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Interoperable Specs and
Standards

GLOBAL PRODUCT DATA INTEROPERABILITY **S U M M I T** 2016



 **ELYSIUM**

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SWISS

Global Product

INTEROPERABLE STANDARDS FOR THE ENTERPRISE AND SUPPLY CHAIN



WHY WE DO WHAT WE DO?

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Millions of engineers spend hours every day navigating and analyzing information in order to make the next decision in their workflow. Those decisions are fraught with significant time, cost, and risk.

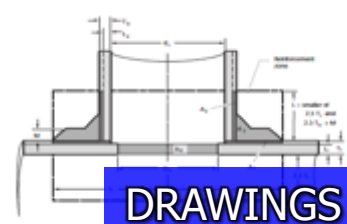


STANDARDS CONTAIN “DATA ELEMENTS”

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$$W_2 = \frac{aS_y}{4} \left[1 - \frac{S_y}{4n\pi^2 E} \left(\frac{l}{r} \right)^2 \right]$$

EQUATIONS



DRAWINGS

ASTM

value shift may be calculated as $(S_y)_{shift} = S_y - K_{ts} S_y$, where K_{ts} is the yield strength factor from Table 1.

where $K_{ts} = 4K_1 K_2 = 32,000$ (See Figure 1)

K_1 is the yield strength factor from Table 1

K_2 is the size distribution factor, static torque

where $K_{ts} = 0.0148 K_1 + 1.07$ for F measured in inches and $F \leq 10$ in.

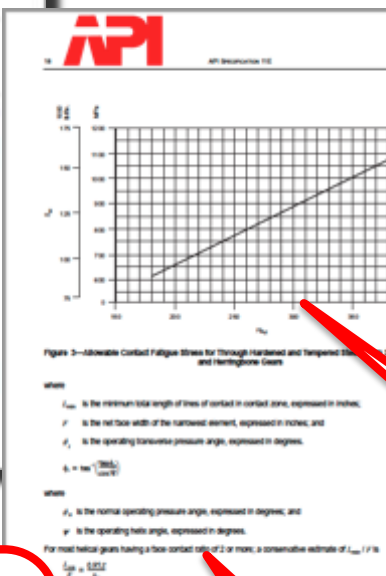
$K_{ts} = 1.3$ for $F > 10$ in.

The allowable static torque rating determined using this formula is conservative since the geometry factor K_1 includes a stress concentration factor for fatigue. It should be noted that some gear materials do not have a well-defined yield point and the ultimate strength is approximately equal to the yield. For these materials, a much lower value of K_1 shall be selected. The user of this specification should verify that the yield values selected are appropriate for the materials used.

Material	K_1
Steel through-hardened	1.00
Modular steel	1.00
Steel flame or induction hardened	0.80
Steel case carburized	1.20
Steel nitrided	0.80
Cast iron	0.75
Intermediate steel	1.00

7.2.4. Metallurgy

The allowable stress, S_y , and S_u included in this specification are for an average tensile material manufacturing practice. For static strength, and manufacturing tolerances for allowable stress values, reasonable levels of material and metallurgical controls are required for the use of the allowable stress values contained in this specification.



ASME

Figure 4.4 Reinforcement of Branch Connections

4.3.4.5.5 Reinforcement of Multiple Openings

Reinforcement of multiple openings shall be in accordance with the following:

a) Where two or more adjacent branch pipes are spaced between centers at less than 2 times their average outside diameter (or their effective areas of reinforcement overlap), the group of openings shall be reinforced in accordance with the requirements of [Clause 4.3.4.5.3](#) and [4.3.4.5.3.1](#). The reinforcing metal shall be added as a combined reinforcement, the strength of which shall be at least the sum of the strengths of the individual reinforcements.

“Go to Section 4.2.4.”

