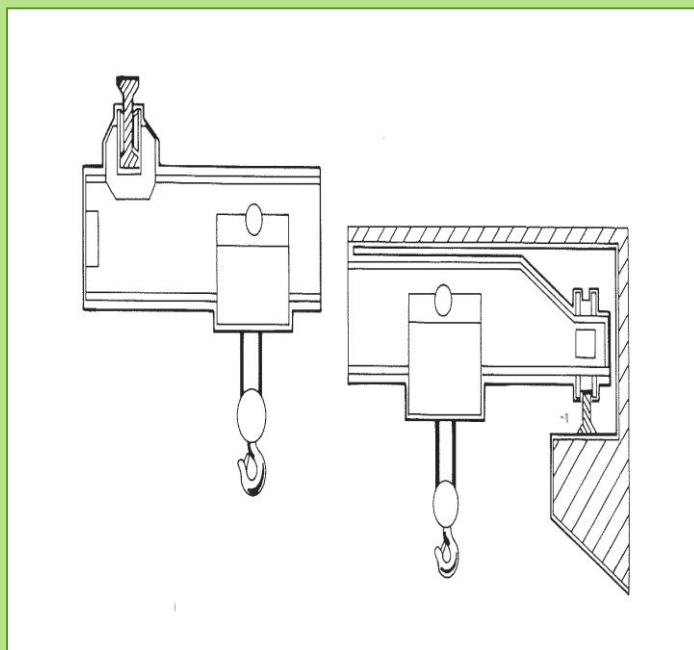
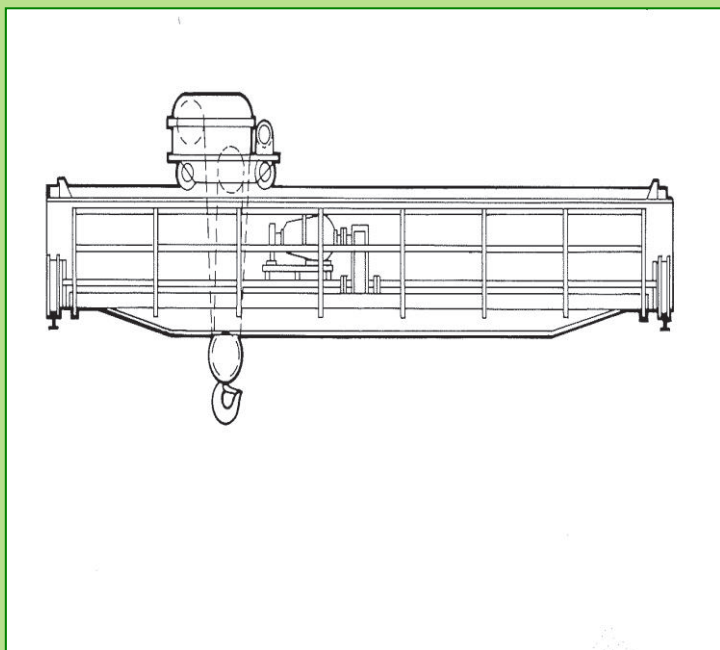


Buyer's Guide Companion for Top Running Bridge & Gantry Multiple Girder Cranes and Top Running & Under Running Single Girder Electric Traveling Cranes

Prepared by
The Crane Manufacturers Association of America, Inc

70 & 74



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Buyer's Guide Companion

This Guide, which was developed by the Crane Manufacturers Association of America, Inc. ("CMAA"), an affiliated trade association of the Material Handling Industry ("MHI"), provides guidance about the proper selection of crane and hoist systems and covers various issues about such a system's terminology, usage, and more. It was developed with the sole intent of offering information to parties engaged in selecting and purchasing such a crane or hoist system. This Guide is advisory only and should only be regarded as a simple tool that a potential user or buyer may or may not choose to follow, adopt, modify, or reject. The following information does not constitute a comprehensive safety program, cannot guard against pitfalls in operating, selecting and purchasing such a system, and should not be relied upon as such. Such a program should be developed, and an independent adviser should be consulted to do so.

