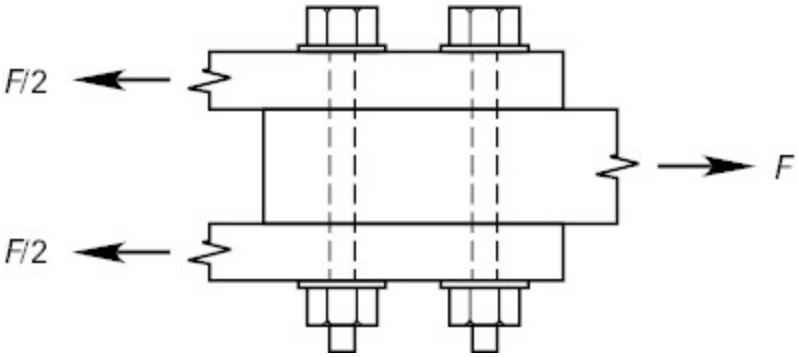
Problem 28

Return to Questions (/admin/questions/0?sfield=magento_id&stext=0000004663&sdka=&stype=&sdiff=)

Test Bank Question preview

Question

The bolted joint shown is designed to carry a shear force of 12,000 lbf and to yield before the force exceeds 20,000 lbf. Characteristics of candidate bolts are listed in the table. There are no threads in the shear plane. Which size bolt best meets the design specifications?



size (in)	major diameter (in)	minor diameter (in)	yield strength (lbf/in^2)	tensile strength (lbf/in^2)
$^1/_4$	0.2500	0.1887	57,500	74,500
$^3/_8$	0.3750	0.2983	57,500	74,500
$^1/_2$	0.5000	0.4056	57,500	74,500
$^5/_8$	0.6250	0.5135	57,500	74,500

Answers

(A) $^1/_4$ in

(B) $^3/_8$ in

(C) $^1/_2$ in

(D) $^5/_8$ in

QUESTION DATA

Vendor
0000004663
Solving Time

Difficulty
easy
Quantitative?
Yes
Status
Active
Created On
04/28/2020
04:37:56 PM
Published On
04/28/2020
04:37:56 PM
Modified On
09/10/2020
11:06:49 PM

OTHER VERSIONS

10/23/2019
08:18:16 PM
(/admin
/questions
/preview/25092)

10/31/2019
09:03:33 PM
(/admin
/questions
/preview/45317)

The answer is (B).

Solution

Content in blue refers to the NCEES Handbook.

Calculate total shear area. The bolts are loaded in double shear.

$$A_s = (2 \text{ bolts}) \left(2 \frac{\text{surfaces}}{\text{bolt}}\right) \left(\frac{\pi}{4} d^2\right) = \pi d^2$$

Per the maximum shear stress theory, under the conditions described for the bolts, yielding occurs whenever the maximum shear is greater than or equal to half the yield strength. [Ductile Materials]

Using the maximum shear stress theory, determine the maximum shear strength.

Ductile Materials

$$\begin{aligned} t_{\max} \geq \frac{S_y}{2} &= S_s \\ S_s &= \frac{57{,}500 \frac{\text{lbf}}{\text{in}^2}}{2} \\ &= 28{,}750 \text{ lbf/in}^2 \end{aligned}$$

Determine the force that the pattern can support with each bolt size.

Bolted and Riveted Joints Loaded in Shear

$$\begin{aligned} \tau &= \frac{F}{A} = S_s \\ F &= S_s A_s \end{aligned}$$

size (in)	maximum shear strength, S_{us} (lbf/in^2)	cross-sectional area, A_s (in^2)	force supported, F (lbf)
$^1/_4$	28,750	0.1963	5,644
$^3/_8$	*28,750*	*0.4418*	*12,702*
$^1/_2$	28,750	0.7854	22,580
$^5/_8$	28,750	1.2272	35,282

11/06/2019 11:57:21 PM (/admin /questions /preview/45346)

04/16/2020 11:39:45 PM (/admin /questions /preview/45802)

04/28/2020 04:37:56 PM (/admin /questions /preview/49318)

DISCIPLINES

PE Civil: Construc (/admin/questions /index?sfield=disc stext=PE Civil: Construction)

PE Mechanical: Machine Design a Materials (/admin /questions /index?sfield=disc stext=PE Mechar Machine Design a Materials)

KNOWLEDGE AREAS

Material Quality Control and Production (/adm /questions /index?sfield=area stext=Material Quality Control ar Production)

Problem 29

Test Bank

Return to Questions (/admin/questions/0?sfield=magento_id&stext=0000004662&sdka=&stype=&sdiff=)

Question preview

Question

A nut tightened on a permanently installed, zinc-coated 1″-8UNC-2A bolt develops the full ~~105,000 lbf/in^2 proof stress.~~ Most nearly, what amount of torque is required to tighten the nut to full ~~proof load?~~

Answers

(A) 1000 ft-lbf

(B) 1300 ft-lbf

(C) 1500 ft-lbf

(D) 2400 ft-lbf

The answer is (A).

Solution

Content in blue refers to the NCEES Handbook.

Calculate the bolt force at the proof stress.

