CRANE MANUFACTURERS ASSOCIATION OF AMERICA, INC.

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CMAA Specification No. 74 - 2020

SINGLE GIRDER CRANES

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CMAA SPECIFICATION NO. 74-2020
SPECIFICATIONS FOR TOP RUNNING AND UNDER RUNNING SINGLE GIRDER ELECTRIC TRAVELING CRANES UTILIZING UNDER RUNNING TROLLEY HOIST

INTRODUCTION

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. The use of this Specification should not limit the ingenuity of the individual manufacturer but should provide guidelines for technical procedure.

In addition to Specifications, the publication contains information which could be helpful to the purchasers and users of cranes and to the engineering and architectural professions. While much of this information must be of a general nature, it may be checked with individual manufacturers, and comparisons may be made, leading to the selection of the proper equipment.

These Specifications consist of nine Sections, as follows:

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SUMMARY OF CHANGES SINCE THE 2015 REVISION OF SPECIFICATION #74

Article 1.4.1.1.1, 1.4.1.2.1	Runway rail cleanliness
Table 1.4.1-1	Modification of runway rail straightness and elevation
Article 1.4.2	Anchorage / Restraints Devices
Article 1.5.4, 5.11	Runway/bridge conductors combined in one article
Article 1.7	Revision of section
Article 1.7.3	FEA design statement
Article 3.3.2.5.3	Addition of in service wind load to collision load case
Article 3.4.4.3	Corrected error in formula
Article 3.4.7	Addition of load case for fatigue
Article 3.5.1	Girder proportions
Article 3.5.5	Deflection and camber
Article 3.6.4	End truck deflection
Article 3.10	Restraint Devices
Article 5.2.1.3.1	Motor design for inverter applications
Article 5.5.6	Dynamic braking resistors in conductive dust
Article 5.4.7.5	Practices inside enclosures (new)
Article 5.4.7.6	Practices outside enclosures (new)
Article 5.4.7.7	Suppression devices (new)
Article 5.5.5 & 5.13.2	Removed duplication and changed text
Article 5.5.6	Resistors in conductive dust (new)
Article 5.6.10	Modified text (addition of intentional reset)
Figures 5.7.3c, 5.8.1, 5.15.6	Added recommended layouts for cab, pendant and radio
Article 5.9.3.4	Added text for operation with molten metal
Article 5.11.8	Conductor Bar Isolation Sections
Article 5.13.12	Regenerative power considerations
Article 5.13.13	Application of IEEE 519 for cranes
Article 5.15	Wireless data (new)
Article 5.18	Magnet controls (new)
Article 5.19	Rail clamps (new)

Appendix	Added appendix for non-mandatory crane design information

Glossary	Anchorage
Glossary	Common mode failure
Glossary	Conductive dust
Glossary	Critical load drop
Glossary	EMC
Glossary	EMI
Glossary	Hazardous locations
Glossary	Intentional reset
Glossary	Magnet
Glossary	Magnet controller
Glossary	Plain Reversing Control changed for Reversing Control
Glossary	Regenerative power system
Glossary	Restraint
Glossary	RFI
Glossary	Modified Undervoltage Protection definition

CMAA SPECIFICATION INTERPRETATION REQUEST PROCEDURE

A request for interpretation of CMAA's specifications is to be designated as an "Action Alert Inquiry."

Only written inquiries about interpretations and the applicability of CMAA Specifications 74 will be given a response by the CMAA Engineering and Safety Advocacy Workgroup. CMAA does not provide: design guidance, design critique, advice, comments on non-CMAA documents, etc. Inquiries of this nature, if received, will be declined.

Send all written requests for interpretation of Specifications 70, 74 and 78, identifying the particular Specification and the Section numbers in question via email to cmaa-info@mhi.org or via Fax to 704-676-1199 to the attention of CMAA.

Interpretation requests must identify the sender by name, title, company name, address and telephone number and be on company letterhead. They must also be specific and concise.

The following is the CMAA procedure for processing and responding to interpretation requests.

1. CMAA assigns an Action Alert Inquiry number to each written inquiry.
2. CMAA immediately forwards the inquiry to the CMAA Engineering Vice President. Based on the nature and substance of the inquiry, the Vice President selects either a non-balloted or balloted response. Non-balloted responses generally will be selected for simple obvious replies and for inquiries to be declined. Inquiries for interpretation of CMAA Specifications 70, 74 and 78 will be balloted.
3. Response time for inquiries typically range from one week to one month, if balloted.