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Buyer's Guide Companion – Multiple Girder Cranes

1. Is the crane designed per CMAA specifications?
 - a. This Specification has been developed by the Crane Manufacturers Association of America, Inc. (CMAA), an organization of leading electric overhead traveling crane manufacturers in the United States, for the purpose of promoting standardization and providing a basis for equipment selection. In addition to Specifications, the publication contains information which should be helpful to the purchasers and users of cranes and to the engineering and architectural professions.
2. Are design stresses in accordance with CMAA Specifications?
 - a. CMAA provides guidelines for stresses in the structural members of the crane. These guidelines include factors to enable the crane to properly operate for the application for which it was designed, including normal load cases.
3. Are Welding (Design, Fabrication, Testing and Welder) Qualifications in accordance with AWS D14.1?
 - a. AWS (American Welding Society) D14.1 provides specific guidelines for welding materials on cranes or other material handling equipment. This specification includes considerations for joint configurations, fatigue and workmanship of the welds so that they are performed properly.
4. Are static/dynamic load factors and load combinations consistent with CMAA requirements?
 - a. Consider static and dynamic load factors so that the crane is designed with the correct design factor.
5. Are calculated stresses within limitations/guidelines?
 - a. Designing a crane where allowable stresses are within the limits of CMAA specifications can increase the service life of the crane based on its class of service.
6. Have the allowable stress ranges based on class of service been considered (fatigue)?
 - a. Static stresses are often encountered in the design of cranes. Fatigue must also be considered during the design to reduce premature failure of cyclically loaded components.
7. Girder design – Proportional requirements, Factors of Safety on buckling consistent with CMAA?
 - a. Compression, as well as tension, must be considered in crane girder design. Using the guidelines and limits established by CMAA will enable the crane to be designed to reduce the likelihood of buckling failures.
8. Girder deflection per CMAA specifications (1/888)
 - a. CMAA recommends minimum deflection of the bridge beam(s) to avoid load handling problems due to trolley drift and cab operator discomfort.
9. Are foot walks designed for 50psf live load?
 - a. Foot walks should be designed with proper loads (pounds per square foot) so that they function properly when used. Under-designed foot walks can result in excessive deflection causing uneasiness or distress when used by personnel.
10. Are structural bolted joints designed in accordance with CMAA requirements?



- a. CMAA requires compliance with ASTM-A325 or ASTM-A490 for all structural connections which is consistent with American Institute of Steel Construction (AISC) requirements.
11. Hook design factor min 5:1 based on ultimate strength
 - a. Hooks must be sized so that the ultimate strength is five times greater (5:1 Design Factor) than the rated load capacity. Lower factors could increase the likelihood of premature failure.
12. Is the Wire Rope Design Factor a minimum 5:1?
 - a. Wire ropes must be sized so that any combination of the rope diameter and construction has a breaking strength at least five times greater (5:1 design factor) than the rated load capacity plus the weight of the load block for standard cranes. Cranes that lift molten materials should have wire ropes with a breaking strength of eight times greater (8:1 Design Factor). Lower factors may reduce the expected lifespan of the rope due to fatigue and other stress factors.
13. Type of wire rope and size
 - a. Wire rope is available in different grades of steel including stainless. It is important to select the proper material for the application and environment where the wire rope will be used.
14. Hoist rope fleet angle per CMAA specifications?
 - a. Fleet angle is the angle of the rope as it approaches the grooves of a drum or sheave. Excessive fleet angles may accelerate wear on the rope, sheaves and drum and could increase localized stresses on the rope itself.
15. Hoist meeting or exceeding the guide for minimum pitch diameter of running sheaves
 - a. CMAA has recommended minimum "diameter ratios" based on the construction of the wire rope that determines the allowable pitch diameter for sheaves and drums for a given wire rope size. These minimum ratios have been shown to increase wire rope service life based on the crane service class and may result in fewer wire rope replacements.
16. Pitch diameter of equalizer sheaves per CMAA specifications
 - a. See 15.a above
17. Hoist drum meet minimum pitch diameter per CMAA specifications
 - a. See 15.a above
18. Gearing designed to AGMA 2001-C95 and service factor consistent with class of service
 - a. The American Gear Manufacturers Association (AGMA) standards provide criteria regarding the fatigue life, durability, and other factors influencing gear survival. Gears designed for a higher life expectancy may have a reduced frequency of gear failure.
19. Bearings consistent with duty cycle selected
 - a. CMAA has recommendations for bearing life that are based on the class of service (duty cycle) of the crane. As the class of service increases from Class "A" to Class "F," the bearing life increases accordingly.
20. Brake mechanical and thermal ratings consistent with CMAA requirements and class of service.
 - a. As the class of service or duty cycle of the crane or hoist increases, the brake ratings must increase to provide a design factor consistent with crane service classification.
21. Shafting design per CMAA specifications



