

Project No. II

Due April 26th, 2018

Consider working for a company that engineers, designs, and produces heavy machine parts. Most parts are single unit or small quantity production and entail extensive weldments. The company is relatively small, and you are one of only a few engineers employed by this company. Recently, this company secured a new contract to manufacture large scale pressure vessels. The nature of producing these pressure vessels is such that they attain more and more weight as the production nears its end of one such unit – due to the fact that most parts of the pressure vessels are welded and bolted on. The machine shop of your company is not equipped to hoist and transport these vessels through the shop due to not having access to an overhead crane, which is used for another contract. Your manager contacted a number of crane suppliers and received quotations for jib-wall mounted cranes. Your manager in particular investigated ‘C’, ‘H’, and ‘T’ versions of jib-wall mounted cranes. However, as the contract for pressure vessels is such that only a few of these are manufactured at a time, the cost of procuring such a crane was deemed to be too excessive. In addition, your manager believes that you can engineer such a crane for the company, as the company has the machinery to produce it.



Figure 1: Jib-crane, wall mounted, ‘T’ version, using the I beam of the structure as mast¹.

¹ http://www.expo21xx.com/cipmedia/20177/22_e.jpg

Your assignment is to design a jib-wall mounted crane with a given set of specifications (as outlined in an email to you). The engineering work requested includes the following items:

- Familiarize yourself with ASME BTH-1-2005 standard, which is the governing standard for this project.
- Generate the basic design to meet geometric specifications, meeting ASME BTH-1-2005 standard.
- Strength computations.
- Detailed trolley, beam structure, pivot assembly, and hoist assembly design.
- Weldment calculations and specifications for the machine shop to produce the jib crane.
- Computation of bearings, bolts, and any other machine part you may need for the design.
- Specification (include exact information of vendor etc.) of hoist motor.
- Drawings of all parts with dimensions, tolerances, and production specifications
- Detailed cost of each component

Tasks and Timeline:

1. Read through ASME BTH-1-2005. Familiarize yourself with the project and the given specification for your design. Develop any questions you may have on the assignment. You will post your questions on March 29th, 2018 during class time.
2. Develop a concept design and compute the static loading requirements, the bending moments, shear force, and associated diagrams (completed by April 5th, 2018).
3. Design trolley, beam structure, pivot assembly, and hoist assembly etc., (April 12th, 2018).
4. Perform weldment, bearing, bolts, etc. computations, and select bearing as well as hoist motor, (April 19th, 2018)
5. Generate drawing files with all technical information (dimensions, tolerances, surface conditions, weldments, etc.). Include all details and consider the manufacturing process when making the drawings.
6. Do a detailed cost estimates (document each of your references for each estimation, don't guess!)
7. Submit a final report with all details of your design as a hard copy as well as via email as a pdf file by April 26th, 2018.

