

\*\*\*\*\*  
USACE / NAVFAC / AFCEA UFGS-14534N (September 1999)  
-----

Preparing Activity: NAVFAC Replacing without revision  
NFGS of same number and date

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

\*\*\*\*\*

### SECTION TABLE OF CONTENTS

#### DIVISION 14 - CONVEYING SYSTEMS

#### SECTION 14534N

#### MONORAILS WITH MANUAL HOIST

09/99

#### PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 VERIFICATION OF DIMENSIONS
- 1.3 SUBMITTALS
- 1.4 QUALITY ASSURANCE
  - 1.4.1 Certifications: Load Chain
  - 1.4.2 Design Data: Design Calculations

#### PART 2 PRODUCTS

- 2.1 FABRICATION AND CONSTRUCTION
  - 2.1.1 Capacity
  - 2.1.2 Hook Lift
  - 2.1.3 Hooks
  - 2.1.4 Trolley
  - 2.1.5 Load Chain
  - 2.1.6 Load Hooks and Load Hook Components
    - 2.1.6.1 Hook
- 2.2 MONORAIL TRACK BEAM SYSTEM
  - 2.2.1 Patented Track
  - 2.2.2 Track Suspension
    - 2.2.2.1 Cataloged Products
    - 2.2.2.2 Design
    - 2.2.2.3 Suspension of Curves and Switches
    - 2.2.2.4 Sway Bracing
    - 2.2.2.5 Lock Nuts
    - 2.2.2.6 Multiple Suspension Devices
  - 2.2.3 Identification Plates
- 2.3 PAINTING OF SYSTEM

#### PART 3 EXECUTION

- 3.1 ERECTION AND INSTALLATION
- 3.2 FIELD INSPECTION AND TESTS
  - 3.2.1 Pre-Erection Inspection

### 3.2.2 Operational Inspection and Load Tests

-- End of Section Table of Contents --

\*\*\*\*\*  
USACE / NAVFAC / AFCEA UFGS-14534N (September 1999)  
-----  
Preparing Activity: NAVFAC Replacing without revision  
NFGS of same number and date

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

\*\*\*\*\*

### SECTION 14534N

#### MONORAILS WITH MANUAL HOIST 09/99

\*\*\*\*\*

NOTE: This guide specification covers the requirements for monorails with manual hoists.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

\*\*\*\*\*

\*\*\*\*\*

NOTE: This guide specification is not to be used for monorail systems that operate in hazardous areas as defined in the National Electrical Code or for nonstandard monorail systems or for the monorail systems that handle hot metals or fissionable materials. All procurement of such monorail systems shall be forwarded to the Northern Division, Naval Facilities Engineering Command, Attn: 09A4, Crane Center, 10 Industrial Highway, Mail Stop #82, Lester, PA 19113-2090. (See NAVFAC Instruction 11450.1 of 24 June 1983).

Monorail systems procurement that does not fall within the options of this specification should be forwarded to the Northern Division, Naval Facilities Engineering Command, Attn: 09W, Crane Center, 10 Industrial Highway, Mail Stop #82, Lester, PA 19113-2090. (See NAVFAC Instruction 4330.17C.)

\*\*\*\*\*

## PART 1 GENERAL

### 1.1 REFERENCES

\*\*\*\*\*  
NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.  
\*\*\*\*\*

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2004) Structural Welding Code - Steel

#### ASME INTERNATIONAL (ASME)

ASME B30.11 (1998) Monorails and Underhung Cranes

ASME HST-2 (1999; R 2004) Hand Chain Manually Operated Chain Hoists

ASME HST-3 (1999; R 2004) Manually Lever Operated Chain Hoists

#### ASTM INTERNATIONAL (ASTM)

ASTM A 275/A 275M (2003) Magnetic Particle Examination of Steel Forgings

#### MONORAIL MANUFACTURERS ASSOCIATION (MMA)

MMA MH27.1 (2003) Underhung Cranes and Monorail Systems

### 1.2 VERIFICATION OF DIMENSIONS

The Contractor shall verify all building dimensions that relate to fabrication of the monorail system, and shall notify the Contracting Officer of any discrepancy before the order to the monorail manufacturer is finalized.

