0.380	0.480	
1.250" <= 1.500	0.220	0.340	0.470	0.590	
1.500"	0.270	0.400	0.530	0.680	
tmin per Stress (inch)	0.170	0.200	0.230	0.300	

Figure AST-14. Floor MRT Calculations

To access the Report MRT Calculations from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [AST Floor MRT Calculations] button under Appendix B.

Begin performing Floor MRT Calculations by entering remaining data in cells as called for in accordance with the unit designation chosen on the base page.

Variable definitions are given in table in upper right corner and can be accessed via the pull down menu.

The [Edit Comp. CML] button is available to edit the CML data if a value was entered erroneously and needs to be deleted from the cell or an alternate value is required.


Threshold setting for the MFE floor exam should be considered prior to getting started with the exam to determine a basis to start with. The client should be consulted to obtain information on the tank such as what previous inspections of the tank may have yielded. The variables may need to be adjusted as the inspection progresses based on predominant findings in situ such as those listed in 1-6 below.


Determining RTbc and RTip thresholds depends on what the existing conditions for top and bottom side yields. The following are some guidelines to consider:

1. Overall, if the bottom is clean with virtually no “relevant” indications, consider, as a minimum, starting with 40mil material loss (i.e. 0.250” plate would = 0.210” threshold and therefore, RTbc would = 0.21”). Anything less than 40mil would be difficult for MFE technology to pick up in a favorable percentile and therefore is not practical to set the threshold any lower. Remember that just because no relevant indications were recorded doesn’t mean there weren’t any indications at all, just none that were above the threshold or “relevant” or in the red.
2. If the bottom side has just a few areas with significant indications and the top side has a numerous amount of indications, determine max allowable topside pit depth that would be cost effective for repairs that would match well with the minimum for the bottom after the few areas are repaired (aim for 40mil material loss as in #1 for RTbc)
3. If the bottom side has numerous areas with significant indications and the top side has very few areas of indications, determine max allowable bottom side pit depth that would be cost effective for repairs that would match well with the minimum for the top after the few areas are repaired (aim for 50 to 70mil material loss for top side pitting)
4. If the both sides have numerous areas with significant indications, determine max allowable top and bottom side pitting that would be cost effective for repairs.
5. If it is realized early on in the exam process that the damage is so severe that replacing the floor plates would be best and most cost effective option, address these issues with the client as soon as possible to deter any unnecessary inspections.
6. Always consider how adding coatings or CP systems will affect the results as well, if it is a viable alternative for the client.
7. For all scenarios, consider adjusting the Or (next inspection period) to limit scope of repairs, if it is a viable alternative for the client.

Notes may be entered if necessary at the bottom right of the data page. Notes will appear on the bottom of the calculation report.

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

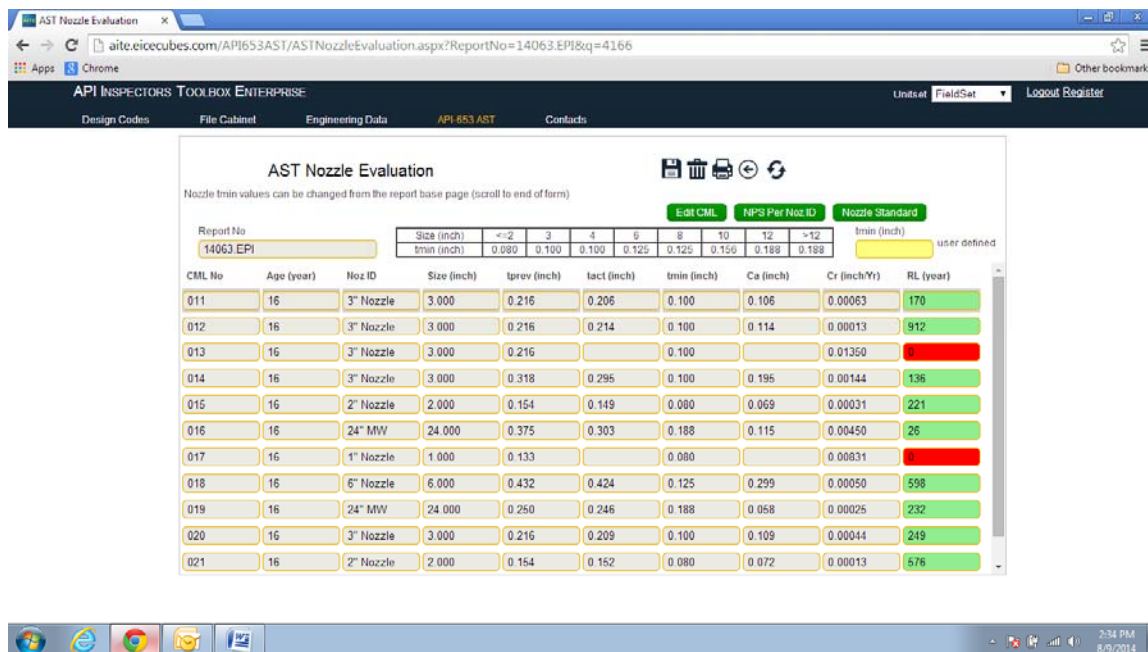
A record may be deleted by clicking the  icon at the top right hand corner and confirming.

 To print, click the print icon in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**



Click the back arrow to return to the Appendix page for next step.

Report Nozzle Calculations



The screenshot shows the 'AST Nozzle Evaluation' web application. At the top, there's a navigation bar with 'API INSPECTORS TOOLBOX ENTERPRISE' and links for 'Design Codes', 'File Cabinet', 'Engineering Data', 'API 653 AST', and 'Contacts'. The main content area is titled 'AST Nozzle Evaluation' and includes a sub-header 'Nozzle tmin values can be changed from the report base page (scroll to end of form)'. Below this, there's a form for 'Report No' (14063 EPI) and a table for 'Size (inch)' and 'tmin (inch)' values. The main table lists 12 records with columns for CML No, Age (year), Noz ID, Size (inch), tprev (inch), tact (inch), tmin (inch), Ca (inch), Cr (inch/Yr), and RL (year). The records are numbered 011 to 021, with various nozzle sizes and ages. The RL values are highlighted in green or red, indicating different levels of risk or compliance.

CML No	Age (year)	Noz ID	Size (inch)	tprev (inch)	tact (inch)	tmin (inch)	Ca (inch)	Cr (inch/Yr)	RL (year)
011	16	3" Nozzle	3.000	0.216	0.206	0.100	0.106	0.00063	170
012	16	3" Nozzle	3.000	0.216	0.214	0.100	0.114	0.00013	912
013	16	3" Nozzle	3.000	0.216		0.100		0.01350	6
014	16	3" Nozzle	3.000	0.318	0.295	0.100	0.195	0.00144	136
015	16	2" Nozzle	2.000	0.154	0.149	0.080	0.069	0.00031	221
016	16	24" MW	24.000	0.375	0.303	0.188	0.115	0.00450	26
017	16	1" Nozzle	1.000	0.133		0.080		0.00831	6
018	16	6" Nozzle	6.000	0.432	0.424	0.125	0.299	0.00050	598
019	16	24" MW	24.000	0.250	0.246	0.188	0.058	0.00025	232
020	16	3" Nozzle	3.000	0.216	0.209	0.100	0.109	0.00044	249
021	16	2" Nozzle	2.000	0.154	0.152	0.080	0.072	0.00013	576

Figure AST-11. AST Nozzle Calculations

To access the Report Nozzle Calculations from the home page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [Nozzle RL Calculations] button under Appendix B.

Nozzle evaluations are presented in this sub form based on previous data entry and practical minimum thicknesses as recommended in API-570 for pipe tmins. The tmin values used in this toolbox program were derived from the Practical tmin module of this program (Reference page 75 for more details).

NOTE: API-570 7.3 RETIREMENT THICKNESS DETERMINATION Recommends establishing a greater thickness than the calculated thickness to allow for undiscovered metal loss due to general and localized corrosion, unanticipated loadings, and resistance to normal loss.


The default tmin values can be overridden using the "User Defined" (yellow) data cell at top of page. Click on the CML and enter the new tmin value. Repeat for all CML's tmins that require editing.


The [Edit CML] button is available to edit the CML data if a value was entered erroneously and needs to be deleted from the cell or an alternate value is required with less placements.

A [NPS per Noz ID] button is available for a quick reference to the pipe size for the size nozzle that is selected. Click on the CML of interest then click the [NPS per Noz ID] button in the top left corner to view OD and pipe schedules/wall thickness for that Nozzle size.

A [Nozzle Standards] button is available for a quick reference to all pipe/nozzle data. Click on the [Nozzle Standards] button then select the subject matter of interest. (Reference page 67 for more details)