INTERNAL LINKS

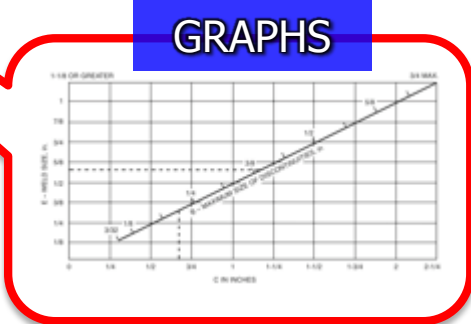
Table 2—Pumping Unit Pressure Rating and Ratings

Size	Pressure Rating
0.4	15,000
0.6	15,000
0.8	15,000
1.0	15,000
1.2	15,000
1.5	15,000
2.0	15,000
2.5	15,000
3.0	15,000
3.5	15,000
4.0	15,000
4.5	15,000
5.0	15,000
6.0	15,000
8.0	15,000
10.0	15,000
12.0	15,000
15.0	15,000
20.0	15,000
25.0	15,000
30.0	15,000
36.0	15,000
42.0	15,000
48.0	15,000
54.0	15,000
60.0	15,000
66.0	15,000
72.0	15,000
78.0	15,000
84.0	15,000
90.0	15,000
96.0	15,000
102.0	15,000
108.0	15,000
114.0	15,000
120.0	15,000
126.0	15,000
132.0	15,000
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168.0	15,000
174.0	15,000
180.0	15,000
186.0	15,000
192.0	15,000
198.0	15,000
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210.0	15,000
216.0	15,000
222.0	15,000
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252.0	15,000
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264.0	15,000
270.0	15,000
276.0	15,000
282.0	15,000
288.0	15,000
294.0	15,000
300.0	15,000
306.0	15,000
312.0	15,000
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336.0	15,000
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1260.0	15,000
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1332.0	15,000
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1404.0	15,000
1410.0	15,000
1416.0	15,000
1422.0	15,000
1428.0	15,000
1434.0	15,000
1440.0	15,000
1446.0	15,000
1452.0	15,000
1458.0	15,000
1464.0	15,000
1470.0	15,000
1476.0	15,000
1482.0	15,000
1488.0	15,000
1494.0	15,000
1500.0	15,000

TABLES

EXTERNAL REFERENCE

“Must comply with API 650.”



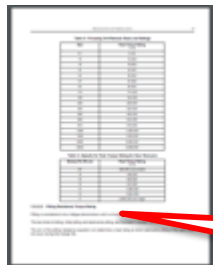


USING THAT DATA IS CHALLENGING

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Data Element

Now What?



References

"Must comply with API 650."

Obtain API 650, and find the relevant section (498 pages)

$$W_2 = \frac{aS_y}{4} \left[1 - \frac{S_y}{4n\pi^2 E} \left(\frac{l}{r} \right)^2 \right]$$

Equations

Table 1—Pumping Unit Reducer Sizes and Ratings

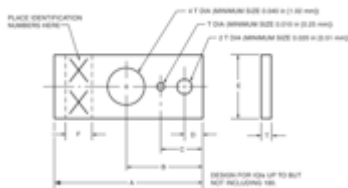
Size	Peak Torque Rating
1/2	15,000
3/4	25,000
1	35,000
1 1/4	55,000
1 1/2	75,000
2	110,000
2 1/2	150,000
3	200,000
3 1/2	250,000
4	300,000
4 1/2	350,000
5	400,000
5 1/2	450,000
6	500,000
6 1/2	550,000
7	600,000
7 1/2	650,000
8	700,000
8 1/2	750,000
9	800,000
9 1/2	850,000
10	900,000
10 1/2	950,000
11	1,000,000
11 1/2	1,050,000
12	1,100,000

Tables of Numbers

Copy manually or rekey into notebook, Word, Excel, Matlab, calculator, software, etc.