### 1.3 SUBMITTALS

\*\*\*\*\*  
NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some

submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

\*\*\*\*\*

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

[[\_\_\_\_\_] will review and] [\_\_\_\_\_] Division, Naval Facilities Engineering Command will approve submittals requiring special review in this section.

#### SD-02 Shop Drawings

Track beam system; G

Submit drawings showing the general arrangement of the track beam system, including curves and switches, clearances, principal dimensions, details of structural connections, and all component details. Manufacturer's catalog data will suffice for items of standard manufacturer.

#### SD-05 Design Data

Structural design calculations; G

#### SD-06 Test Reports

Hook and hook nut magnetic-particle tests; G

Monorail system load tests; G

#### SD-07 Certificates

Manual hoist load chain

## SD-10 Operation and Maintenance Data

Track beam system, Data Package 2; G

Hoist and trolley, Data Package 2; G

Submit in accordance with Section 01781 OPERATION AND  
MAINTENANCE DATA.

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Certifications: Load Chain

Submit factory certification of load chain rated capacity.

#### 1.4.2 Design Data: Design Calculations

Submit design calculations verifying the size of structural members, structural support fittings, rods, brackets, components, and lifting beams for the track beam system. The calculations shall include stress and loading diagrams. Submit calculations with monorail drawings.

## PART 2 PRODUCTS

### 2.1 FABRICATION AND CONSTRUCTION

Provide manual hoist and trolley, ASME HST-2, ASME HST-3, trolley suspension. Trolley and wheels shall be suitable for operation on the steel monorail track beam provided, and shall have not less than four wheels.

#### 2.1.1 Capacity

\*\*\*\*\*  
NOTE: Standard hoist capacities 1/4, 1/2, 1, 1-1/2,  
2, 3, 4, 5, and 6 metric tons tons.  
\*\*\*\*\*

The hoist shall have a minimum rated capacity of [\_\_\_\_\_] metric tons tons.  
The monorail system shall have a minimum rated capacity of [\_\_\_\_\_] metric tons tons.

#### 2.1.2 Hook Lift

\*\*\*\*\*  
NOTE: Do not specify a longer lift range than  
required, as this will increase the building height  
and hoist cost. The average lift for manual hoist is  
2400 mm 8 feet. However, longer lifts are  
commercially available at additional cost per foot.  
Chain containers should be provided for lifts over  
3000 mm 10 feet.  
\*\*\*\*\*

Shall be the manufacturer's standard. [The hoist lift shall be at its highest point a minimum of [\_\_\_\_\_] m feet above the finished floor and at its lowest point a minimum of [\_\_\_\_\_] m feet below the finished floor.]

### 2.1.3 Hooks

Shall be of the safety type with hook nuts keyed to hook shanks by means of a setscrew installed in a plane parallel to the longitudinal axis of the hook shank, or by any other similar easily removable securing device. All hook components shall be magnetic-particle inspected over the entire area in accordance with ASTM A 275/A 275M. The acceptance standard shall be one of no defects. A defect is defined as a linear indication revealed by magnetic-particle inspection that is greater than 3 mm 1/8 inch long whose length is equal to or is greater than three times its width.

### 2.1.4 Trolley

Shall be designed to operate from [[\_\_\_\_\_] track beam section] [the track beam section furnished under this contract]. Where two or more hoists are located on the same monorail beam, the trolleys shall be equipped with rubber bumper devices designed to prevent contact of any part or parts of the hoists.