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

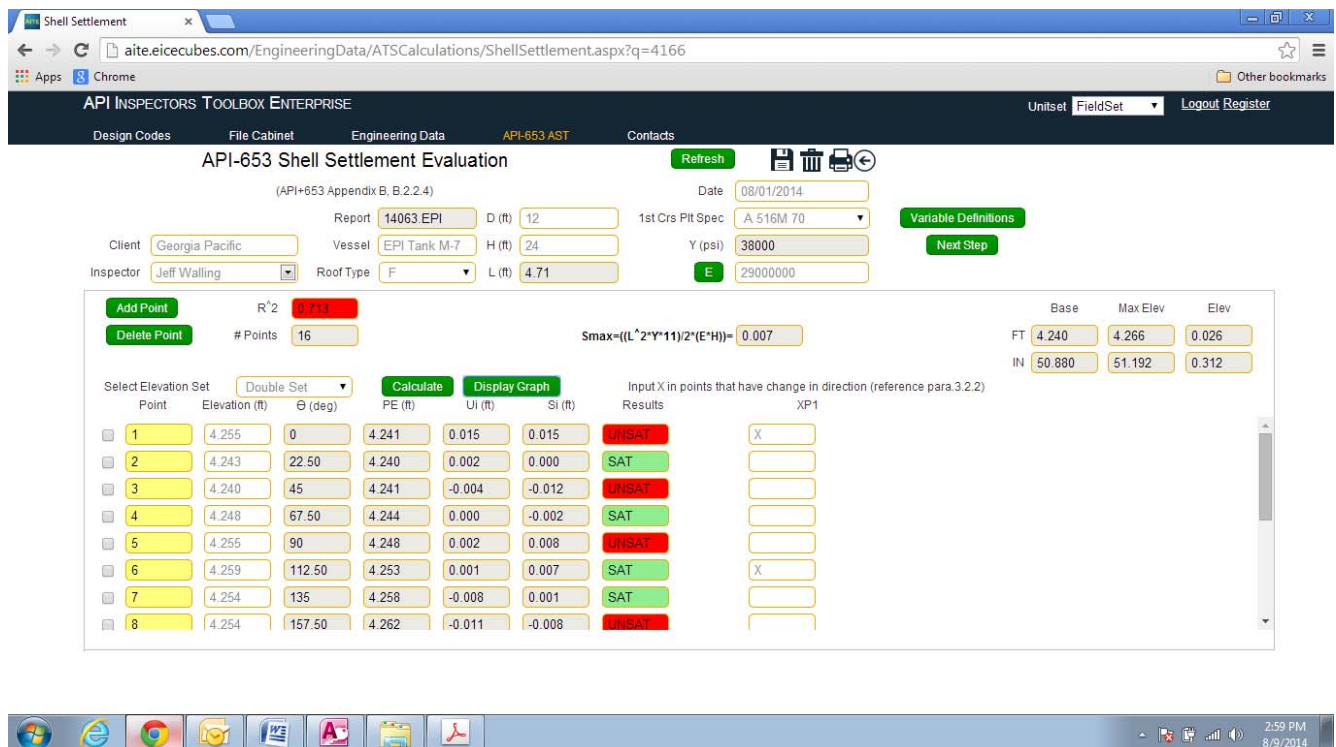
A record may be deleted by clicking the  icon at the top right hand corner and confirming.

 To print, click the print icon in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**



Click the back arrow to return to the Appendix page for next step.

Report Shell Settlement Survey Calculations



API-653 Shell Settlement Evaluation

(API-653 Appendix B, B.2.2.4)

Report: 14063 EPI D (ft): 12 1st Crs Pit Spec: A 516M 70 Date: 08/01/2014

Client: Georgia Pacific Vessel: EPI Tank M-7 H (ft): 24 Y (psi): 38000

Inspector: Jeff Walling Roof Type: F L (ft): 4.71 E: 29000000

Variable Definitions: Next Step

Base Max Elev Elev

FT 4.240 4.266 0.026

IN 50.880 51.192 0.312

Sm_{max} = ((L² * Y¹¹) / 2 * (E * H)) = 0.007

Select Elevation Set: Double Set Calculate Display Graph

Input X in points that have change in direction (reference para.3.2.2)

Point	Elevation (ft)	θ (deg)	PE (ft)	UI (ft)	SI (ft)	Results	XP1
1	4.255	0	4.241	0.015	0.015	UNSAT	X
2	4.243	22.50	4.240	0.002	0.000	SAT	
3	4.240	45	4.241	-0.004	-0.012	UNSAT	
4	4.248	67.50	4.244	0.000	-0.002	SAT	
5	4.255	90	4.248	0.002	0.008	UNSAT	
6	4.259	112.50	4.253	0.001	0.007	SAT	X
7	4.254	135	4.258	-0.008	0.001	SAT	
8	4.254	157.50	4.262	-0.011	-0.008	UNSAT	

Figure AST-11. Shell Settlement Survey Evaluation

To access the Report Shell Settlement Calculations from the home page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [Shell Settlement Calculations] button under Appendix B.

Shell Settlement Surveys should be performed utilizing the API Inspector Toolbox Settlement Survey Inspection Form accessed via the API-653 Module [Inspection Forms] button.

When taking field measurements, for the best fit, find the center of the highest point about the tank and make that point #1. If you do not do this the predicted elevation will not match the point of actual measurement and the evaluation will experience a greater margin of error.

Always use even number of points (i.e. Tank Dia. =90ft, $90/10 = 9$ points -> use 10 points, therefore $90 \times \pi() = 282.7/10 = 28.27$ ft between points about the circ of the tank (take 20 points at 14.14 ft in case needed for best fit/refinement purposes).

The preliminary form calculates survey points to even numbers to better fit a cosine curve.

The max distance between survey points is to be limited to 31.42 ft.



New/Save/Duplicate/Delete/Print/Back

Using the field data form, enter the values for each white cell into the form.

Variable definitions are given above the data input cells for user convenience.

For roof type, O = Open Top Tank, F = Fix roof Tank.

The "L" value will not be displayed until all points are entered.

The program defaults to a MOE of 29,000,000. Click on the [E] button to the above the designated cell to access MOE values for diverse temperatures and material.

Enter associated elevation values in "Feet" in the cell under the "Elevation" column. If measurements were taken in inches or feet and inches they will need to be converted to feet (no tick marks [' or "]).

Click the [Add Point] button as many times needed to equal the remaining number of points (i.e. for 10 points click 9 times).

Enter the elevation values associated with each point sequentially for each entry line.

Select the elevation set as **Single Set** or **Double Set** from the pull down above the entry cells. (select double where you have taken double the minimum required points).

Click on the [Calculate] button at the top of the data point cells. This button will calculate the settlement in accordance with the requirements of Appendix B. Click the [Display Graph] button to exhibit a chart with the points plotted relative to a predicted elevation (along a tilted plane) represented by a cosine curve.

The best fit curve should result in an R^2 ratio (predicted elev. to measure

API-653 Shell Settlement Survey

Legend: Elevation (Blue), PE (Red)

Point	Elevation (ft)	PE
1	4.255	0
2	4.243	22.50
3	4.240	45
4	4.248	67.50
5	4.255	90
6	4.259	112.50
7	4.254	135
8	4.254	157.50

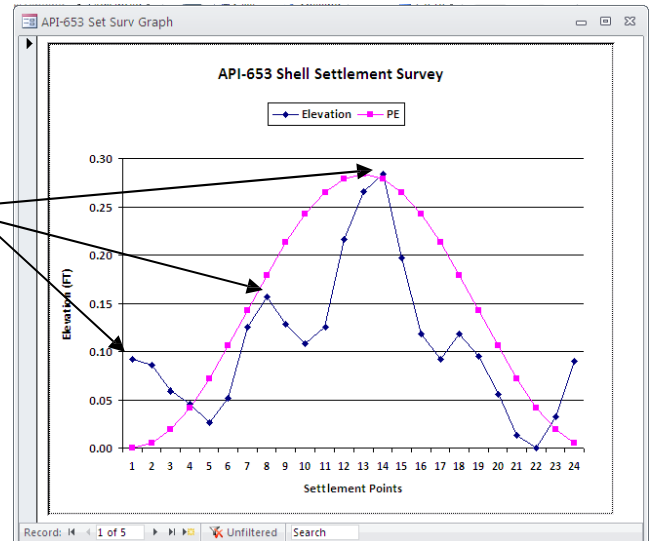
Settlement Points: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Evaluation described in B.2.2.5 (Reference Appendix B, Figure B.4)

- (1) The actual settlement is plotted using points around the tank circumference as the abscissa.
- (2) An initial settlement arc length and maximum settlement is determined from the points on the plotted data that indicate a (significant) change in (upper peak) direction of settlement slopes.
- (3) Additional settlement points may be needed halfway between the points indicating a change in direction of the settlement slope to further refine the settlement arc length and location and magnitude of maximum settlement (where you would select double set).

Determine points that indicate a change in direction (upper peaks only) of settlement slopes from the cosine curve graft (click the [Display Graft] button to view graft) Insert an “X” in the cells across from the points that indicate a change in direction of settlement slopes in the column under the XP1column then click the [Next Step] button when all points have been identified and an X placed in the appropriate cells.

Points with significant change in direction
(upper peaks only)



API-653 Set Surv Main - Microsoft Access

POINT	elevation	θ	PE	UI	SI	RESULTS	Calc RESULTS	XP1
1	0.092	0	0.000	0.092	0.010	SAT	OK	X
2	0.085	15	0.005	0.080	0.014	SAT	OK	
3	0.059	30	0.019	0.040	-0.002	SAT	OK	
4	0.046	45	0.042	0.004	0.007	SAT	OK	
5	0.026	60	0.071	-0.045	-0.021	SAT	OK	
6	0.052	75	0.106	-0.054	-0.022	SAT	OK	
7	0.125	90	0.142	-0.017	0.020	SAT	OK	
8	0.157	105	0.179	-0.022	0.029	SAT	OK	X
9	0.128	120	0.214	-0.086	-0.007	SAT	OK	
10	0.108	135	0.243	-0.135	-0.022	SAT	OK	
11	0.125	150	0.266	-0.141	-0.042	SAT	OK	
12	0.217	165	0.280	-0.063	0.017	SAT	OK	
13	0.266	180	0.285	-0.019	0.010	SAT	OK	
14	0.285	195	0.280	0.005	0.049	SAT	OK	X
15	0.197	210	0.266	-0.069	-0.009	SAT	OK	
16	0.118	225	0.243	-0.125	-0.030	SAT	OK	
17	0.092	240	0.214	-0.122	-0.028	SAT	OK	
18	0.118	255	0.179	-0.061	0.023	SAT	Recalculate	X
19	0.095	270	0.142	-0.047	0.008	SAT	OK	
20	0.056	285	0.106	-0.050	0.003	SAT	Recalculate	

Figure 2. X in the cells across from points that indicate a change in direction of settlement slopes under the XP1 Column

The final result will display the graft.

