****
USACE / NAVFAC / AFCESA **UFGS-11290 (August 2004)**

Preparing Activity: USACE **Superseding UFGS-11290A (March 2004)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

****

SECTION TABLE OF CONTENTS

DIVISION 11 - EQUIPMENT

SECTION 11290

WIRE ROPE FOR GATE OPERATING DEVICES

08/04

-- End of Section Table of Contents --

****

USACE / NAVFAC / AFCESA | **UFGS-11290 (August 2004)**

Preparing Activity: USACE | **Superseding UFGS-11290A (March 2004)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

****

SECTION 11290

WIRE ROPE FOR GATE OPERATING DEVICES
08/04

****

NOTE: This guide specification covers the requirements for supplying and installing wire rope (new or replacement) needed by gate operating devices (i.e. spillway gates, tainter gates, etc.)

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.

****

PART 1 GENERAL

****

NOTE: This guide specification is based on the assumption that a single contractor will be responsible for supply and installation of the wire rope. Please refer to US Army Corps of Engineers Engineer Manual 1110-2-3200 Wire Rope Selection Criteria for Gate-Operating Devices prior to editing this section. It is recommended that the designer talk with wire rope manufacturers to get their consensus that the proposed wire rope type can be manufactured and used successfully.

If a specification is needed only for supply of wire rope, or for installation of wire rope, there are example specifications included in the appendices of US Army Corps of Engineers Engineer Manual

1110-2-3200 Wire Rope Selection Criteria for Gate-Operating Devices. It is also assumed the wire rope is for replacement for a gate operating device. Paragraphs written in regard to removal of existing wire rope, and cleaning drums and sheaves would need to be deleted if the application is for a new installation.

****

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.

ASTM INTERNATIONAL (ASTM)

ASTM A 148/A 148M	(2003) Steel Castings, High Strength, for Structural Purposes
ASTM A 351/A 351M	(2003) Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2003) Safety -- Safety and Health Requirements

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-W-410	(Rev E) Wire Rope and Strand

WIRE ROPE TECHNICAL BOARD (WRTB)

WRTB	(1993) Wire Rope Users Manual

1.2 SUMMARY

In general, the Contractor shall perform the following work in regard to the operating devices for [one] [two] [three] [_____] [spillway] [tainter] [_____] gates [at the _____ Project]: [remove the existing wire rope,] furnish new wire rope, and install the new wire rope. The Contractor shall provide all manufacturing facilities, tools, equipment, personnel, and expertise to accomplish this work. [The [_____] Project is located on the [_____] River approximately [_____] km miles [north] [east] [south] [west] [_____] of the city of [_____].]

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] [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:

SD-01 Preconstruction Submittals

Work Plan[; G][; G, [_____]]

Work plan shall include:
Schedule for delivery
Schedule for installation
Removal plan for old wire rope
Installation plan for new wire rope
Plan for tensioning wire ropes

Safety Plan[; G][; G, [_____]]

Safety plan for accident prevention, as specified.

SD-02 Drawings

End Terminations[; G][; G, [_____]]

Fabrication drawings, as specified.

SD-03 Product Data

Lubrication[; G][; G, [_____]]

Brand/specifications for factory and field lubricant.

Pre-Stretching[; G][; G, [_____]]

Pre-Stretching Procedure.

End Termination Attachment Method[; G][; G, [_____]]

Attachment method for end terminations, as specified.

Wire Rope Manufacturer's Qualifications[; G][; G, [_____]]

Wire rope manufacturer's qualification statement.

Installation Supervisor's Qualifications[; G][; G, [_____]]

Istallation supervisor's qualification record.

SD-06 Test Reports

Tension Testing[; G][; G, [_____]]

Rope tension test report.

Attaching and Proof Loading Terminations[; G][; G, [_____]]

Proof load of terminations test report and measured rope lengths.

Wire Strength and Ductility[; G][; G, [_____]]

Wire strength and ductility test results.

Pre-forming[; G][; G, [_____]]

Verification of pre-forming test results.

Stress Relief[; G][; G, [_____]]

Stress relief verification test results.

Zinc Coating[; G][; G, [_____]]

Zinc coat test results.

End Terminations[; G][; G, [_____]]

Materials properties test for casting end terminations.

