Code Case 2695 Implementation

and PV Elite 2012 Sneak Peak

by: Scott Mayeux

INTERGRAPH®

Webinar Overview topics

- What is ASME Code Case 2695 and why is it important?
- What are ‘common rules’ and how does it all tie together?
- How is this implemented in PV Elite® 2012?
- An Exchanger example with and without CC 2695
- Conclusions

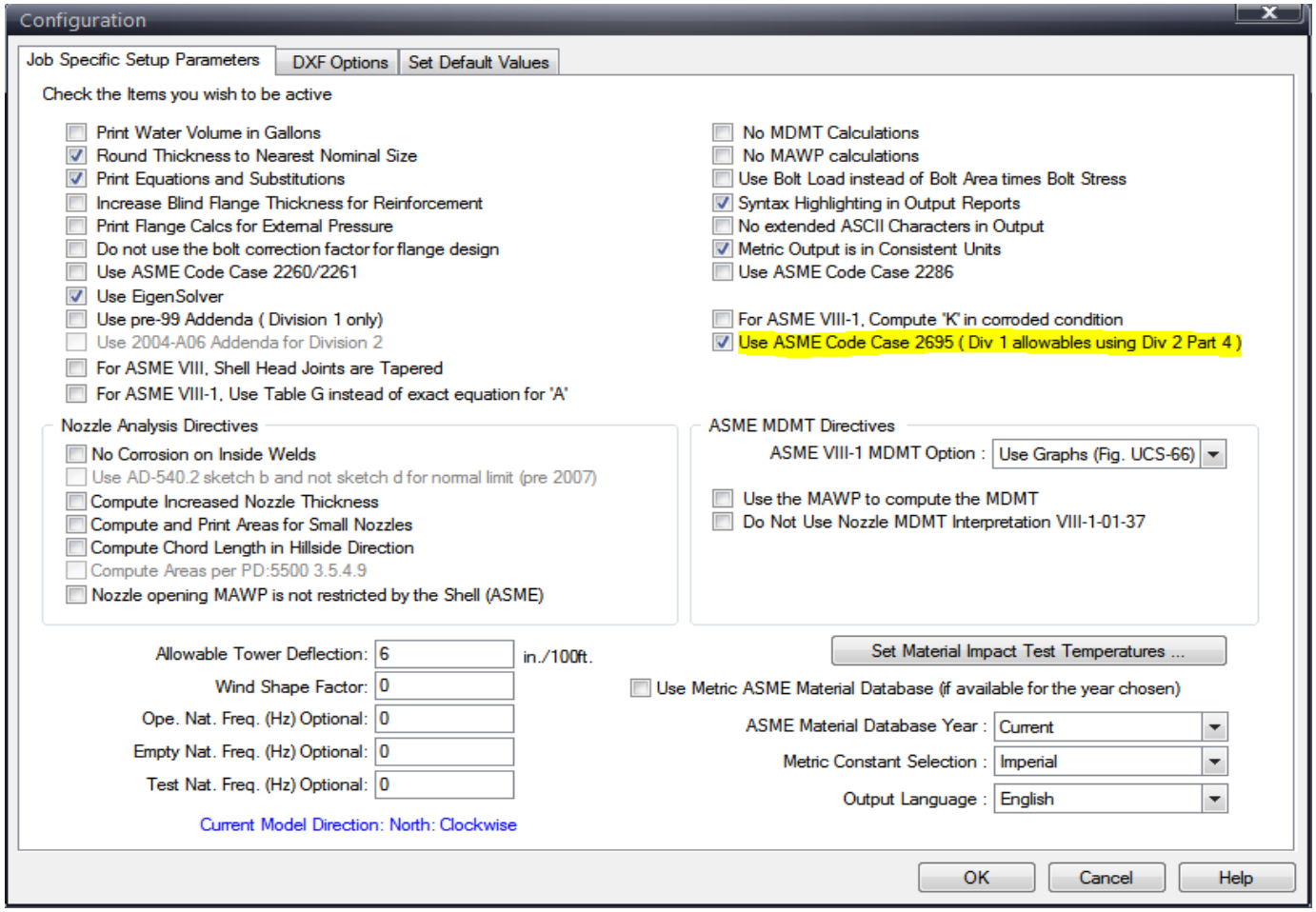
What is Code Case 2695?