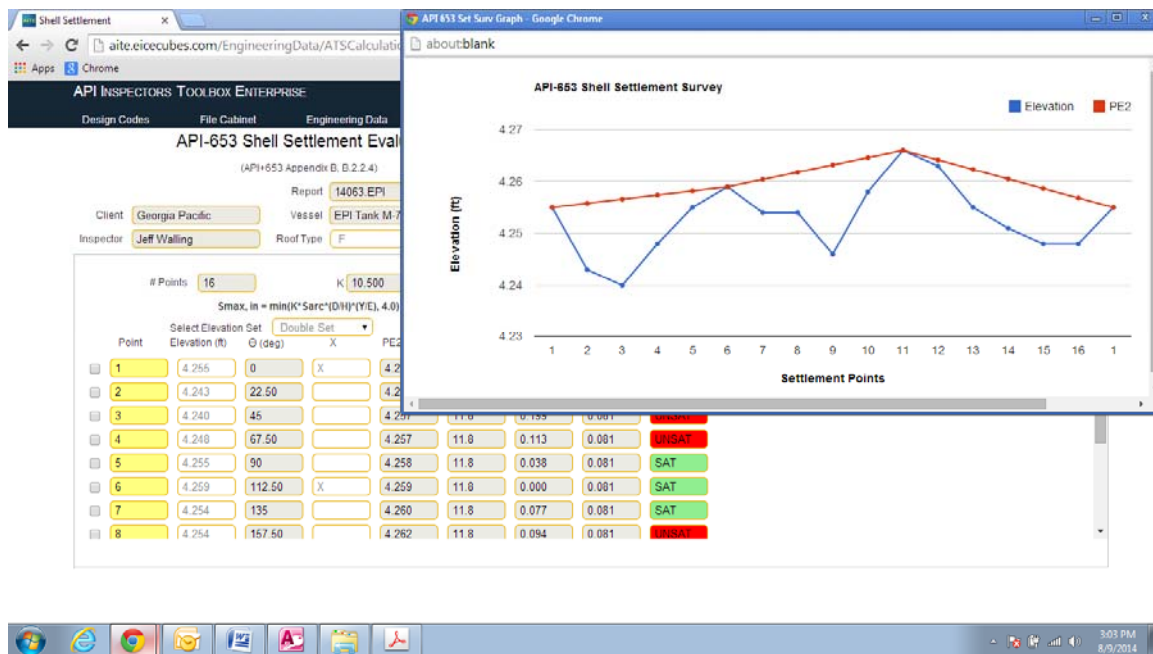



Figure 3. Final result will display a graft showing the lines between high points selected for the significant change in direction.

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

A record may be deleted by clicking the  icon at the top right hand corner and confirming.



To print, click the print icon in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**



Click the back arrow to return to the Appendix page for next step.

Report AST Checklists


Figure AST-17. Report AST Checklists

To access the Report Checklist Calculations from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [API-653 Checklist] button under Appendix D.

This section is divided up in three separate windows for building the report checklist. To enter a check the [Select Checklist] button at the top left of the Checklist to be included in the report.

Scroll through the list and enter an X in the center of the line for the relevant items that were checked during the inspection. (place the cursor in center of check line, back space and type X [Caps])

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

A record may be deleted by clicking the  icon at the top right hand corner and confirming.

 To print, click the print icon in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**



Click the back arrow to return to the Appendix page for next step.

Report Shell AutoCAD Inspection Drawings

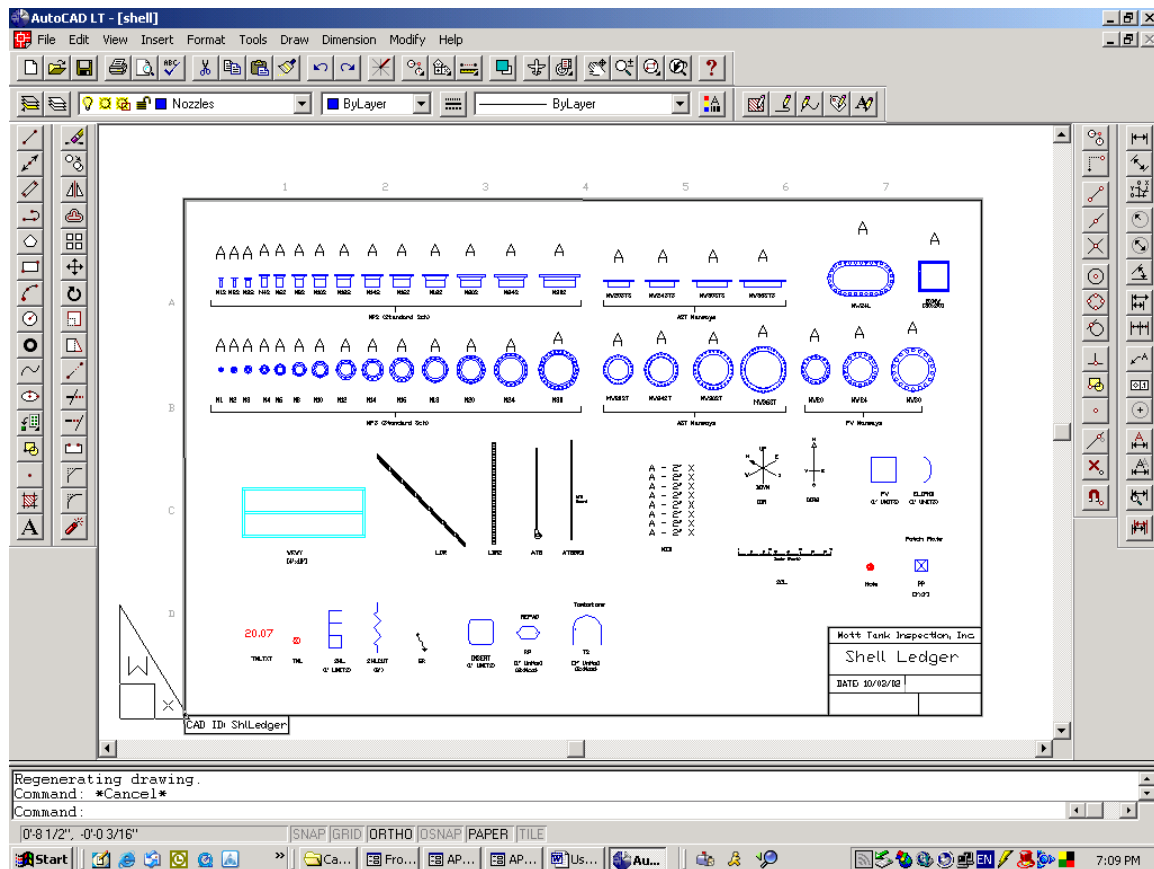


Figure AST-19. AutoCAD Shell Ledger Drawing

User has the choice to upload pdf drawings or open a template AutoCAD file.

User must have the AutoCAD program (1997 or later version) or AcceliCAD to use this function.

User must obtain the field data sheet and drawings relative to this project. (Reference pg 96 for more details on field forms)

To access the Report AutoCAD Inspection Drawings from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the icon (page with the star) under Appendix C. Save the file to the a project folder and print out the Ledger drawing for reference when building the shell drawing.

Once the cad drawing is open and saved to a project folder, complete the following steps referencing the field data sheets and drawings:

- 1) Edit all title blocks and drawing text in papers space (PS enter on command line) related to specific report info (Logo, Company, Date, and other text as needed to conform to user company drawing protocols).

- 2) In model space (MS enter on command line), On command line:
- Command:** insert → SHL
 - Insertion Point:** “0,0”
 - X scale factor:** enter tank circumference in feet but without any unit signifiers (i.e. 35 ft diameter is 35x PI = 110 ft to be entered as “110”
 - Y scale factor:** enter tank shell course height in feet but without any unit signifiers (i.e. 8 ft width = 8 ft to be entered as “8”
 - Rotation Angle:** enter default.
 - Command:** Zoom to limits (if this does not bring the shell into a full view then zoom to a scale to gain a full view)
 - Explode SHL Block

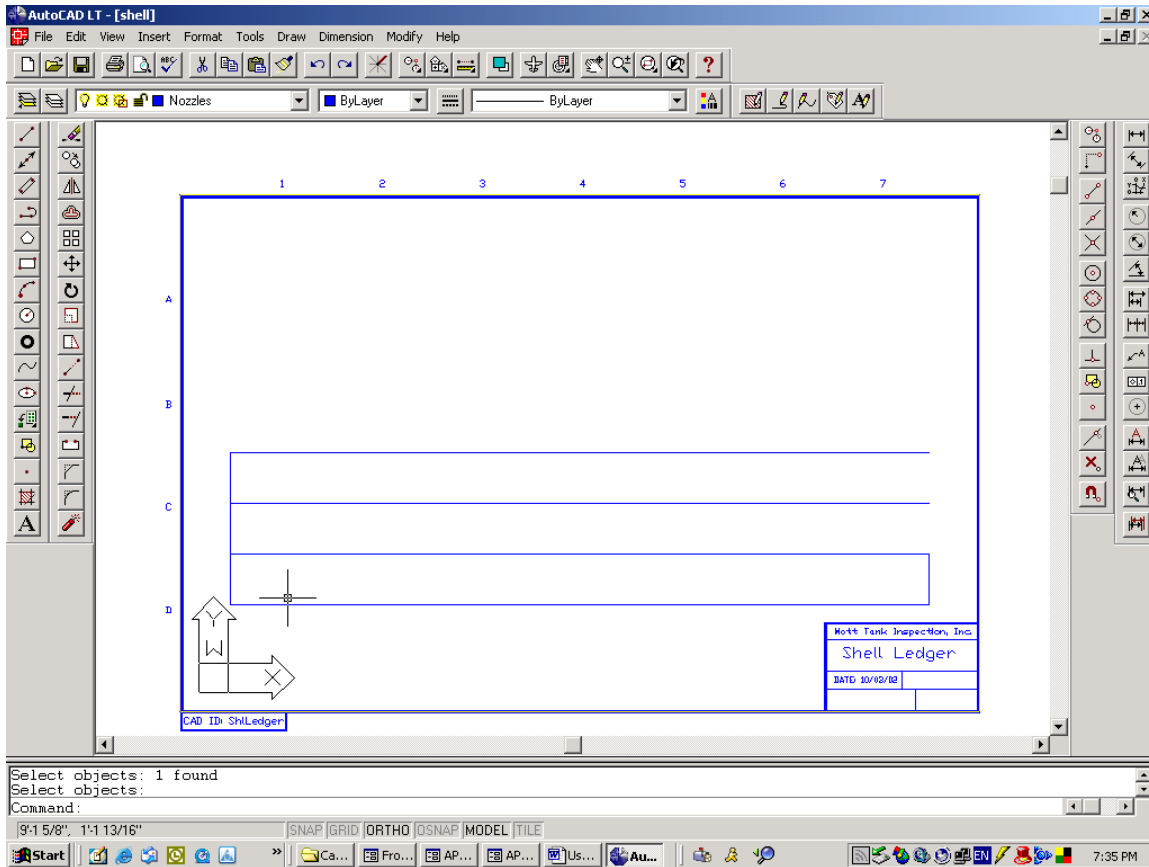


Figure AST-20. Basic Shell Block Insert

- Copy and paste from the now existing three tier shell drawing to gain the required number of shell course.
- Delete the vert lines (weld seams) above weld seam #1 at point 0,0 in the upper courses that do not align with the first

course vert weld seam at point 0,0 in accordance with field data records and draw in those that do align.