- a. By following CMAA specifications, proper shaft design may reduce premature shaft failure due to fatigue or other factors. An improperly designed shaft may be a hazard in that the shaft could fail and could eliminate the brake from the system.
- 22. Allowable wheel loads per CMAA specifications
 - a. CMAA recommends allowable maximum wheel loads for a given wheel diameter, rail size and hardness of the wheel. If wheels are overloaded, the wheel life could be shortened due to premature wheel wear.
- 23. Bumpers sized per CMAA specifications
 - a. Bumpers are designed to absorb impact loading. Properly sized bumpers per CMAA specifications can reduce damage to both the crane runway system and crane in the event of accidental collisions with runway end stops or other cranes. This also applies to bumpers for trolleys.
- 24. Panel and interconnect wiring per NEC 610
 - a. CMAA specifications recognize Article 610 of The National Electric Code (NEC), which regulates electrical design including things such as minimum conductor (wire) sizing, fusing guidelines, grounding, short circuit devices, overload devices, etc. The NEC recognizes hazards to persons and property arising from the use of electricity.
- 25. Motors designed per NEMA MG-1 or IEC.
 - a. Motors that are certified under NEMA MG-1 or IEC motors comply with rules regarding service conditions, standard dimensions and tolerances, duty rating and more. The use of motors constructed to these standards will improve their reliable operation and service life.
- 26. Motors appropriate for use with VFD (if applicable)
 - a. Motors designed for use with variable frequency drives (VFD) are typically referred to as Inverter Duty Motors. These motors have minimum requirements for insulation design that reduce the likelihood of premature failure due to heat or other factors.
- 27. Motor HP requirements calculated per CMAA for class of service
 - a. CMAA provides horsepower calculations to correctly size the motor per the duty classification of the crane, which can result in longer service life.
- 28. Controls sized for class of service
 - a. Controls (i.e. contactors, inverters, etc.) should be sized to the appropriate service class and application requirements. Components in controls that are not sized properly could result in premature failure.
- 29. Short circuit devices & overload devices per NEC 610
 - a. See 24.a above
- 30. 4th Runway Electrification Ground Bar:
 - a. The National Electric Code was updated in 2005 to require a separate bonding (ground) conductor for all new cranes.
- 31. Rail Sweeps
 - a. Rail sweeps are designed to reduce the likelihood of debris entrapment hazards under the travel wheels. They are necessary to comply with OSHA standards to reduce the likelihood of damage to the wheel were it to run over an object.



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Buyer's Guide Companion – Single Girder Cranes

1. Is the crane designed per CMAA specifications?
 - a. This Specification has been developed by the Crane Manufacturers Association of America, Inc. (CMAA), an organization of leading electric overhead traveling crane manufacturers in the United States, for the purpose of promoting standardization and providing a basis for equipment selection. In addition to Specifications, the publication contains information which should be helpful to the purchasers and users of cranes and to the engineering and architectural professions.
2. Are design stresses in accordance with CMAA Specifications?
 - a. CMAA provides guidelines for stresses in the structural members of the crane. These guidelines include factors to enable the crane to properly operate for the application for which it was designed, including normal load cases.
3. Are Welding (Design, Fabrication, Testing and Welder) Qualifications in accordance with AWS D14.1?
 - a. AWS (American Welding Society) D14.1 provides specific guidelines for welding materials on cranes or other material handling equipment. This specification includes considerations for joint configurations, fatigue and workmanship of the welds so that they are performed properly.
4. Are static/dynamic load factors and load combinations consistent with CMAA requirements?
 - a. Consider static and dynamic load factors so that the crane is designed with the correct safety factor.
5. Are calculated stresses within limitations/guidelines?
 - a. Designing a crane where allowable stresses are within the limits of CMAA specifications can increase the service life of the crane based on its class of service.
6. Have the allowable stress ranges based on class of service been considered (fatigue)?
 - a. Static stresses are often encountered in the design of cranes. Fatigue must also be considered during the design to reduce premature failure of cyclically loaded components.
7. Girder design – Proportional requirements, Factors of Safety on buckling consistent with CMAA?
 - a. Compression, as well as tension, must be considered in crane girder design. Using the guidelines and limits established by CMAA will enable the crane to be designed to reduce the likelihood of buckling failures.
8. Girder deflection per CMAA specifications (1/888)
 - a. CMAA recommends minimum deflection of the bridge beam(s) to avoid load handling problems due to trolley drift.
9. Are structural bolted joints designed in accordance with CMAA requirements?
 - a. CMAA requires compliance with ASTM-A325 or ASTM-A490 for all structural connections which is consistent with American Institute of Steel Construction (AISC) requirements.
10. Is the hoist designed per ASME B30.16 and applicable HST hoist performance standard?