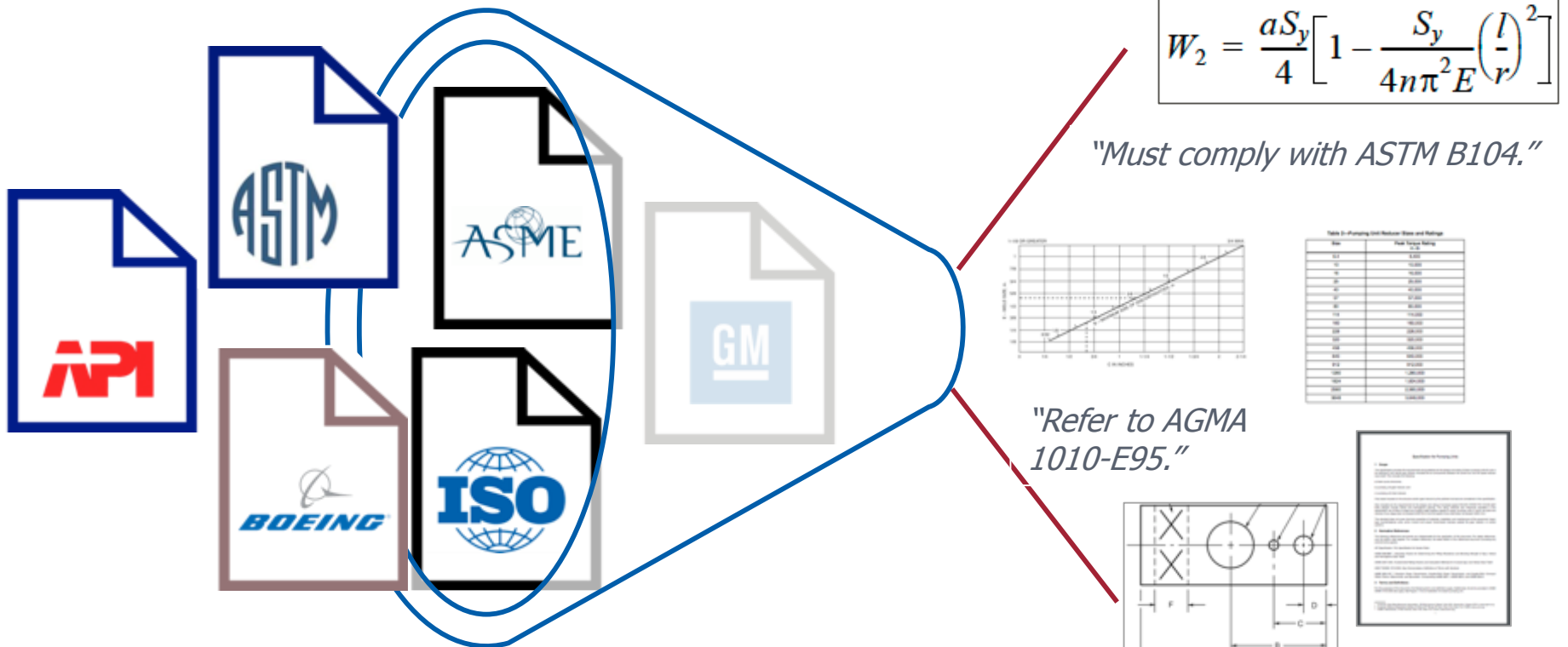
CAD Drawings

Recreate in CAD.