\*\*\*\*\*  
NOTE: For LANTNAVFACENGCOM, add the following  
paragraphs.  
\*\*\*\*\*

### 2.1.5 Load Chain

High strength steel links, flexible; minimum safety factor of 5 to 1 based on ratio of minimum chain breaking load to the calculated load on the chain when the hoist is assumed loaded to rated capacity. Certification from hoist manufacturer of provided chain's breaking strength shall be submitted to Contracting Officer and approved prior to final acceptance of hoist. Do not paint or coat the load chain.

### 2.1.6 Load Hooks and Load Hook Components

#### 2.1.6.1 Hook

Forged steel; complete with spring-loaded steel throat opening safety device. The hook shall be carried on suitably sealed or shielded anti-friction thrust bearings and shall swivel freely through 360 degrees rotation with full load without twisting chain.

- a. Disassembly. Hook and hook nut shall be capable of complete disassembly that enables access to all surfaces of the hook, including shank and hook nut for inspection purposes. Provision shall be made for the hook nut, or other hook-to-block fastener, to be keyed to hook shank by means of a set screw or similar, easily removable, securing device.
- b. Hook Non-Destructive Test. Each hook, including shank and hook nut, shall be inspected over the entire surface areas by magnetic particle inspection. If hook nut is not used, any device that functions the same as the hook nut shall be inspected by magnetic particle inspection.

(1) Procedure: Magnetic particle inspection shall be conducted in accordance with ASTM A 275/A 275M. This inspection shall be conducted at the factory of the hook manufacturer or hoist manufacturer. Alternately, a recognized independent testing lab

may conduct the inspections if equipped and competent to perform such a service, and if approved by the Contracting Officer.

(2) Acceptance Criteria: Defects found on the hook or hook nut shall result in rejection of defective items for use on furnished hoist. For this inspection, a defect is defined as a linear or non-linear indication for which the largest dimension is greater than 3 mm 1/8 inch. Weld repairs for defects on hook or hook nut will not be permitted.

(3) Test Report: A test report of the magnetic particle inspection of each hook and hook nut provided shall be submitted to and approved by the Contracting Officer prior to final acceptance of hoist installation. Test reports shall be certified by the testing organization.

## 2.2 MONORAIL TRACK BEAM SYSTEM

\*\*\*\*\*  
NOTE: For LANTNAVFACENGCOM, substitute bracketed paragraphs.  
\*\*\*\*\*

\*\*\*\*\*  
NOTE: When there is one hoist on one monorail system, the monorail system capacity and the hoist capacity will be comparable. When there is more than one hoist on the monorail system, the capacity of the monorail system should be comparable to the sum of the individual rated hoist capacity with the following exceptions:

1. There are positive monorail track beam stops to restrict the approach of the hoists.

2. Calculations indicate that at the point of closest approach of the hoists, with rated capacity load on the hoists, the monorail track beam and monorail support points (and appurtenances) are not loaded in excess of the load condition imposed by any one hoist with rated load in any location. Should conditions 1 and 2 exist, then the capacity of the monorail system may be comparable to the capacity of the highest rated individual hoist in the monorail track system. Do not specify a monorail system of greater capacity than required, as this will increase the system cost.

\*\*\*\*\*

[Comply with MMA MH27.1 except as modified and supplemented herein.]

### 2.2.1 Patented Track

Provide specially designed trackage, e.g., patented track beam, curves, and switches constructed from welded steel components. The lower flange of the track section shall have flat wheel treads; minimum lower flange width of 80 mm 3.25 inches; chemical composition of 0.45 to 0.60 percent carbon content, 0.60 to 1.1 percent manganese content; and wheel treads shall be hardened to a minimum Brinell Hardness Number of 225. Upper flange and web



of the track section shall be steel, continuously welded together or provided as one monolithic piece.

#### 2.2.2 Track Suspension

Provide means of suspending the monorail track system, including curves and switches from the structural supports indicated on the drawings. The suspension system shall be the sole responsibility of the track supplier; however, design shall be subject to the requirements specified herein.