e. **Command:** Insert → SHLCUT

f. **Insertion Point:** snap to top of vertical weld seam #1

g. **X scale factor:** Enter default

h. **Y scale factor:** Enter default

i. **Rotation Angle:** Enter default.

j. Copy and paste the SHLCUT to all the remaining vert placements above the weld seam #1. Copy and paste those on the right when done to the weld seam at the left (both represent weld seam #1).

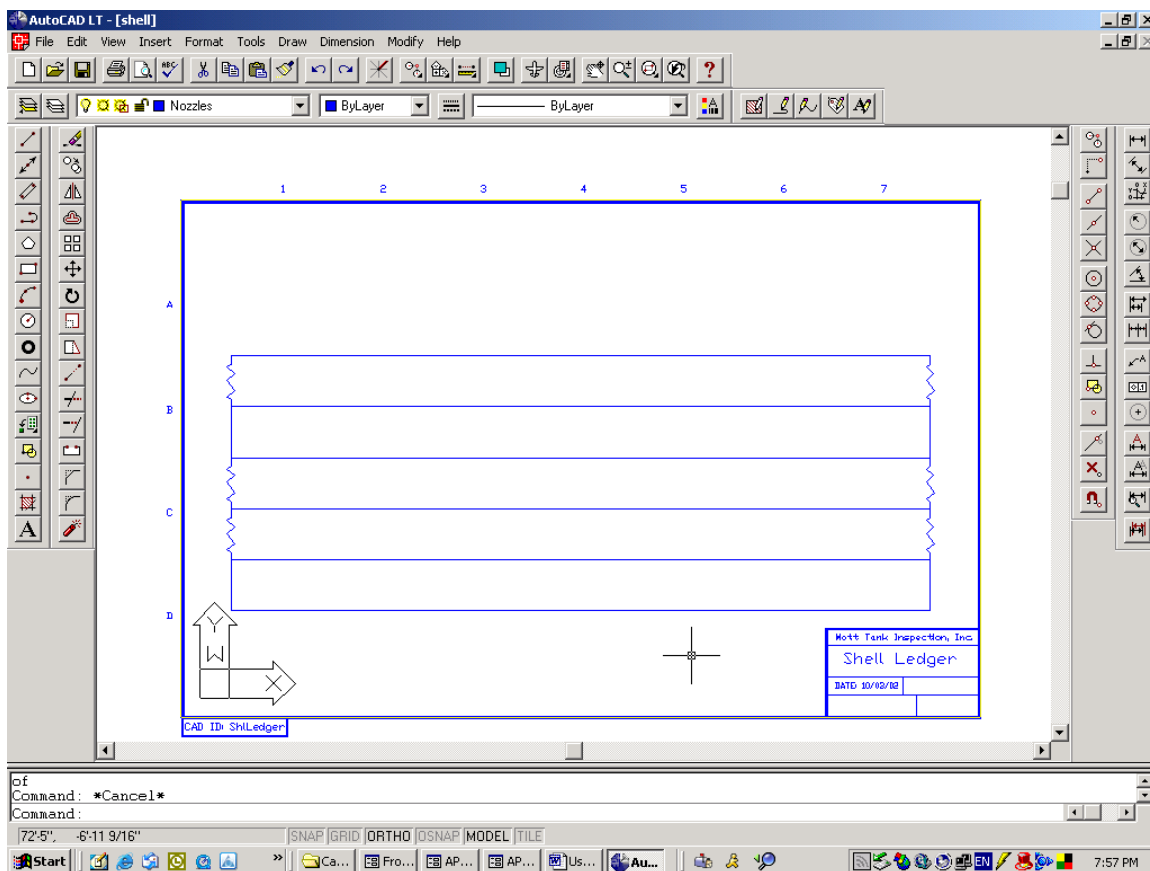


Figure AST-21. Shell Course Layout with “Shlcut Insert” Pattern

k. offset the #1 first weld seam in accordance with the field data sheet (i.e. 30’; Command: offset → 30’-0”-→ pick #1 weld and left click mouse to right of the seam) → repeat until all lines (weld seams) are drawn in on the first course. Copy and paste the first course weld seams to any other courses that align with that course. Repeat process for all courses.

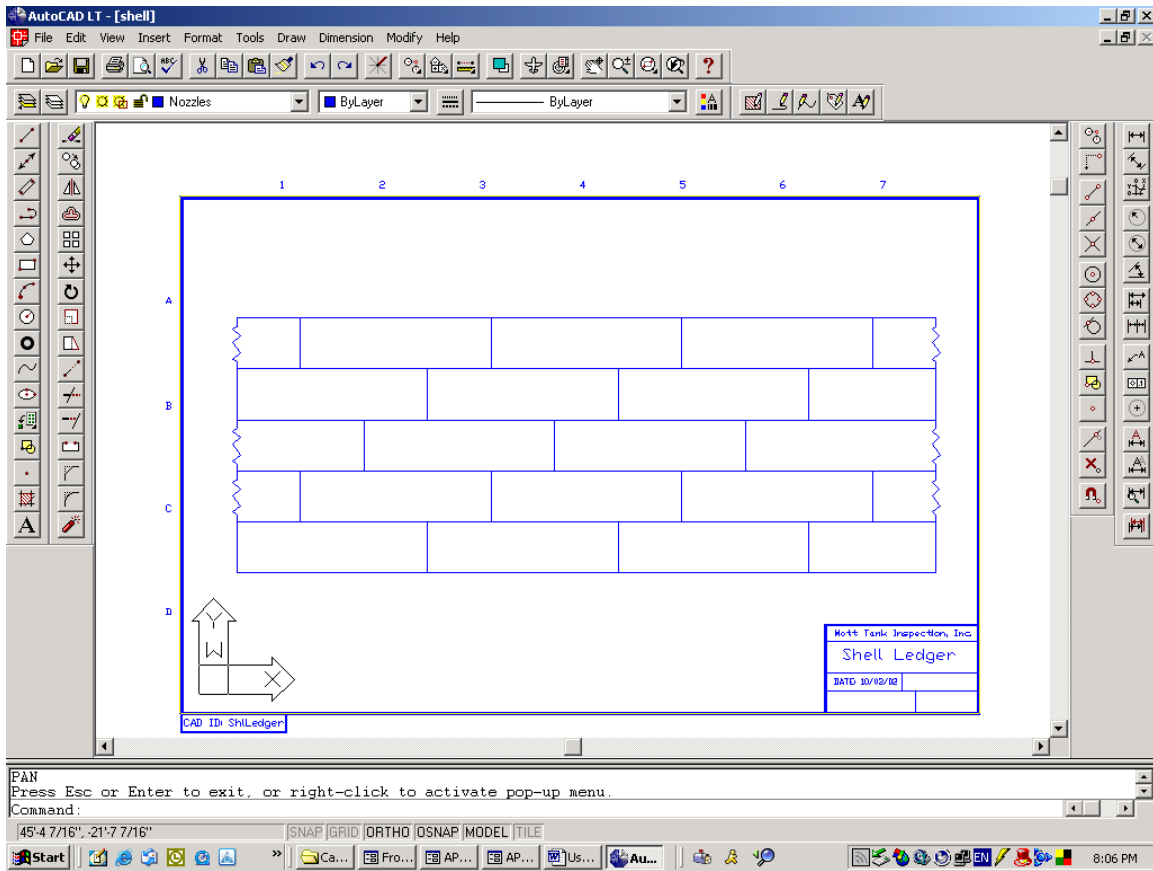


Figure AST-22. Shell Course Layout with Vert. Weld Seam

l. Insert nozzles as indicated on the field drawings. Reference Shell ledger drawing for Nozzle nomenclature (i.e., use N6 block for a to scale 6" Nozzle elevation view, use MW24 block for a to scale 24" Manway elevation view)

1. **Command:** Insert → MW24 → **Insertion Point:** if X = 4' and Y = 30" enter 4',30
2. **X scale factor:** Enter default
3. **Y scale factor:** Enter default
4. **Rotation Angle:** Enter default.
5. Explode nozzle block and edit text to associated CML
6. Repeat for all nozzles according to field data. (Reference the ledger sheet for nozzle block names.
7. Insert Repad blocks if desired. (NOTE: as an inspection drawing, only that which helps to communicate inspection findings need be included in the drawing)

m. Insert ladder as indicated on the field drawings

1. **Command:** Insert → LDR → **Insertion Point:** if X = 25' and Y = 1' enter 25',12
2. **X scale factor:** Enter default
3. **Y scale factor:** Enter default
4. **Rotation Angle:** Enter default.
5. If ladder runs opposite insert default then use mirror command to flip it to the correct orientation before exploding.
6. Explode LDR block and edit conform to field drawing.