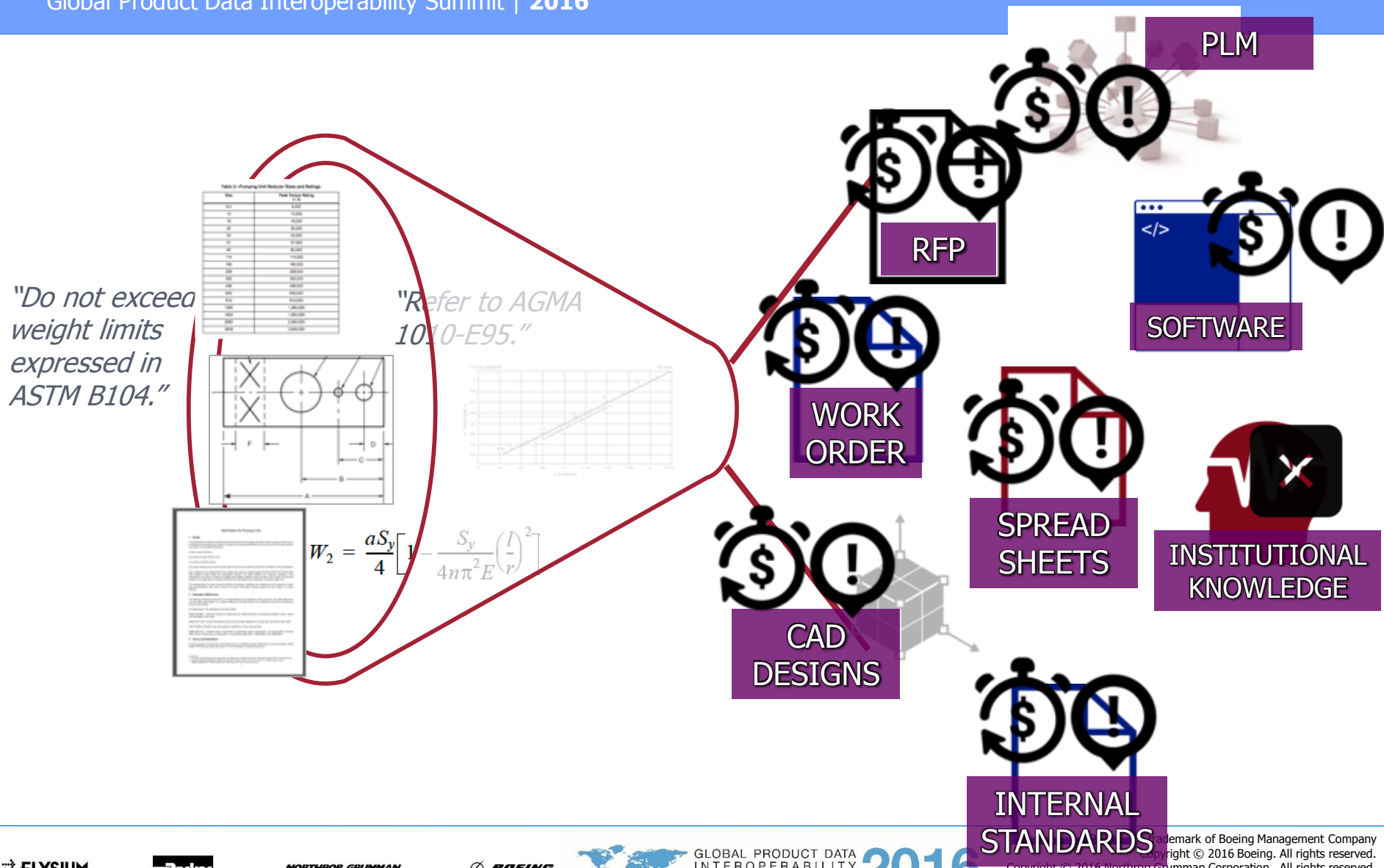
ONE PROJECT, TENS OF DOCUMENTS, THOUSANDS OF DATA ELEMENTS





INTEGRATION IS THE NORM (BUT VERY DIFFICULT)

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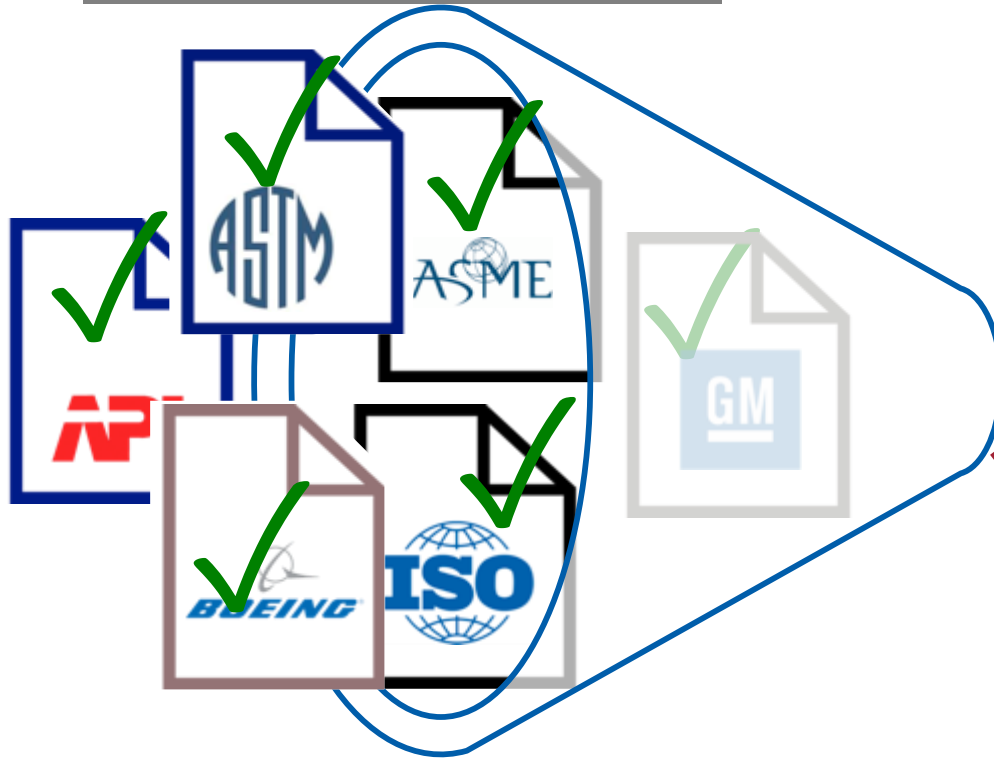