This Specification is accompanied by explanatory commentaries.

The commentaries in this Specification are not a part of the Specification and do not constitute a formal interpretation of the Specification (which can be obtained only through requests as indicated above). The commentaries, therefore, solely reflect the personal opinions of the editor or other contributors and do not necessarily represent the official position of CMAA or its technical committees.

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74-1 GENERAL SPECIFICATIONS

1.1. SCOPE

1.1.1. These Specifications shall be known as the Specifications for Top Running and Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist. CMAA Specifications No. 74 - Revised 2020.

1.1.2. The Specifications and information contained in this publication apply to top running and under running single girder electric overhead traveling cranes utilizing under running trolley hoist except patented track. It should be understood that the Specifications are general in nature and other Specifications may be agreed upon between the purchaser and the manufacturer to suit each specific installation. ***These Specifications do not cover equipment used to lift, lower or transport personnel suspended from the hoist rope system.***

1.1.3. These Specifications outline, in Chapter 74-2, four different classes of crane service as a guide for determining the service requirements of the individual application. In many cases, there is no clear category of service in which a particular crane operation may fall, and the proper selection of a crane can be made only through a discussion of service requirements and the crane details with the crane manufacturer or other qualified persons.

1.1.4. Service conditions have an important influence on the life of the wearing parts of a crane such as wheels, gears, bearings, and electrical equipment, and must be considered in specifying a crane to assure maximum life and minimum maintenance.

1.1.5. In selecting overhead crane equipment, it is important that not only present but future operations be considered which may increase loading and service requirements and that equipment be selected which will satisfy future increased service conditions, thereby minimizing the possibility of overloading or placing in a duty classification higher than intended.

1.1.6. Parts of these Specifications refer to certain portions of other applicable Specifications, codes or standards. Where interpretations differ, CMAA recommends that these Specifications be used as the guideline. Mentioned in the text are publications of the following organizations:

AGMA — American Gear Manufacturers Association
1001 N. Fairfax Street, Suite 500
Alexandria, VA 22314-1587

ANSI/AGMA 2001-D04 (R2010) Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth

ANSI/AGMA 2000-A88 Gear Classification and Inspection Handbook – Tolerances and Measuring Methods for Unassembled Spur and Helical Gears

ANSI/AGMA 2015-1-A01 Accuracy Classification System – Tangential Measurements for Cylindrical Gears

AISC — American Institute of Steel Construction
One East Wacker Drive, Suite 700
Chicago, IL 60601-1802

AISC 9th Edition ASD

AIST — Association for Iron and Steel Technology
186 Thorn Hill Rd
Warrendale, PA 15086

Technical Report TR-01-1991

ANSI — American National Standards Institute
25 West 43rd Street
New York, NY 10036

ANSI A14.3-2008 – Safety Requirements for Fixed Ladders and Workplace Surfaces

ANSI B17.1-1967 – Keys and Keysets

ANSI C84.1-2011 – Electric Power Systems and Equipment Voltage Ratings (60 Hz)

ASCE — The American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, VA 20191

ASCE/SEI 7-10 - Minimum Design Loads for Buildings and Other Structures

ASME	American Society of Mechanical Engineers Two Park Avenue New York, NY 10016-5990
	ASME B30.11-2010- Monorails and Underhung Cranes
	ASME B30.16-2017 - Overhead Hoists (Underhung)
	ASME B30.17-2015 - Overhead and Gantry Cranes (Top Running, Single Girder, Underhung Hoist)
ASTM	American Society of Testing and Materials 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428-2959
AWS	American Welding Society 8669 NW 36 Street, #30 Miami, FL 33166-6672
	D14.1-97 - Specifications for Welding Industrial and Mill Cranes and Other Material Handling Equipment
CMAA	Crane Manufacturers Association of America, Inc. 8720 Red Oak Blvd., Suite 201 Charlotte, NC 28217-3996
	Overhead Crane Inspection and Maintenance Checklist
	Crane Operator's Manual
	Crane Operator's Training Video
ECMA	Electrification and Controls Manufacturers Association 8720 Red Oak Blvd., Suite 201 Charlotte, NC 28217-3996
	ECMA 15 2018 – Specification for Cable-less Controls for Electric Overhead Traveling Cranes
	ECMA 25 2019 – Specification for AC Inverters for use on Electric Overhead, Monorail, and Gantry Traveling Cranes
	ECMA 35-2018 - Electrification Systems for Electric Overhead Traveling Cranes
IEEE	Institute of Electrical and Electronic Engineers 445 Hoes Lane Piscataway, NJ 08854
	IEEE Standard 519-2014 - Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
	IEEE Standard 141-1993 – Recommended Practice for Electric Power Distribution for Industrial Plants
NEC	National Electric Code (NFPA 70)
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, MA 02269-7471
	NFPA 70 – National Electrical Code, 2014 Edition
	NFPA 780 - Standard for the Installation of Lightning Protection Systems
NEMA	National Electrical Manufacturers Association 1300 North 17th Street, Suite 900 Arlington, VA 22209
	ICS 1-2000 (R2005, R2008) - Industrial Control Systems and Electrical Requirements
	NEMA MG-1-2011 Motors and Generators
OSHA	U.S. Department of Labor Directorate of Safety Standards Program 200 Constitution Avenue, N.W. Washington, DC 20210

