

Agenda Item 653-1007

Title: Corrections to Table 4.2

Date: May 18, 2021

Revision: 0

Handled By: Donald Spencer
Fluor Enterprises
One Fluor Daniel Dr.
Sugar Land, Texas 77478
Telephone: 281-263-2154
Email: Donald.Spencer@Fluor.com

Purpose: To correct Annex references in Table 4.2

Source: INQ-653-D017 Joint Efficiencies for Welded Joints

Impact: Technical correction to Table 4.2

Discussion: According Table 4.2 the Joint Efficiency for welded tank shells in accordance with API 650 First to Sixth edition (1961 to 1978) is 1.00 for butt joints if "Appendices D and G" are applicable. The wording "AND" implies that BOTH appendix D and appendix G must be applicable to the existing tank built under API 650 First to Sixth edition). However, API 650 First and Second editions do not have an appendix G and any tank built to this edition can never satisfy the requirement of applicability to appendix G, since it did not exist (also applicable for some other editions). Appendix G first appears as a supplement to API 650 Third edition

Should the text in the "Applicability or Limits" column read "Annexes D OR G" instead of "Annexes D AND G". (Butt joint according to API 650, First to Sixth Edition, Joint Efficiency 1.00)

The current table is shown on the next page

Current Table:

Table 4.2—Joint Efficiencies for Welded Joints

Standard	Edition and Year	Type of Joint	Joint Efficiency E	Applicability or Limits
API 650	Seventh and Later (1980 to Present)	Butt	1.00	Basic Standard
		Butt	0.85	Appendix A Spot RT
		Butt	0.70	Appendix A No RT
	First to Sixth (1961 to 1978)	Butt	0.85	Basic Standard
		Butt	1.00	Appendices D and G
API 12C	14th and 15th (1957 to 1958)	Butt	0.85	
	3rd to 13th (1940 to 1956)	Lap ^a	0.75	³ / ₈ in. max. t
		Butt ^c	0.85	
	First and Second (1936 to 1939)	Lap ^a	0.70	⁷ / ₁₆ in. max. t
		Lap ^b	$0.50 + k/5$	¹ / ₄ in. max. t
		Butt ^c	0.85	
Unknown		Lap ^a	0.70	⁷ / ₁₆ in. max. t
		Lap ^b	$0.50 + k/5$	¹ / ₄ in. max. t
		Butt	0.70	
		Lap ^d	0.35	
^a Full double lap-welded.				
^b Full fillet weld with at least 25 % intermittent full fillet opposite side; k = percent of intermittent weld expressed in decimal form.				
^c Single butt-welded joints with a back-up bar were permitted from the years of 1936 to 1940 and 1948 to 1954.				
^d Single lap-welded only.				

Proposed Changes:

Revise Table 4.2 to separate the first and second editions as these editions do not have Appendix G.

Table 4.2-Joint Efficiencies for Welded Joints

Standard	Edition and Year	Type of Joint	Joint Efficiency E	Applicability or Limits
API 650	Seventh and Later (1980 to Present)	Butt	1.00	Basic Standard
		Butt	0.85	Appendix A Spot RT
		Butt	0.70	Appendix A No RT
	Third to Sixth (1966 to 1978)	Butt	0.85	Basic Standard
		Butt	1.00	Appendices D or G
	First and Second (1961 to 1964)	Butt	0.85	Basic Standard
		Butt	1.00	Appendix D
API 12C	14 th and 15 th (1957 to 1958)	Butt	0.85	
	3rd to 13th (1940 to 1956)	Lap ^a	0.75	3/8 in. max. t
		Butt ^c	0.85	
	First and Second (1936 to 1939)	Lap ^a	0.70	7/16 in. max. t
		Lap ^b	$0.50 + k/5$	1/4 in. max. t
		Butt ^c	0.85	
Unknown		Lap ^a	0.70	7/16 in. max. t
		Lap ^b	$0.50 + k/5$	1/4 in. max. t
		Butt	0.70	
		Lap ^d	0.35	

a. Full double lap weld

b. Full fillet weld with at least 25 % intermittent full fillet opposite side; k = percent 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.

References:

From API 650 1st edition

8	AMERICAN PETROLEUM INSTITUTE	
		PAGE
6.2	SECTIONING METHOD	51
6.2.1	Application	51
6.2.2	Sectional Specimens	51
6.2.3	Number and Location of Specimens	51
6.2.4	Size of Sectional Segments	51
6.2.5	Preparation of Sectional Segments	51
6.2.6	Inspection of Sectional Segments	52
6.2.7	Repair of Defective Welds	52
6.2.8	Closure of Openings	52
6.2.9	Record of Segments	52
	7. WELDING PROCEDURE AND WELDER QUALIFICATIONS	
7.1	GENERAL	53
7.1.1	Definitions	53
7.2	WELDING PROCEDURE QUALIFICATION	53
7.3	WELDER QUALIFICATION	53
	8. MARKING	
8.1	NAME PLATES	54
8.2	DIVISION OF RESPONSIBILITY	54
8.3	RESTRICTIONS ON USE OF API MONOGRAM	54

APPENDIX A:	REFERENCE AND TYPICAL DESIGN DATA	55
APPENDIX B:	RECOMMENDED PRACTICE FOR CONSTRUCTION OF FOUNDATIONS FOR API VERTICAL CYLINDRICAL OIL STORAGE TANKS	59
APPENDIX C:	FLOATING ROOFS	61
APPENDIX D:	ALTERNATE DESIGN BASIS FOR TANK SHELLS (To Be Published Later)	
APPENDIX E:	USE OF API MONOGRAM	64

From API 650 2nd edition

	PAGE
6.2 SECTIONING METHOD	56
6.2.1 Application	56
6.2.2 Sectional Specimens	56
6.2.3 Number and Location of Specimens	56
6.2.4 Size of Sectional Segments	56
6.2.5 Preparation of Sectional Segments	56
6.2.6 Inspection of Sectional Segments	57
6.2.7 Repair of Defective Welds	57
6.2.8 Closure of Openings	57
6.2.9 Record of Segments	57

7. WELDING PROCEDURE AND WELDER QUALIFICATIONS

7.1 GENERAL	58
7.1.1 Definitions	58
7.2 WELDING PROCEDURE QUALIFICATION	58
7.3 WELDER QUALIFICATION	58

8. MARKING

8.1 NAMEPLATES	59
8.2 DIVISION OF RESPONSIBILITY	59
8.3 RESTRICTIONS ON USE OF API MONOGRAM	59

* * * * *

APPENDIX A: REFERENCE AND TYPICAL DESIGN DATA	60
APPENDIX B: RECOMMENDED PRACTICE FOR CONSTRUCTION OF FOUNDATIONS FOR API VERTICAL CYLINDRICAL OIL STORAGE TANKS	64
APPENDIX C: FLOATING ROOFS	66
APPENDIX D: ALTERNATE DESIGN BASIS FOR TANK SHELLS	68
APPENDIX E: USE OF API MONOGRAM	81

From Supplement to API 650 3rd edition

CONTENTS

	PAGE
ADDENDA TO API STANDARD 650 (Third Edition)	3
APPENDIX G: HIGH-STRESS DESIGN FOR TANK SHELLS	5
APPENDIX H: COVERED FLOATING ROOFS	9

For Committee Review Only