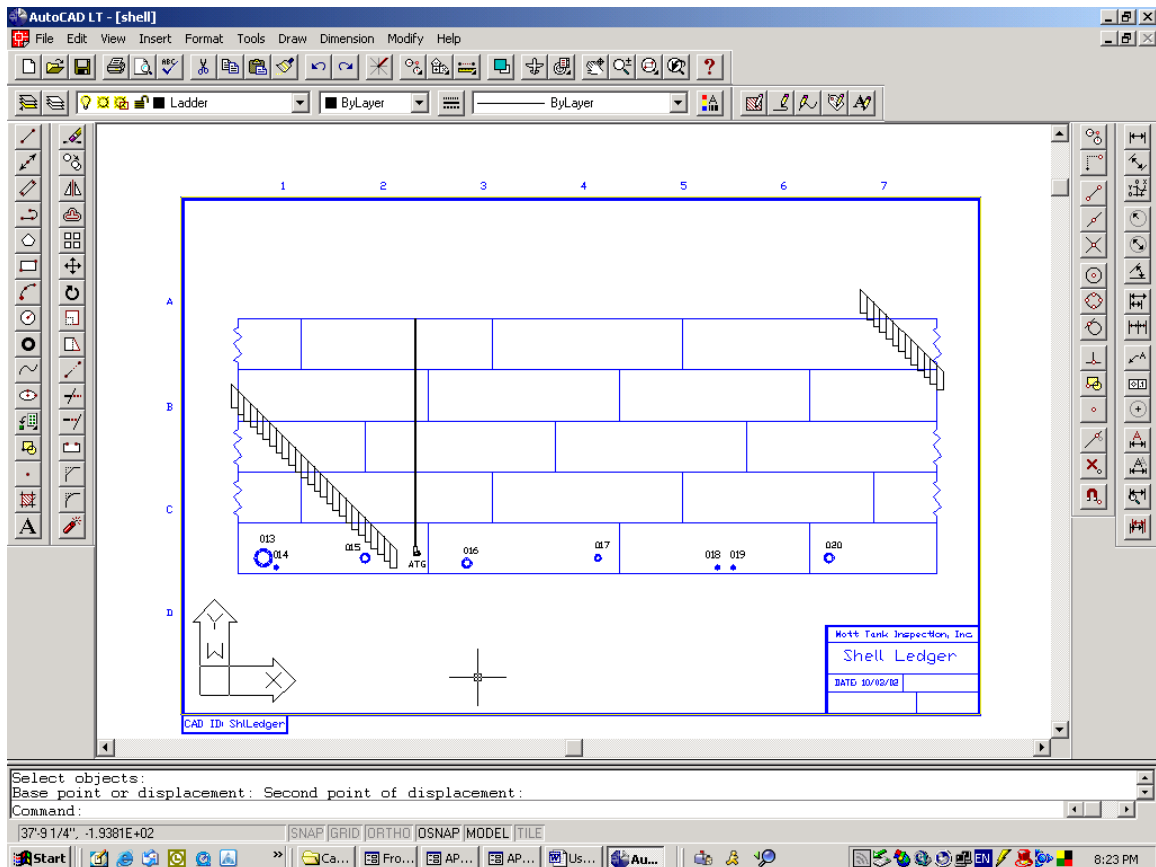


Figure AST-23. Shell Course Layout with Nozzles and Appurtenances

m. Insert any other entities that there are a blocks for or draw in any other objects that are required for inspection drawing as indicated on the field drawings (such as ATG, GR, Hand Rails, et)

1. **Command:** Insert → ATG → **Insertion Point:** if X = 27' and Y = 4' enter 27',4'
2. **X scale factor:** Enter default
3. **Y scale factor:** Enter default

4. **Rotation Angle:** Enter default.
5. Explode ATG block and edit to conform to field drawing.

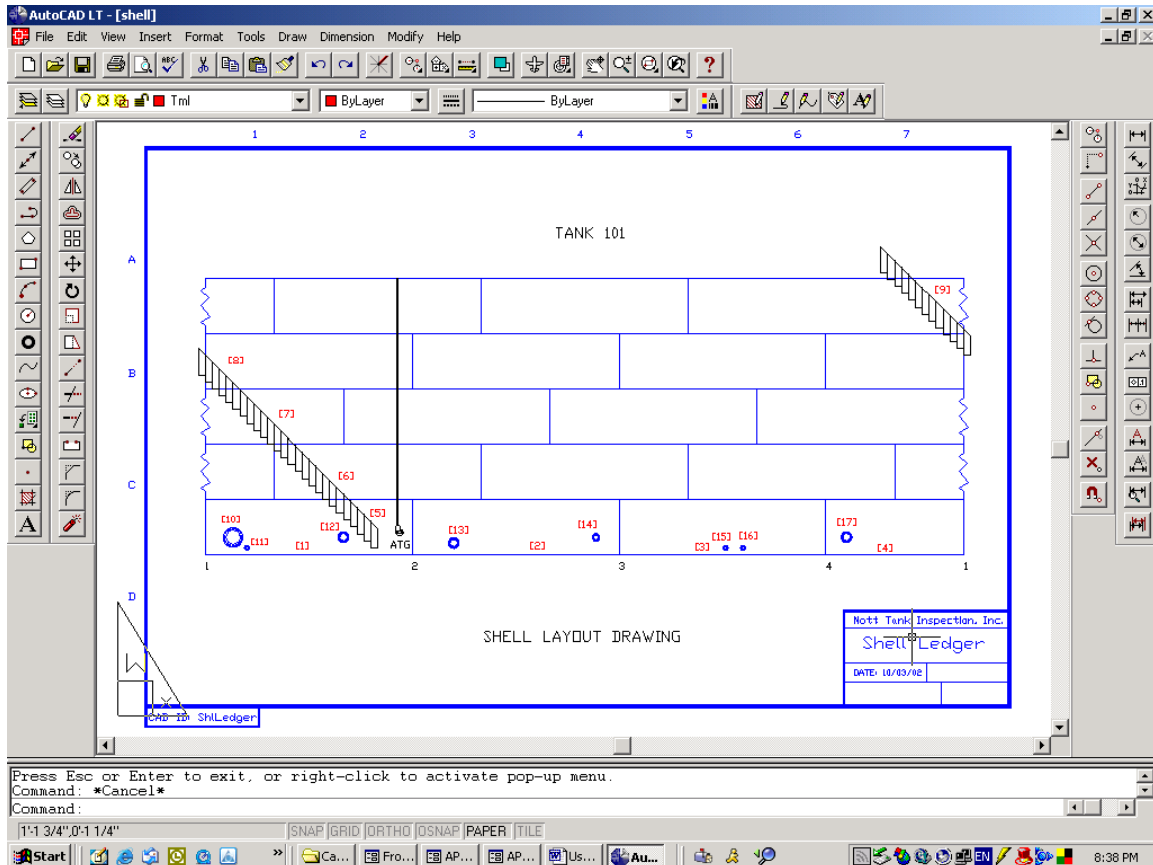


Figure AST-24. Shell Course Layout with CML's and Seam Numbering

- N. Add in Weld Seam Numbers
- O. Add in CML Points

3. If tank is a large tank, recommend drawing the shell initially as one drawing and then saving as, as many drawings needed to reduce the sizes to where all entities are recognizable and all text is legible, rule of thumb at least two to four course sheets per drawing. When doing so remember to edit title block to reflect number sequencing of drawings.

Report Roof/Floor AutoCAD Inspection Drawings

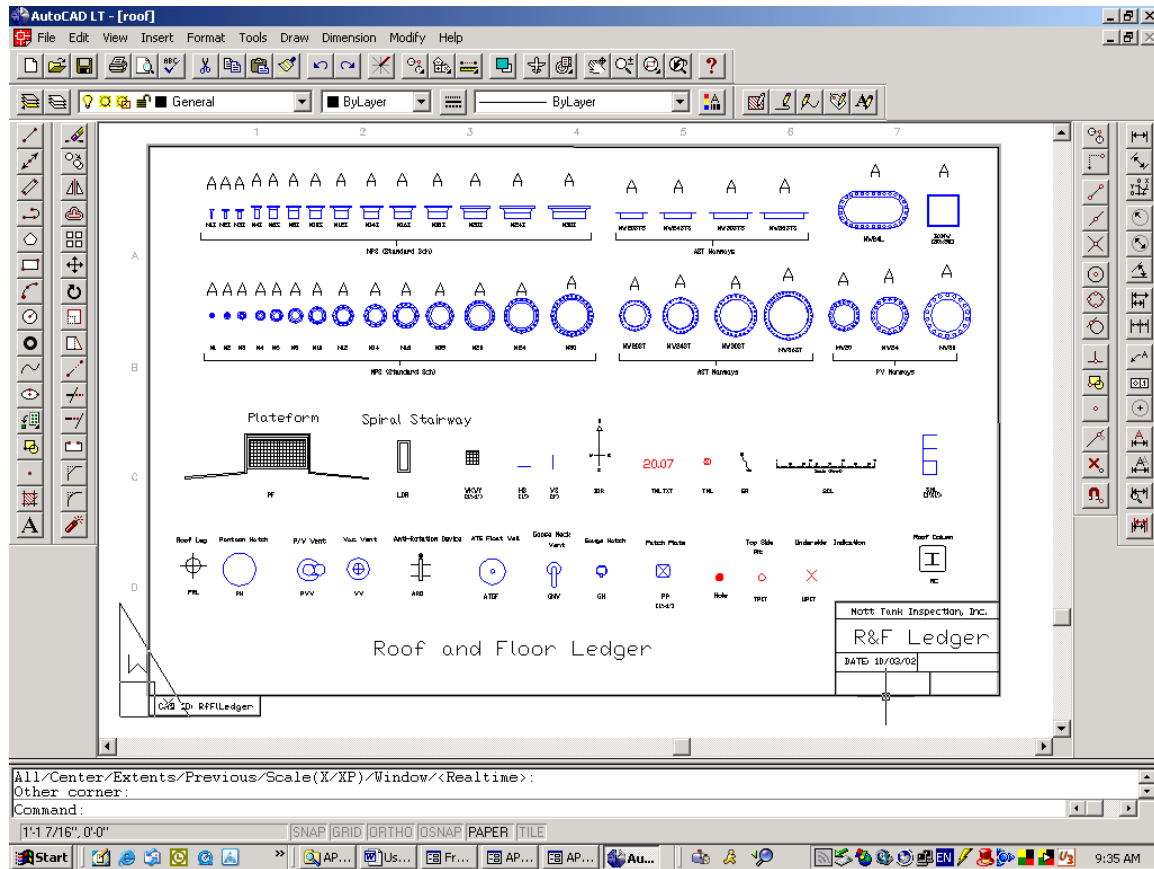


Figure AST-25. AutoCAD Roof/Floor Ledger Drawing

User must have the AutoCAD program (1997 or later version) or AcceliCAD to use this function.