29 CFR Part 1910 - Occupational Safety & Health Standards for General Industry (Revised 7/1/97)

Peterson's Stress Concentration Factors
Walter D. Pilkey
2nd Edition; 1997
Copyright John Wiley & Sons, Inc.

OR

Walter D. Pilkey & Deborah F. Pilkey
3rd Edition; 2008

1.1.7. The hoist and trolley may be supplied by the crane manufacturer or by the purchaser. In either case, the hoist and trolley shall comply with ASME B.30.16, Overhead Hoists (Underhung). If the hoist and/or trolley are supplied by the purchaser, the crane builder shall be provided with certified dimensional drawings with all required data, including wiring diagrams, trolley connector locations, and trolley hoist weight. This CMAA Specification #74 does not apply to the hoist and/or trolley.

1.2. BUILDING DESIGN CONSIDERATIONS

1.2.1. The building in which an overhead crane is to be installed must be designed with consideration given to the following points:

1.2.1.1. The distance from the floor to the lowest overhead obstruction must be such as to allow for the required hook lift, plus the distance from the saddle or palm of the hook in its highest position to the high point on the crane, plus clearance to the lowest overhead obstruction.

1.2.1.2. In addition, the distance from the floor to the lowest overhead obstruction must be such that the lowest point on the crane will clear all machinery or when necessary provide railroad or truck clearance under the crane.

1.2.1.3. After determination of the building height, based on the factors above, the crane runway must be located with the top of the runway rail at a distance below the lowest overhead obstruction equal to the height of the crane plus clearance.

1.2.1.4. Lights, pipes, or any other objects projecting below the lowest point on the building truss must be considered in the determination of the lowest overhead obstruction.

1.2.1.5. The building knee braces must be designed to permit the required hook approaches.

1.2.1.6. Access to the cab or bridge walkway should be a fixed ladder, stairs, or platform requiring no step over any gap exceeding 12 inches. Fixed ladders shall be in accordance with ANSI A14.3-2008, Safety Requirements for Fixed Ladders.

1.3. CLEARANCE

1.3.1. Clearance shall be maintained between the crane and the building, as well as cranes operating at different elevations, under all normal operating conditions. In the design of new cranes, all factors that influence clearance, such as roof / ceiling deflection, girder camber, trolley positions and configurations shall be considered. As a minimum, the clearance between the highest point of the crane and the lowest overhead obstruction shall not be less than 3 inches with the crane unloaded. Pipes, conduits, lights, etc., must not reduce this clearance.

1.3.2. Clearance shall be maintained between the crane and the building, as well as parallel running cranes, under all normal operating conditions. In the design of new cranes, all factors that influence clearance, such as wheel float, bridge skewing, or trolley positions and configurations shall be considered. As a minimum, the clearance between the end of the crane and the closest side obstruction shall not be less than 2 inches with crane centered on runway rails. Pipes, conduits, lights, etc., must not reduce this clearance.

1.3.3. Where passageways or walkways are provided on the structure supporting the crane, obstructions on the supporting structure shall not be placed so that personnel will be struck by movement of the crane. The accuracy of building dimensions is the responsibility of the owner or specifier of the equipment.

1.4. CRANE RUNWAY

1.4.1. The crane runway, runway rails, and crane stops are typically furnished by the purchaser unless otherwise specified. The crane stops furnished by the purchaser are to be designed to suit the specific crane to be installed.

1.4.1.1. Top Running Runway

1.4.1.1.1. Rails shall be straight, parallel, free of paint on the wheel running surface, level, at the same elevation and at the specified center to center distance, within the tolerances given in Table 1.4.1-1.