- What is a Code Case?
- ASME board certified September 2011
- Allows ASME Division 1 vessels to be designed using the equations in Division 2, 2011a Addenda
- Allowable Stresses per Division 1
- MDMT per Division 1
- Use the ‘Design-by-Rule’ requirements of Part 4
- A number of other ‘restrictions’ to know about

What are Common Rules?

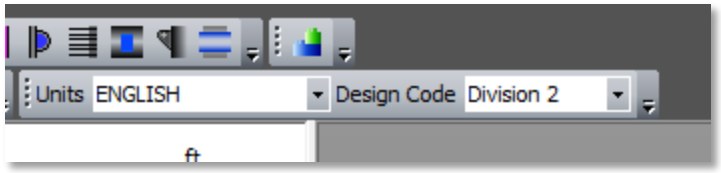
- Division 2 represents newer technology in many areas (nozzle reinforcement) and ‘copies’ sections that are in Division 1 (like part UHX)
- It would be nice if there was only one set of rules for ASME to maintain
- In the future there may be only 1 set of rules
- Is CC 2695 the beginning of an important initiative?

- Set the Code Case 2695 ‘parameter’



PV Elite® Implementation

- Notice the design Code is set to Division 2

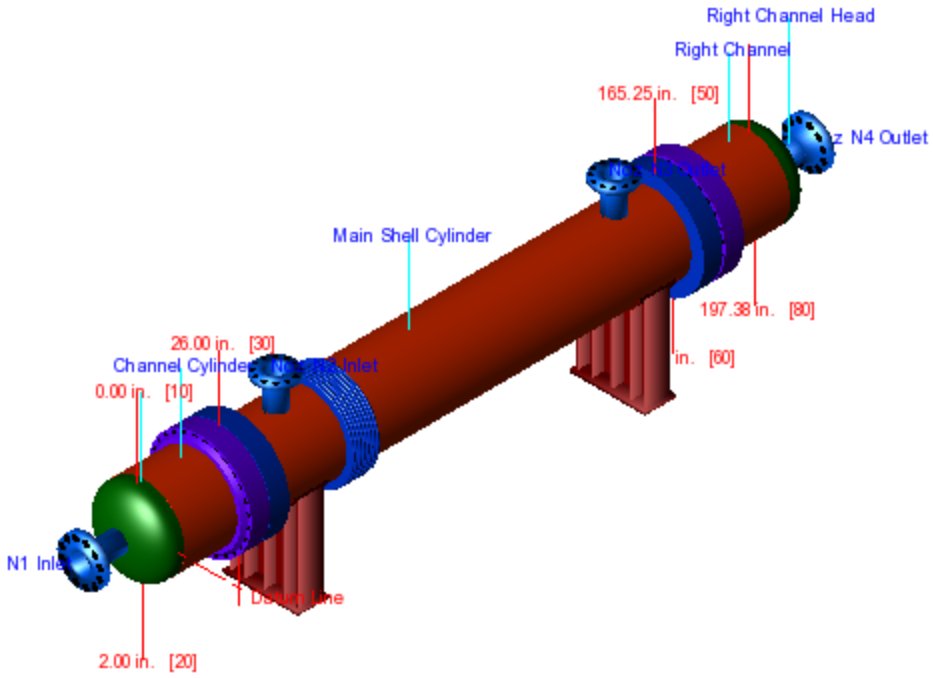


- Model as usual
- Numerous notes in the output to make this clear to inspectors and checkers

This analysis was performed per ASME VIII-1 and Code Case 2695 which allows the use of ASME VIII-2 Part 4 formulas using VIII-1 allowable stresses. The MDMT calculations are per UCS-66 where applicable.

An Example

- Evaluate a Heat Exchanger



The results

- Review CC 2695 results :
  - Internal Pressure
  - External Pressure
  - Nozzles
  - Tubes
- Re-run without using the Code Case
  - Review

Internal Pressure Comparison

- With 2695

Element Required Thickness and MAWP :

From	To	Design Pressure psig	M.A.W.P. Corroded psig	M.A.P. New & Cold psig	Minimum Thickness in.	Required Thickness in.
Left Chann		1425.00	1489.89	1809.95	1.00000	0.95971
Channel Cy		1425.00	1579.20	1887.26	1.18750	1.07978
30	40	1425.00	1782.95	1782.95	6.00000	5.25100
Main Shell		375.000	376.544	615.433	0.37500	0.37397
50	60	1425.00	1782.95	1782.95	6.00000	5.25100
Right Chan		1425.00	1579.20	1887.26	1.18750	1.07978
Right Chan		1425.00	1489.89	1809.95	1.00000	0.95971