User must obtain the field data sheet and drawings relative to this project. (Reference pg 96 for more details on field forms)

To access the Report AutoCAD Inspection Drawings from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the icon (page with the star) under Appendix C. Save the file to the a project folder and pint out the Ledger drawing for reference when building the shell drawing.

Once the cad drawing is open and saved to a project folder as Roof or Floor layout Drawing, complete the following steps referencing the field data sheets and drawings: (references herein are for a roof layout drawing but principles apply to both the floor and roof except for different appurtenances such as nozzles, platforms and stairways which would only be specific to roof layout whereas the floor may have roof columns, sumps and other items)

1) Edit all title blocks and drawing text in papers space (PS enter on command line) related to specific report info (Logo, Company, Date, and other text as needed to conform to user company drawing protocols).

2) In model space (MS enter on command line), On command line:

a. **Command:** "C" enter

b. **Center Point:** "0,0"

c. **Diameter (Rad):** enter tank diameter (i.e. 70 ft diameter is to be entered as 70'

d. **Command:** Zoom All, and bring the roof circle into a full view to a scale with room around to insert platforms and stairways)

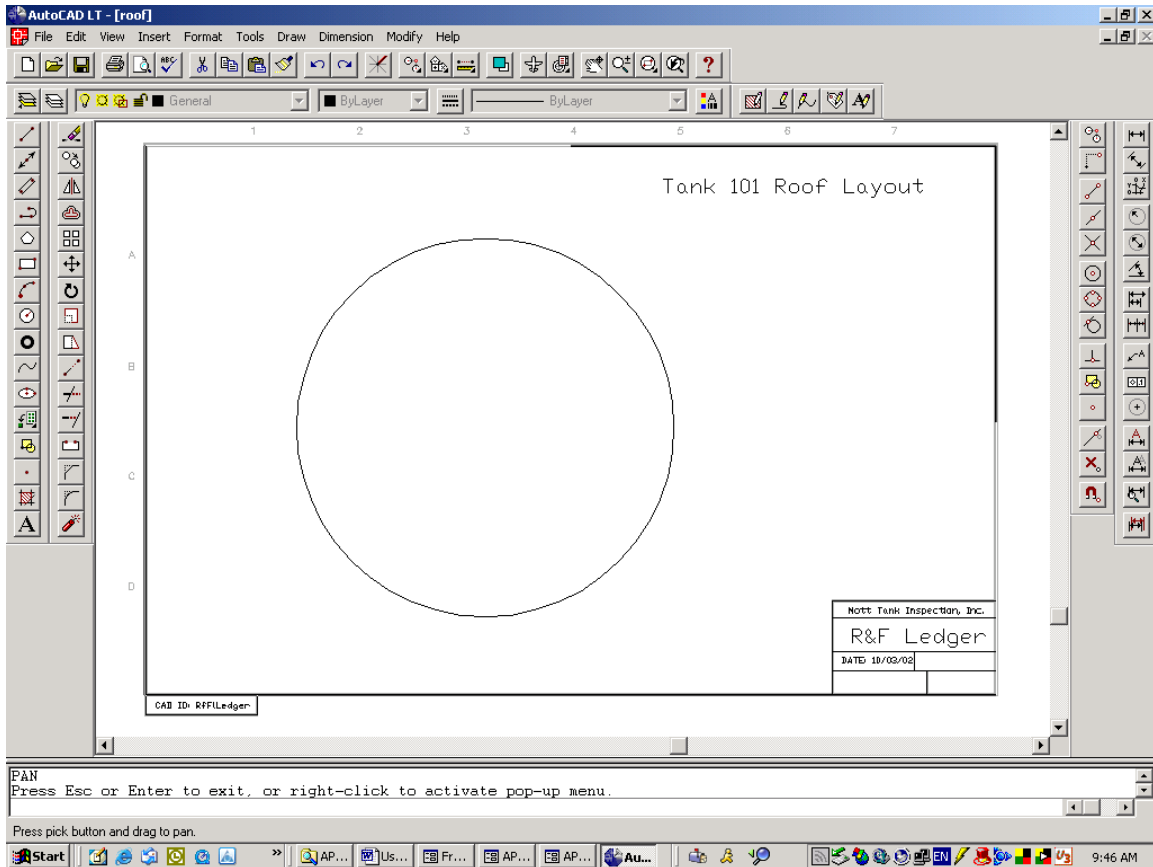


Figure AST-26. AutoCAD Roof Layout Drawing

e. From field drawings and data sheets determine horizontal weld seam offset distance (normally they are nominally 6 ft) from one another and the roof center and draw horz. weld seams:

1. **Command:** type "L" enter → snap to left quad → snap to right quad.

2. **Command:** Offset → 3'

3. **Select Object:** Pic weld Line -> pick just above line and delete original (center) line
4. **Command:** Offset -> 6'
5. **Select Object:** Pic weld Line -> pick just above.
Repeat until all upper weld lines are in place in accordance with field drawing. Trim all lines outside of roof perimeter

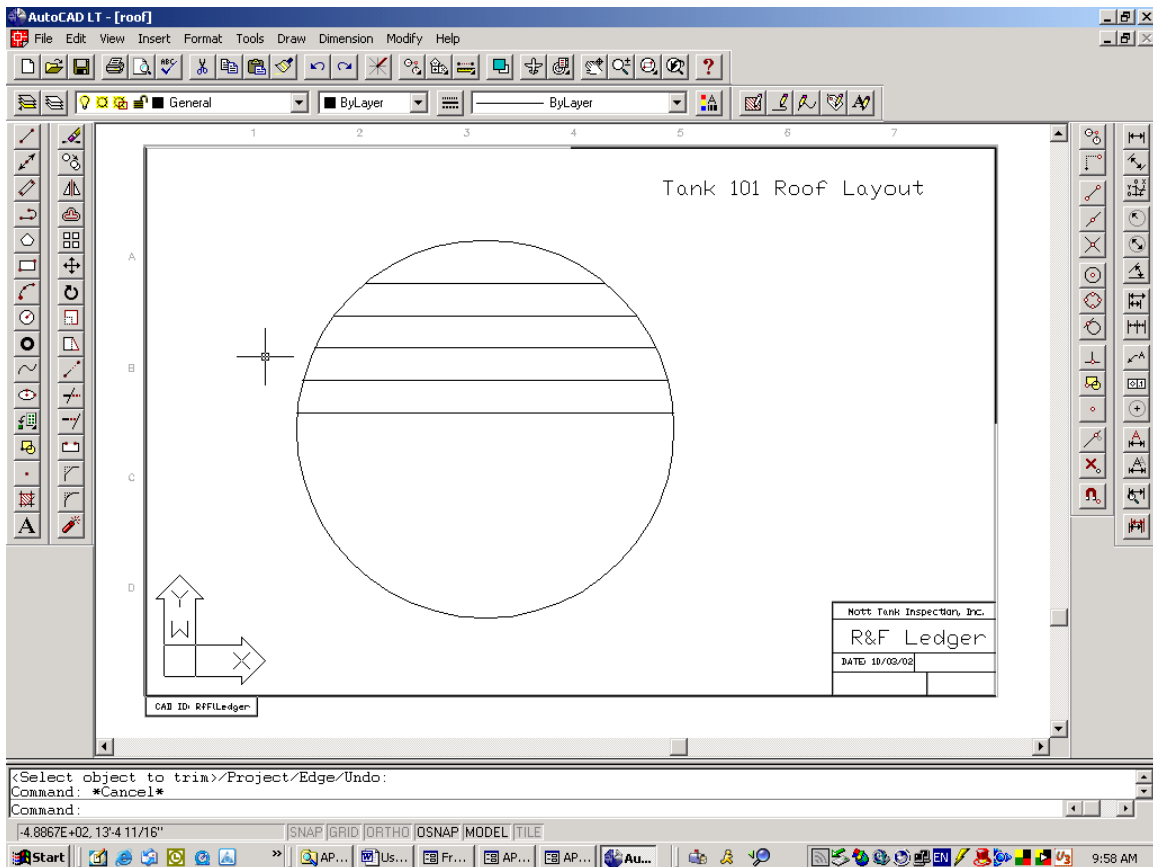


Figure AST-27. Roof Upper Horizontal Weld Seams

f. From field drawings and data sheets determine vertical weld seam placement for upper half and drawing. (normally these can be drawn in free style keeping to a generally close representation to the as built layout.).

g. From field drawings and data sheets determine configuration the lower half of drawing. Normally the lower half is layout identical to the upper half only inverted, therefore, the upper half can be mirrored and then mirror again down the middle, remembering to "delete old objects" when prompted. Any differences can be edited and the vertical weld seams between the upper and lower section can be drawn in.