##### 2.2.2.1 Cataloged Products

If possible, provide track manufacturer's standard cataloged devices for connection of the track to the indicated supporting structures. If track manufacturer's cataloged devices are not provided for this suspension system, complete shop drawings and calculations for the custom suspension device shall be submitted for review and approval by the Contracting Officer. Track suspension devices which are not the track manufacturer's cataloged products shall meet the additional requirements specified in Section 05500 METAL: MISCELLANEOUS AND FABRICATIONS.

##### 2.2.2.2 Design

The suspension system shall be designed and constructed to ensure no impairment of the strength of track or the structural support. A hanger or suspension shall be located at each rack splice joint. [Provide bracing to hold track sections in rigid alignment at all joints.]

##### 2.2.2.3 Suspension of Curves and Switches

Provide steel framing (structural supports), in addition to that indicated, as required by monorail curve and switch manufacturer to support curves and switches. The additional steel framing shall be the sole responsibility of the monorail supplier. Submit shop drawings and framing design calculations to the Contracting Officer for approval.

##### 2.2.2.4 Sway Bracing

Where the track is suspended from hanger rods, track shall be braced laterally and longitudinally to prevent sway.

##### 2.2.2.5 Lock Nuts

Where the track is suspended from hanger rods, lock nuts or other means shall be provided to prevent the nuts from backing off the rods.

##### 2.2.2.6 Multiple Suspension Devices

Where more than one suspension device attached to the track at a single point, the suspension devices shall be provided so that the loads shall be induced in each in proportion to the device's size.

#### 2.2.3 Identification Plates

Provide identification plates of noncorrosive metal. Information and data on the plates shall include, in clearly legible permanent lettering, the manufacturer's name, model number, capacity rating, and other essential information. In addition, the monorail track beam system shall be furnished with identification plates showing the capacity of the system,

which shall be legible from the floor and from either side of the monorail track beam.

## 2.3 PAINTING OF SYSTEM

Provide manufacturer's standard painting or shop painting of components specified in this section; comply with the requirements specified in Section 15050N BASIC MECHANICAL MATERIALS AND METHODS. Do not paint, coat, or galvanize load chain, load, hook nut, or load chain sheave.

## PART 3 EXECUTION

### 3.1 ERECTION AND INSTALLATION

\*\*\*\*\*  
NOTE: Supervisory erection services should be required only on projects with extensive monorail systems; when not applicable this sentence should be deleted.  
\*\*\*\*\*

The Contractor shall erect and install the hoist trolley and monorail system in accordance with manufacturers written instructions, MMA MH27.1, and the contract drawings. [The monorail supplier shall provide supervisory erection services.] [Welding new sections of monorail track to existing shall conform to AWS D1.1/D1.1M.]

### 3.2 FIELD INSPECTION AND TESTS

#### 3.2.1 Pre-Erection Inspection

Before erection, the Contractor [and the manufacturer's representative] shall [jointly] inspect the monorail and hoist systems and components at the job site to determine compliance with specifications and manufacturer's data and shop drawings as approved. The Contractor shall notify the Contracting Officer [\_\_\_\_\_] days before the inspection.

#### 3.2.2 Operational Inspection and Load Tests

Upon completion, and before final acceptance, the hoist, trolley, and monorail shall be given the rated load test specified in ASME B30.11, carrying 125 percent (plus 5 percent, minus 0 percent) of the rated capacity, and with the units spaced to obtain maximum possible loads in the monorail track beam systems. Hoists shall hold a static, as well as control a dynamic, 125 percent rated load. The systems shall be thoroughly tested in service to determine that each component of the system operates as specified, is properly installed and adjusted, and is free from defects in material, manufacture, installation, and workmanship. The Contractor shall furnish test loads, operating personnel, instruments, and all other necessary apparatus at no additional cost to the Government. The test and final adjustments of the equipment will be under the supervision of the Contracting Officer. The Contractor shall rectify any deficiencies found and completely retest work affected by such deficiencies.

-- End of Section --