Torque Requirements

$$\begin{aligned} F_p &= A_t S_p = \left(0.606 \text{ in}^2\right)\left(105{,}000 \frac{\text{lbf}}{\text{in}^2}\right) \\ &= 63{,}630 \text{ lbf} \end{aligned}$$

The torque coefficient factor is 0.20 for zinc. [Torque Coefficient (Surface Finish) Factor K]

The connection is permanent, so the torque required to tighten the nut is

Torque Requirements

$$\begin{aligned} F_i &= 0.90 F_p \\ &= (0.90)\left(63{,}630 \text{ lbf}\right) \\ &= 57{,}267 \text{ lbf} \end{aligned}$$

Torque Requirements

$$\begin{aligned} T &= K F_i d \\ &= \frac{(0.20)\left(57{,}267 \text{ lbf}\right)(1 \text{ in})}{12 \frac{\text{in}}{\text{ft}}} \\ &= 955 \text{ ft-lbf} \quad (1000 \text{ ft-lbf}) \end{aligned}$$

QUESTION DATA

Vendor
0000004662
Solving Time

Difficulty
easy
Quantitative?
Yes
Status
Active
Created On
05/13/2020 06:19:36 PM
Published On
05/13/2020 06:19:36 PM
Modified On
09/10/2020 11:06:49 PM

OTHER VERSIONS

10/23/2019 08:18:16 P (/admin/questions/prev

05/13/2020 06:19:36 P (/admin/questions/prev

DISCIPLINES

PE Civil: Construction (/admin/questions/inde sfield=discipline&stext= Civil: Construction)

PE Mechanical: Machi Design and Materials (/admin/questions/inde sfield=discipline&stext= Mechanical: Machine Design and Materials)

KNOWLEDGE AREAS

Material Quality Contro and Production

Problem 58

Return to Questions (/admin/questions/0?sfield=magento_id&stext=0000142357&sdka=&stype=&sdiff=)

Test Bank

Question preview

Question

(*Point and click*) A project consists of seven distinct activities designated as A through G. The precedence chart for the project is shown.

activity	follows	duration (days)
A		15
B		10
C	A	20
D	B	6
E	B	2
F	C, D	5
G	E, F	8

What is the critical path and duration for this project?

Answers

(A) B-D-G-finish (24 days)

(B) A-B-E-G -finish (39 days)

(C) A-C-F-G-finish (48 days)

(D) A-B-C-D-E-F-G-finish (66 days)

The answer is (C).

Solution

The critical path through this diagram is A-C-F-G-finish. The length of this path is 15 days + 20 days + 5 days + 8 days = 48 days.

QUESTION DATA

Vendor
0000142357
Solving Time

Difficulty
easy
Quantitative?
Yes
Status
Active
Created On
02/20/2020 12:58:43 AM
Published On
02/20/2020 12:58:43 AM
Modified On
09/10/2020 11:11:02 PM

OTHER VERSIONS

10/23/2019 08:18:18 P (/admin/questions/prev

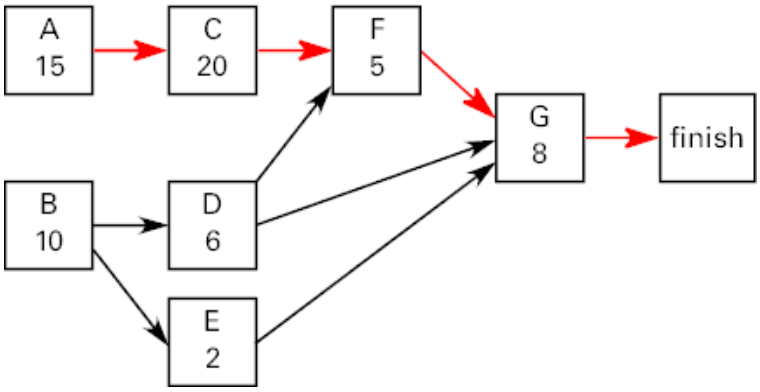
02/20/2020 12:58:43 A (/admin/questions/prev

DISCIPLINES

FE Civil (/admin/questions/inde sfield=discipline&stext= Civil)

FE Electrical and Computer (/admin/questions/inde sfield=discipline&stext= Electrical and Compute

FE Environmental (/admin/questions/inde



sfield=discipline&stext=
Environmental)

FE Mechanical
(/admin/questions/inde
sfield=discipline&stext=
Mechanical)

FE Other Disciplines
(/admin/questions/inde
sfield=discipline&stext=
Other Disciplines)

PE Chemical
(/admin/questions/inde
sfield=discipline&stext=
Chemical)

PE Civil: Construction
(/admin/questions/inde
sfield=discipline&stext=
Civil: Construction)

PE Mechanical: HVAC
and Refrigeration
(/admin/questions/inde
sfield=discipline&stext=
Mechanical: HVAC and
Refrigeration)

PE Mechanical: Machi
Design and Materials
(/admin/questions/inde
sfield=discipline&stext=
Mechanical: Machine
Design and Materials)

PE Mechanical: Therm
and Fluid Systems
(/admin/questions/inde
sfield=discipline&stext=
Mechanical: Thermal a
Fluid Systems)

PE Civil: Geotechnical
(/admin/questions/inde
sfield=discipline&stext=
Civil: Geotechnical)

PE Civil: Structural
(/admin/questions/inde
sfield=discipline&stext=
Civil: Structural)

sfield=area&stext=Eco
Considerations)

Estimating Quantities a
Costs
(/admin/questions/inde
sfield=area&stext=Esti
Quantities and Costs)

Basic Engineering
Practice
(/admin/questions/inde
sfield=area&stext=Bas
Engineering Practice)

Project Planning
(/admin/questions/inde
sfield=area&stext=Proj
Planning)

Applications - Associat
Engineering Principles
(/admin/questions/inde
sfield=area&stext=App
- Associated Engineeri
Principles)

Applications
(/admin/questions/inde
sfield=area&stext=App

Construction Cost Esti
(/admin/questions/inde
sfield=area&stext=Con
Cost Estimates)

Project Costs and
Budgeting
(/admin/questions/inde
sfield=area&stext=Proj
Costs and Budgeting)

Process Design
(/admin/questions/inde
sfield=area&stext=Proc
Design)

PRODUCTS USED IN
PEMEMD2EX
PEMEHVQB
PEMETSQB
PEMEMDQB