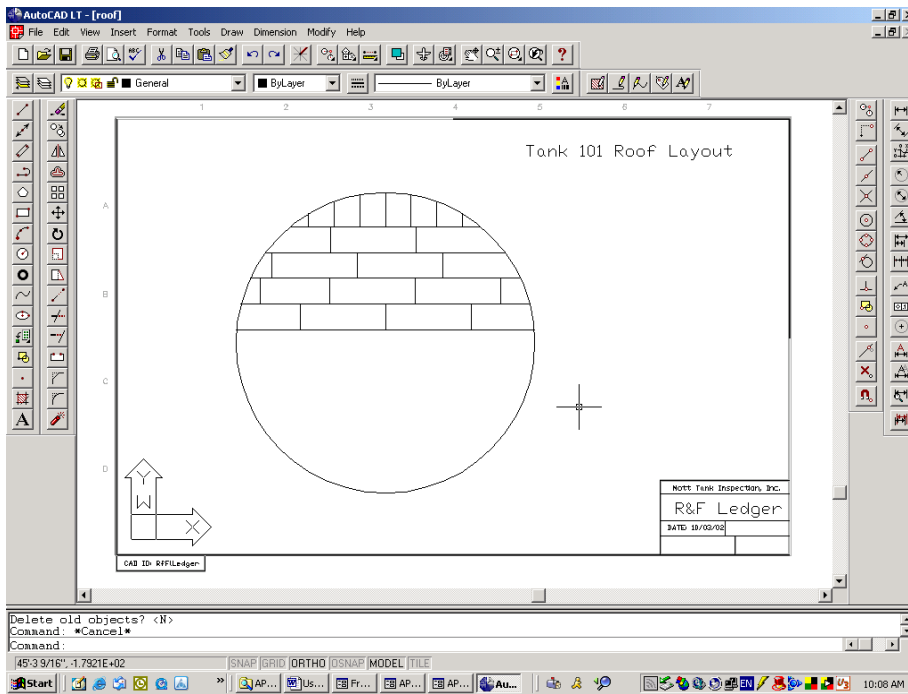


Figure AST-28. Roof Upper Vertical Weld Seams

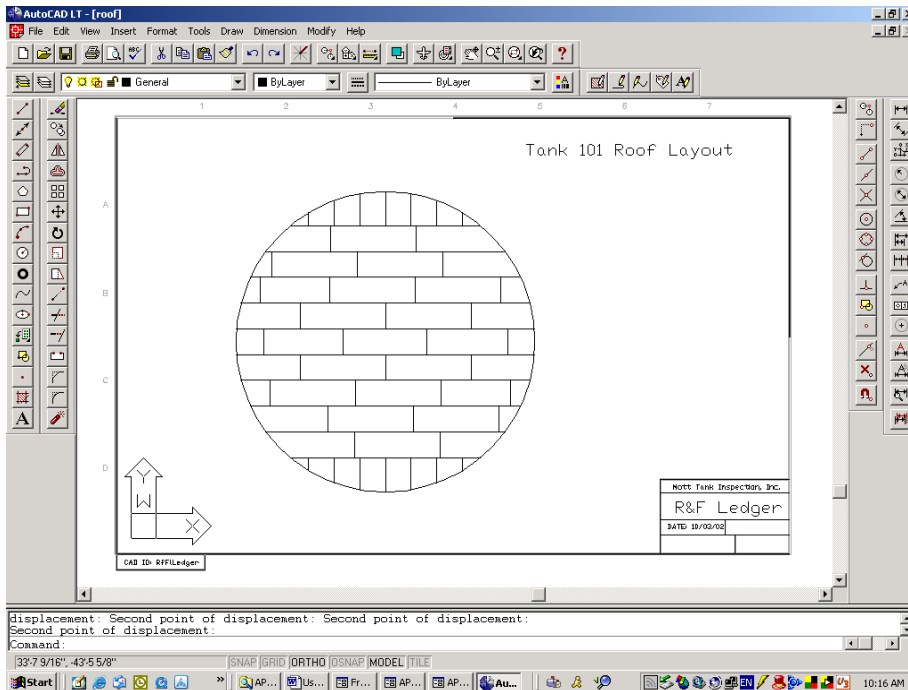


Figure AST-29. All Roof Weld Seams

h. Insert nozzles as indicated on the field drawings. (normally these can be drawn in free style keeping to a general close representation to the as built layout.). Reference Roof Ledger drawing for Nozzle nomenclatures (i.e., use N6 block for a to scale 6" Nozzle elevation view, use MW24 block for a to scale 24" Manway elevation view)

1. **Command:** Insert → MW24 → **Insertion Point:** pick the location as indicated on the field drawings
2. **X scale factor:** Enter default
3. **Y scale factor:** Enter default
4. **Rotation Angle:** Enter default.
5. Explode nozzle block and edit text to associated CML
6. Repeat for all nozzles according to field data. (Reference the ledger sheet for nozzle block names.
7. Insert Repad blocks if desired. (NOTE: as an inspection drawing only that which helps to communicate inspection findings need be included in the drawing)

i. Insert top platform and ladder as indicated on the field drawings

1. **Command:** Insert → PF → **Insertion Point:** top quad.
2. **X scale factor:** Enter default
3. **Y scale factor:** Enter default
4. **Rotation Angle:** Enter default.
5. Use rotate command to adjust position in accordance with the field drawing and move slightly inward to show handrails as on the roof.
6. Explode PF block and rotate text to a readable orientation and scale if need be to a legible size.
7. Zoom into the area of the Platform to insert ladder.
8. **Command:** Insert → LDR → **Insertion Point:** next to shell near the platform
9. **X scale factor:** Enter default
10. **Y scale factor:** Enter default
11. **Rotation Angle:** Enter default.
12. Explode LDR block and move text to side (scale if need be to a legible size)
13. Use rotate command to position Ladder step next to shell aligned with the platform in accordance with the field drawings.

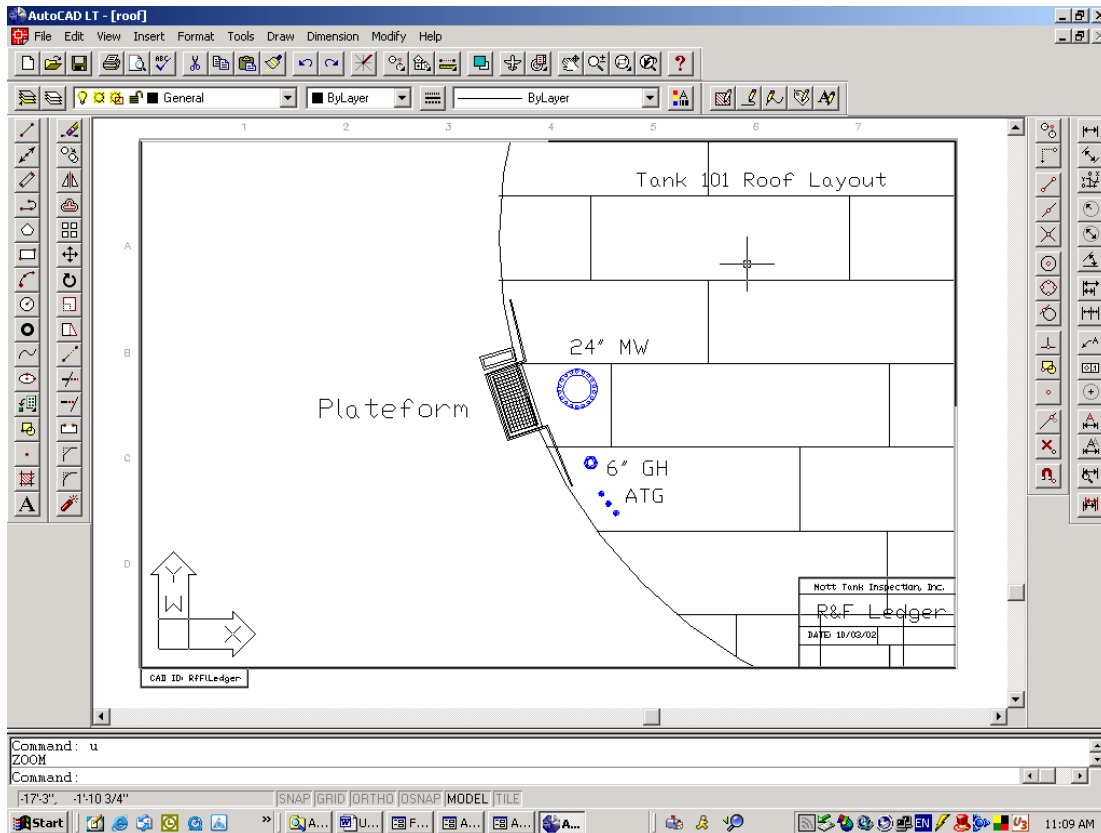


Figure AST-30. Ladder and Platform Orientation

- j. Determine number of steps required (Rule of thumb number of steps = the tank height in feet, (i.e. tank height = 48 ft, no. of steps = 48)
- k. Determine degree to array as follows $360 \times (\text{Height} / \text{Circ}) = X$ ($360 \times (48/220) = 78$ (if CCW or -78 if CW)
 1. Use array command: select ladder rung (include both entities)
 2. **R/P:** Enter P (polar)
 3. **Base/Center:** type "Center" and pick the circle (roof perimeter)
 4. **Number of items:** enter no. determined in j above (i.e. 48).
 6. **Angle to fill (+ = ccw, - = cw) (degree):** enter no. determined in k above in (+) or (–) array (i.e. -78 for Clock Wise in this example)
 7. **Rotate Object (Y):** enter default.
 8. Zoom to previous view and adjust Zoom at this point to fill most the drawing field.

l. Insert or Draw in any other entities as needed.