SD-07 Certificates

Type of Wire Rope[; G][; G, [_____]]

Wire material certification.

Tension Testing Equipment[; G][; G, [_____]]

Certification of rope tension testing device.

1.4 WIRE ROPE MANUFACTURER'S QUALIFICATIONS

The wire rope shall be the standard product of a manufacturer regularly engaged in the manufacture of wire rope, and shall essentially duplicate products having been in satisfactory use for at least 3 years prior to bid opening.

1.5 INSTALLATION SUPERVISOR'S QUALIFICATIONS

The Contractor shall as a minimum, have a supervisor at the site experienced in the installation of wire rope. The supervisor shall have performed work similar to that required in this contract on at least three occasions. The Supervisor's experience shall be submitted and approved before work at the site may begin.

[1.6 SITE VISIT

It is highly recommended that bidders visit the site before submitting bids. Drawings and verbal descriptions cannot fully describe the effort required to satisfactorily complete the contract work. [A pre-bid site visit, between the dates of [_____] and [_____] can be arranged by contacting [_____] at telephone number [_____].] [See Section [_____] for site visit arrangements.]

]1.7 INSPECTIONS

The Contractor shall be prepared to accommodate up to two representatives of the Contracting Officer to witness the various manufacturing processes for the wire rope. At a minimum, a site visit will be made to witness the tension test, and the wire rope will be inspected upon delivery. Inspection during removal of the existing wire rope and installation of the new wire rope will be ongoing.

1.8 VERIFY DIMENSIONS

The Contractor shall become familiar with the details of the work, verify dimensions in the field, and immediately advise the Contracting Officer of any discrepancies before performing any work.

1.9 DELIVERY, STORAGE AND HANDLING

The wire ropes shall be wound on spools in the same direction as they were bent during manufacturing. The spools shall be covered for protection from rain, snow and road spatter during shipping. After delivery, the wire ropes shall be stored in well ventilated enclosures in the Contractor's storage area, so that they will be protected from the elements.

1.10 WARRANTY

****

NOTE: Designer should contact wire rope manufacturers to determine the extent of manufacturer's warranties available. Warranties may vary with type of rope and application.

****

At the completion of the project, the Contractor shall furnish signed copies of a [1][_____] year[s] warranty for all materials and services provided under this section.

PART 2 PRODUCTS

2.1 WIRE ROPE AND SOCKET

2.1.1 Quantity

The Contractor shall furnish [[_____] wire ropes with end terminations (sockets) at both ends. Each wire rope shall be of the length indicated on Drawing No. [_____], and within the tolerance also indicated on that drawing.] [[_____] meters feet of wire rope. The wire rope shall be wound on reels in lengths such that [_____] sections, each with a length of [_____] meters feet will be available for use, as splicing will not be allowed.]

2.1.2 Type of Wire Rope

****

NOTE: Selection should be based on EM 1110-2-3200.

****

The wire rope shall be of the following type:

a. Strand configuration: [6x19 Seale] [7x19 Seale] [6x26 Warrington Seale Swaged] [_____].

****

NOTE: This, particulary the advantages of lang lay wire rope, is discussed in more detail in EM 1110-2-3200.

****

b. Lay: [right, regular] [left, regular] [right, lang] [left, lang] (In many Corps applications existing regular lay wire rope would best be replaced by lang lay wire rope.

c. Diameter: [_____] mm inch, with a tolerance of - 0 and plus 5 percent

d. Finish: [galvanized] [plain]

****

NOTE: Stainless steel wire ropes tends to abrade on itself when wrapped on disk-layered drums. Some manufacturers are questioning the wisdom of making regular lay stainless steel wire rope with flattened strands, as the cold-working tends to be excessive and weaken the rope. Stress relieving to alleviate the cold working can be difficult and inconsistent with the stainless steels.

****

e. Material: [extra improved plow steel] [AISI 302 stainless] [AISI 304 stainless] [_____]

****
NOTE: It is not recommended that fiber core be used for a gate lifting device.
****

f. Core type: independent wire rope core

****
NOTE: There is no reason not to preform.
****

g. Pre-formed: [yes] [no]

2.1.3 Pre-Stretching

****
NOTE: In the following paragraphs the manufacturer is tasked with some testing, etc. This is intentional, as personnel who are familiar with the required procedures should perform these tasks.