- a. A hoist designed in accordance with ASME B30.16 conforms to a variety of design criteria applying to the construction, installation, inspection, and testing of the hoist. ASME B30.16 applies to hoists that will be used on single girder cranes only.
- 11. Load suspension parts of hoist designed to 5:1 based on ultimate strength
 - a. Load suspension parts should also be sized so that the ultimate strength is five times greater (5:1 Design Factor) than the rated load capacity. Lower factors could increase the likelihood of premature failure.
- 12. Is the Wire Rope Design Factor a minimum 5:1?
 - b. Wire ropes should be sized so that any combination of the rope diameter and construction has a breaking strength at least five times greater (5:1 design factor) than the rated load capacity plus the weight of the load block for standard cranes. Cranes that lift molten materials should have wire ropes with a breaking strength of eight times greater (8:1 Design Factor). Lower factors may reduce the expected lifespan of the rope due to fatigue and other stress factors.
- 13. Type of wire rope or chain and size
 - b. Wire rope and chain are available in different grades of steel including stainless. It is important to select the proper material for the application and environment where the wire rope or chain will be used.
- 14. Hoist meeting or exceeding the guide for minimum pitch diameter of running sheaves
 - b. CMAA has recommended minimum “diameter ratios” based on the flexibility of the wire rope that determines the allowable pitch diameter for sheaves and drums for a given wire rope size. These minimum ratios have been shown to increase wire rope service life based on the crane service class and may result in fewer wire rope replacements.
- 15. Bearings consistent with duty cycle selected
 - b. CMAA has recommendations for bearing life that are based on the class of service (duty cycle) of the crane. As the class of service increases from Class “A” to Class “D,” the bearing life increases accordingly.
- 16. Brake mechanical and thermal ratings consistent with HST hoist performance requirements and class of service.
 - a. As the class of service or duty cycle of the crane or hoist increases, the brake ratings must increase to provide a design factor consistent with crane service classification.
- 17. Shafting design per CMAA specifications
 - b. By following CMAA specifications, proper shaft design may reduce premature shaft failure due to fatigue or other factors. An improperly designed shaft may be a hazard in that the shaft could fail and could eliminate the brake from the system.
- 18. Allowable wheel loads per CMAA specifications
 - b. CMAA recommends allowable maximum wheel loads for a given wheel diameter, rail size and hardness of the wheel. If wheels are overloaded, the wheel life could be shortened due to premature wheel wear.
- 19. Bumpers sized per CMAA specifications
 - b. Bumpers are designed to absorb impact loading. Properly sized bumpers per CMAA specifications can reduce damage to both the crane runway system and



crane in the event of accidental collisions with runway end stops or other cranes. This also applies to bumpers for trolleys.

20. Panel and interconnect wiring per NEC 610
 - b. CMAA specifications recognize Article 610 of The National Electric Code (NEC), which regulates electrical design including things such as minimum conductor (wire) sizing, fusing guidelines, grounding, short circuit devices, overload devices, etc. The NEC recognizes hazards to persons and property arising from the use of electricity.
21. Motors designed per NEMA MG-1 or IEC.
 - b. Motors that are certified under NEMA MG-1 or IEC motors comply with rules regarding service conditions, standard dimensions and tolerances, duty rating and more. The use of motors constructed to these standards will improve their reliable operation and service life.
22. Motor HP requirements calculated per CMAA for class of service
 - b. CMAA provides horsepower calculations to correctly size the motor per the duty classification of the crane, which can result in longer service life.
23. Controls sized for class of service
 - b. Controls (i.e. contactors, inverters, etc.) should be sized to the appropriate service class and application requirements. Components in controls that are not sized properly could result in premature failure.
24. Short circuit devices & overload devices per NEC 610
 - b. See 20.a above
25. 4th Runway Electrification Ground Bar:
 - b. The National Electric Code was updated in 2005 to require a separate bonding (ground) conductor for all new cranes.
26. Rail Sweeps
 - b. Rail sweeps are designed to reduce the likelihood of debris entrapment hazards under the travel wheels. They are necessary to comply with OSHA standards to reduce the likelihood of damage to the wheel were it to run over an object.

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