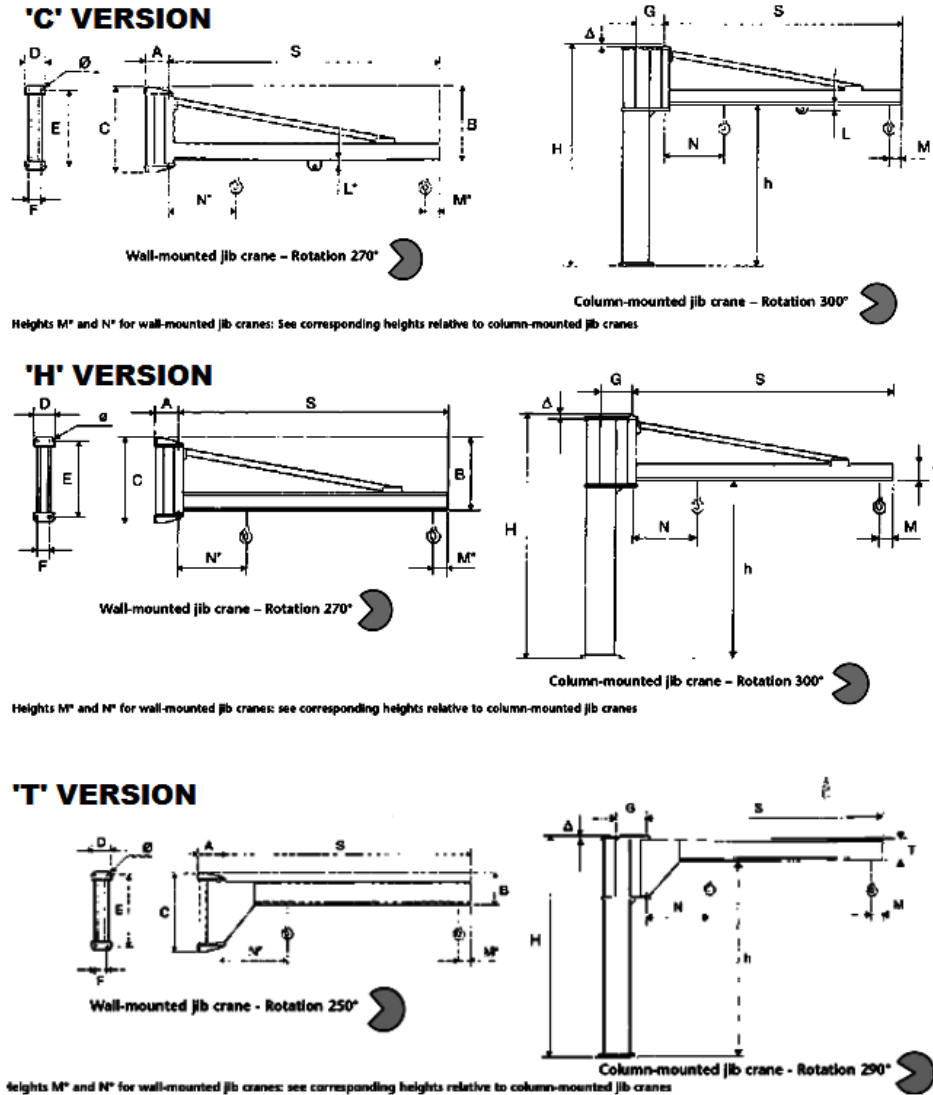


Figure 2: Type definition for jib-cranes².

Specifications:

The 'C' type jib crane accommodates the trolley run inside the boom by using folded sheet metal. Capacity of 'C' type jib cranes are up to 1000 kg and the span is somewhere between 2m and 7m. The 'T' type jib crane uses a 'T' beam as its boom. The capacity of these type of cranes range up to 2000kg and due to the missing support structure are limited in range, in example the span can reach up to 5m. The 'H' type jib crane uses an 'H' beam to accommodate the hoist. As these cranes are sturdier, they can span up to 8m in length, and have a capacity of up to 2000kg.

² <https://www.liftinggeardirect.co.uk/donati-gba-gbp-manually-rotated.html>

Table 1: Specifications for individual assignments of wall mounted jib cranes.

Number	Type	Capacity [kg]	Span	Rotation	Travelling mode	Slewing mode	Height h
C1	C	900	6m	270°	manually	motor	8m
C2	C	600	6.25m	270°	motor	manually	8m
C3	C	650	7m	270°	motor	manually	8m
C4	C	700	6.75m	300°	manually	motor	8m
C5	C	750	6.75m	300°	manually	motor	8m
C6	C	800	6.5m	270°	motor	manually	8m
C7	C	850	6.75m	270°	motor	manually	8m
H1	H	1950	7m	270°	manually	motor	10m
H2	H	1950	7m	270°	motor	manually	10m
H3	H	1850	7.25m	270°	motor	manually	10m
H4	H	1850	7.25m	300°	manually	motor	10m
H5	H	1800	7.5	300°	manually	motor	10m
H6	H	1800	7.5m	270°	motor	manually	10m
H7	H	1750	8m	270°	motor	manually	10m
T1	T	1950	4.5m	270°	manually	motor	10m
T2	T	1950	4.5m	270°	motor	manually	10m
T3	T	1850	4.5m	270°	motor	manually	10m
T4	T	1850	4.75m	300°	manually	motor	10m
T5	T	1800	4.75m	300°	manually	motor	10m
T6	T	1800	5m	270°	motor	manually	10m
T7	T	1750	5m	270°	motor	manually	10m