m. Add CML points

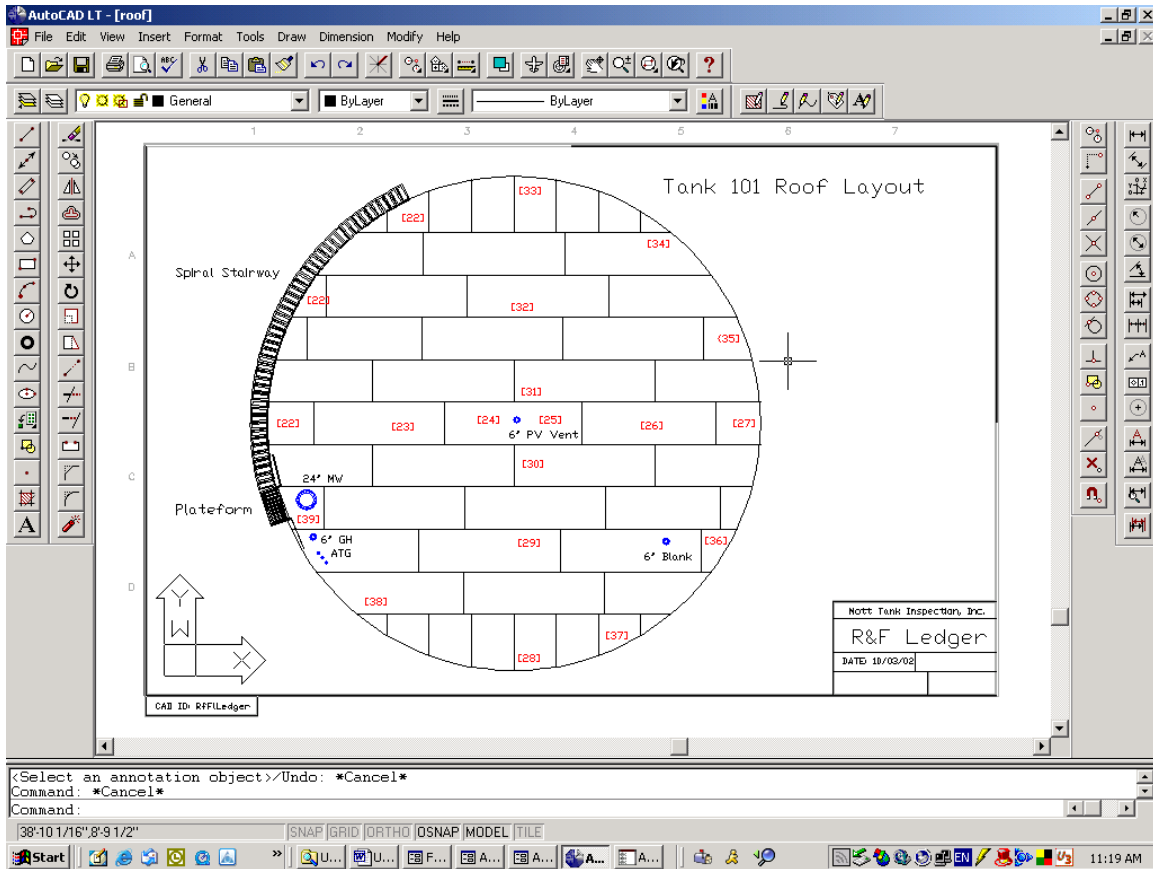


Figure AST-31. Roof Drawing with Ladder Array and CML Points

Extraneous Calculations

To access the Report Calculations from the home page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [-Please Select-] button under Appendix B and chose from the drop down list the calculation of interest.

Click on the access icon on right (w/ star) and begin performing calculations by entering remaining data in cells as called for in accordance with the unit designation chosen on the Report Base Page.

Variable definitions are given in table at bottom left of top right and can be accessed via the pull down menu. Click in the definition box and use vertical scroll to read all text.

The calculation will now be listed in the Appendix and print in the listed order with the report.

Report Inspection Photograph

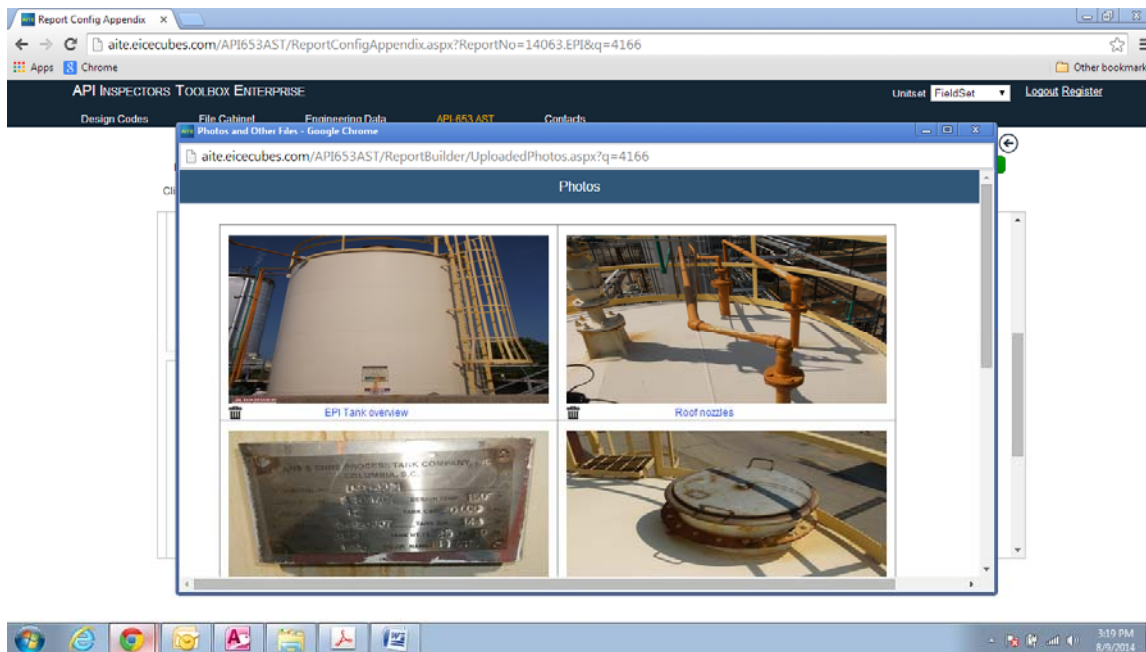


Figure AST-32. Photograph Selection

Users may want to develop Inspection Photographs in a Word document. A link to the File Cabinet is provided to access a pre-design Word document to aid in this project

To access the Report Photos from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [Upload Files] button under Appendix E.

Once the Inspection Photographs Appendix is open, complete the following:

- 1) Enter Caption text in the header space for the photo to be uploaded.
- 2) Pic [Choose File] button and navigate to and pic the photo to be uploaded
- 3) Pic [Upload] button
- 4) Repeat steps 1-3 until all photo's are uploaded

All other Appendices

To access the remaining Appendices from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Appendix Builder] button then click on the [Upload Files] button under Appendix of interest.

Once the Inspection Appendix page is open, complete the following Steps:

- 1) Pic [Choose File] button and navigate and pic the pdf file to be uploaded
- 2) Pic [Upload] button
- 3) Repeat steps 1-2 until all attachments are uploaded

Report Write-up and Recommendations

Report Writeup

API 653 Report Write up

Calculate Next Inspection Date (API Max)

Report No: 14063 EPI, Vessel: EPI Tank M-7, Insp Date: 07/23/2014, Years to Next Insp: 5, Gov'n Component: Shell, Int. Visual Insp. Due Date: 07/23/2029, Ext. Visual Insp. Due Date: 07/23/2019, UT Insp. Due Date: 07/23/2024

3.1 Foundation:

3.1.1 The foundation is constructed of a concrete pad. The containment structure appears to meet the capacity requirements recommended by NFPA 30.

4.1 Foundation Recommendations:

4.1.1 None

3.2 Shell:

3.2.1 The tank shell external surface has an overall clean, smooth surface profile.

3.2.2 Significant corrosion was found at the base of the tank where the shell meets the tank bottom but could not be interrogated to it fullest because of the severity and possible chance of breaching the pressure boundary.

4.2 Shell Recommendations:

4.2.1 The tank needs to be taken out of service and the grating around the tank removed in order to examine the tank without fear of the vessel holing through and leaking product.

4.2.2 Apply sealant to the bottom-to-foundation gap once the issues with the corrosion at the base of the tank are resolved.

Executive Summary

An API Standard 653 In-Service inspection of EPI Tank M-7 located at the Georgia Pacific Site in Crossett, AR was conducted on 07/23/14. This inspection was conducted to collect data in order to evaluate the mechanical integrity and fitness for continued service of the tank.

The tank bottom has some significant external corrosion issues apparent on the floor flanged components located on the south side of the tank. Being that the tank was in service the corroded area could not be interrogated to any extent to determine the magnitude of the deterioration. The tank needs to be taken out of service and the grating around the tank removed in order to examine the tank without the possibility of the vessel holing through and leaking product. The exact amount of corrosion produced

Figure AST-16. Write-up and Recommendations

To access the Write-up and Recommendations page from the front page, choose [API 653 AST] then click on [Report Builder] button at bottom of page. Select Existing Report from the drop down menu, then Click on the [Report Write-up] button at the bottom.

The [Codes] button is available for quick access to referencing codes.

The [Calculate Next Inspection Dates (API max)] button is available for calculating the next inspection dates based on maximum allowed per code and may be overwritten if corrosion rates dictate a shorter inspection interval.

This section is divided up with separate windows for reporting findings and making recommendations for the various components.

The write-up and recommendation text comes in with a default text that needs to be edited to reflect associated information. Alternately, the user may delete the default text and enter other text as desired.

To do a spell check, place the cursor over the red highlighted text and right click for choices to replace the word.

Cells across the top require determinations for dates for next inspections intervals and governing component. The governing component is normally the component with the least remaining life.


The “Years to Next Insp”. is a number value with no signifiers, not a date (i.e., 2, 4, 5, et) which is normally 5 years for API 653 type inspections.

The UT Results Summary and Recommendations should address calculation results and any issues that component evaluations yielded.

The Executive Summary (ES) text comes in with a default text that needs to be edited to reflect associated information. Alternately, the user may delete the default text and enter other text as desired. Normally the only discrepancies that make it into the Executive Summary are the items with a significant cost value, items that could hold up a tank from being put back into service, Results of major NDE technologies (MFE, C-Scan, etc.) or issues that are causing some limitation to the operating parameters of the Tank. These items should be in the body of the report and can easily be copied and pasted into the ES with some minor editing.

Note that the Executive Summary does not appear in the Report Write-up preview page but is rather found on the main page preview.

NOTE: Always hit the save icon before moving from any page in the program to ensure data/changes are not lost.

A record may be deleted by clicking the  icon at the top right hand corner and confirming.



To print, click the print icon in upper right hand corner. **NOTE: Click on save icon in upper right hand corner before selecting print preview.**



Click the back arrow to return to the Appendix page for next step.