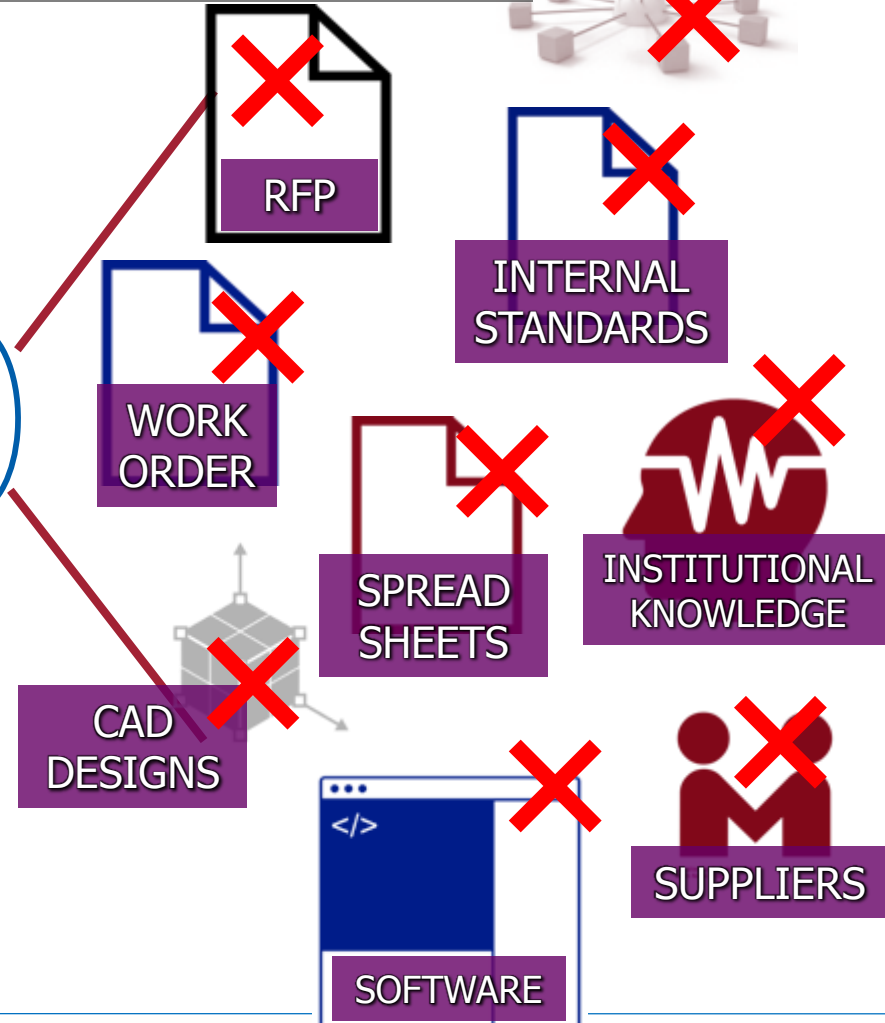
CHANGE MANAGEMENT IS DIFFICULT

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These get updated



But these do not

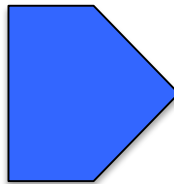


PLM

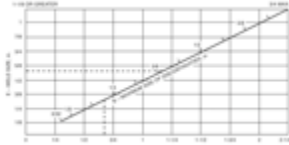


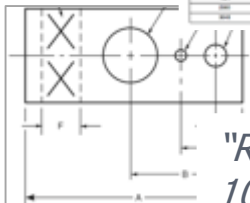
SEARCH VERSUS USAGE

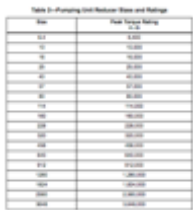
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$$W_2 = \frac{aS_y}{4} \left[1 - \frac{S_y}{4n\pi^2 E} \left(\frac{l}{r} \right)^2 \right]$$








"Refer to AGMA 1010-E95."