- Without 2695

Element Required Thickness and MAWP :

From	To	Design Pressure psig	M.A.W.P. Corroded psig	M.A.P. New & Cold psig	Minimum Thickness in.	Required Thickness in.
Left Chann		*1425.00 >>>*	*1346.98*	*1652.89*	*1.00000 <<<*	*1.05107*
Channel Cy		1425.00	1565.13	1868.24	1.18750	1.08784
30	40	1425.00	1782.95	1782.95	6.00000	5.23400
Main Shell		375.000	375.764	613.497	0.37500	0.37449
50	60	1425.00	1782.95	1782.95	6.00000	5.23400
Right Chan		1425.00	1565.13	1868.24	1.18750	1.08784
Right Chan		*1425.00 >>>*	*1346.98*	*1652.89*	*1.00000 <<<*	*1.05107*

Note the difference in the MAWP and required thickness of the heads.

Nozzle Results Comparison

- With 2695

Nozzle Calculation Summary:

Description	MAWP	Ext	MAPNC	Table 4.5.2	Weld	
N1 Inlet	1489.56	OK	...	OK	OK	Passed
Noz N2 Inlet	376.54	OK	...	OK	OK	Passed
Noz N3 Outlet	376.54	OK	...	OK	OK	Passed
Noz N4 Outlet	1489.56	OK	...	OK	OK	Passed

- Without 2695

Nozzle Calculation Summary:

Description	MAWP psig	Ext	MAPNC psig	UG45 [tr]	Weld Path	Areas or Stresses
N1 Inlet		...	...Failed	0.000 Failed		*NoCalc[*]*
Noz N2 Inlet	375.76	OK	0.00	OK 0.370	OK	Passed
Noz N3 Outlet	375.76	OK	0.00	OK 0.370	OK	Passed
Noz N4 Outlet		...	...Failed	0.000 Failed		*NoCalc[*]*

- w/o 2695 UG-37

Nozzle Calculation Summary:

Description	MAWP psig	Ext	MAPNC psig	UG45 [tr]	Weld Path	Areas or Stresses
N1 Inlet		...	...Failed	0.000 Failed		*NoCalc[*]*
Noz N2 Inlet	*284.73*	*OK*	...	*OK 0.370*	*OK*	*Failed*
Noz N3 Outlet	*284.73*	*OK*	...	*OK 0.370*	*OK*	*Failed*
Noz N4 Outlet		...	...Failed	0.000 Failed		*NoCalc[*]*

The design works using CC 2695 and does not work otherwise.

Tube Results Comparison

- With 2695

Summary of Tube Required Thickness Results:

Total Required Thickness including Corrosion all.	0.0347	in.
Allowable Internal Pressure at Corroded thickness	1048.39	psig
Required Internal Design Pressure	1040.00	psig
Allowable External Pressure at Corroded thickness	1060.99	psig
Required External Design Pressure	335.00	psig
Required Thickness due to Shell Side pressure	0.0197	in.

- Without 2695

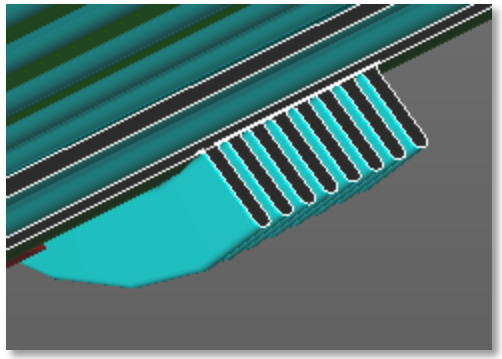
Summary of Tube Required Thickness Results:

Total Required Thickness including Corrosion all.	*0.0351*	*in.*
Allowable Internal Pressure at Corroded thickness	*1037.40*	*psig*
Required Internal Design Pressure	1040.00	psig
Allowable External Pressure at Corroded thickness	519.01	psig
Required External Design Pressure	335.00	psig
Required Thickness due to Shell Side pressure	0.0257	in.

Note the difference in the results for the tubes, especially the MAEP.

Conclusion

- Thinner heads and tubes
- More efficient nozzle reinforcement
- Higher component MAWP's & MAEP's
- CC 2695 can produce more economical designs
- Read and understand the Code Case and abide by any 'local' requirements
- PV Elite® 2012 makes this easy



The End

Thanks for viewing this presentation!