"Must comply with ASTM B104."



Search

Ten Minutes

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since 2000**

Navigation, Analysis, Integration

Many hours

SWISS Focus



VERSION COMPARISON IS PAINFUL

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2012 version

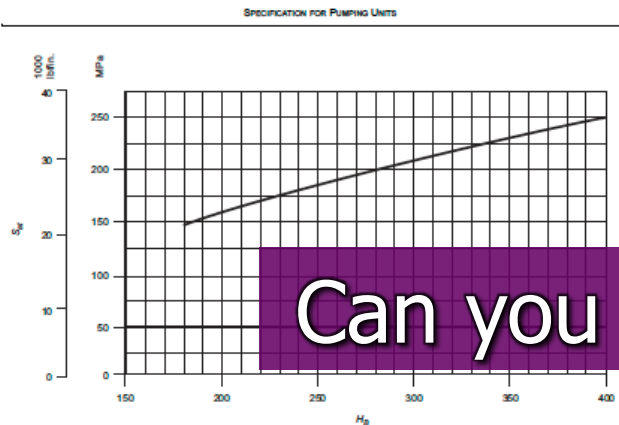


Figure 4—Allowable Bending Fatigue Stress for Through Hardened and Tempered Steel Gears S_{at}

where

Z is the length of line of action in the transverse plane, expressed in inches; and

p_N is the normal base pitch, expressed in inches.

With acceptable gear design, the above value of I_{min}/F is acceptable for a face contact ratio of 1.0 to 2.0. Equation (16) incorporates the expansion of I_p into a more precise equation for C_3 as:

$$C_3 = \left(\frac{\cos \phi + \sin \phi}{2} \right) \left(\frac{m_a}{m_g + 1} \right) \left(\frac{0.95Z}{p_N} \right) \left(\frac{S_w}{C_g} \right)^2 \quad (16)$$

The method used in this specification for determining the geometry factors for pitting resistance I_p is simplified. A more precise and detailed analysis may be made using the method in AGMA 2001-D04 and AGMA 908-B89. The more precise method mentioned previously shall be used for face contact ratios less than 1.0. When I is determined in accordance with AGMA 2001-D04 and AGMA 908-B89 and if $2C_a/(m_g+1)$ is not equal to outside diameter minus two standard addendums, the operating pitch diameter of the pinion in all of the preceding rating equations shall be defined in accordance with AGMA 2001-D04 and AGMA 908-B89.

Incorporating the Equations for C_1 , C_2 and C_3 into Equation (4) gives the following Equation (17) for T_{sa} :

$$T_{sa} = \left(\frac{n_d d^3 C_1}{2n_o} \right) \left(\frac{F}{C_a} k_s \right) \left(I_p \frac{S_w}{C_g} \right)^2 \quad (17)$$

2016 version

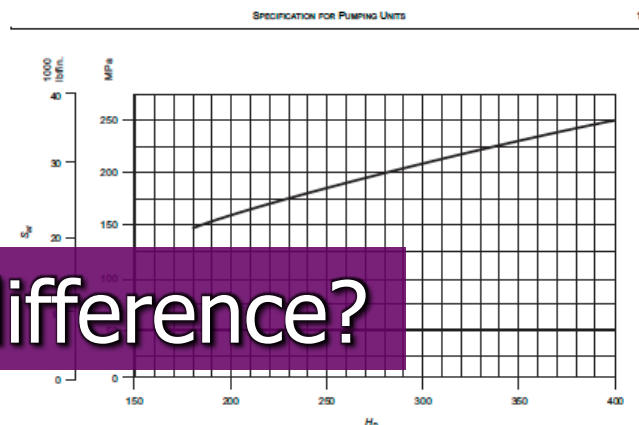


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Can you tell the difference?



WHY SWISS?

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SWISS gives users the knowledge to act, and the ability to make better decisions faster.



SWISS SOLUTION

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- Standards as digital data
- Cloud-based platform of interoperable “data elements”
- Seamless navigation within and between documents
– *right to the section that matters*
- Easy integration into *controlled* Word, Excel, PLM, etc.
- Always up-to-date, always connected to source data



TECHNICAL WORKING GROUP

60 members, 20 orgs

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