Pre-stretching is highly recommended for installations with multi-rope drums, because initial stretch in the wire ropes tends to be uneven. Pre-stretching will likely result a more equal tension between the ropes. It is also recommended for other wire rope so that final length after use will be closer to length at the time of installation.
****

The manufacturer shall pre-stretch the [wire rope.] [wire ropes before attaching their end terminations.] This shall be done by subjecting them to three cycles at 40 percent of its nominal strength. The 40 percent loads shall be held for 5 minutes with 5 percent loads for 5 minutes between cycles. The manufacturer may propose a method of dynamic pre-stretching.

2.1.4 Wire Strength and Ductility

The Manufacturer shall perform testing in accordance with FS RR-W-410 to verify wire strength and ductility.

2.1.5 Pre-forming

The wire rope shall be pre-formed, and the manufacturer shall perform testing in accordance with FS RR-W-410 to verify pre-forming.

2.1.6 Stress Relief

The wire rope shall be stress relieved, and the manufacturer shall perform testing in accordance with FS RR-W-410 to verify stress relief.

2.1.7 Weld Distribution

Wire joints in any strand shall not be closer than 450 mm 18 inches in any strand.

2.1.8 Galvanizing

****
NOTE: Wire rope weaved from galvanized wires will have much better resistance to corrosion than un-galvanized wire rope weaved from bare carbon steel. It will also have better resistance to corrosion than wire rope weaved from drawn galvanized wire. However, it will also have a significantly lower strength. If full strength is required, then use wire rope weaved from plain carbon steel or from drawn galvanized wire depending on how important corrosion resistance is. If full strength is not required, but high corrosion resistance is required, use wire ropes weaved from galvanized wire and perform the zinc coat test to verify the zinc thickness. See FS RR-W-410 for information on the rate of zinc coating. Of course stainless steel wire rope would not be galvanized, and this entire paragraph would be deleted.
****

[The wire rope shall be weaved from drawn galvanized wire. That is, the wires shall be galvanized prior to their last drawing operation. The wire rope shall have the same accepted industry standards for nominal strength as it would, had it not been galvanized.] [The wire ropes shall be weaved from galvanized wire. Zinc shall be applied at a rate of [_____] grams per square meter ounces per square foot of wire surface. The manufacturer shall perform testing in accordance with FS RR-W-410 to verify the zinc coating has been applied at the required rate.]

2.1.9 Lubrication

****
NOTE: If specifying stainless steel wire rope, which will rarely be used, it may be best to specify that it not be lubricated. As explained in EM 1110-2-3200, in some cases the presence of a heavy lubricant will increase corrosion on stainless steel wire ropes.
****

[The wire ropes shall be lubricated at the manufacturing facility. The lubricant shall be applied with equipment capable of forcing the lubricant between the rope wires, including the center strand.] [The wire rope shall not be lubricated.]

2.1.10 Pitch Length

Strand pitch length shall not be less than 4-1/2 times the nominal rope diameter.

2.1.11 Core Strand Wires

The number of wires in the core strand shall be equal to or greater than the number of wires in the other strands. The wires shall be of the same material as the wires in the other strands, or of a material with a lower tensile strength.

2.1.12 End Terminations

****
NOTE: EM 1110-2-3200 discusses materials and coatings, and attachment methods for sockets. Note that the wire rope industry usually recommends replacing sockets when replacing wire rope.
****

The wire rope end terminations (sockets) shall be fabricated as indicated on Drawing No. [_____], and shall be cast from [steel conforming to ASTM A 148/A 148M, Grade 105-85] [stainless steel conforming to ASTM A 351/A 351M CF8M] [_____].

2.1.13 Tension Testing

A tension test shall be performed to verify the wire rope meets the accepted industry standards for nominal strength. Two rope samples shall be tested to failure to be sure the expected performance level has been met. The test shall be performed using suitable tension testing equipment and by qualified personnel, both furnished by the Contractor. The rope samples shall cut to no less than 1 meter 3 feet of length. The test will not be considered valid if the failure occurs less than 50 mm 2 inches from either socket or holding mechanism. Relative speed between the machine heads shall not exceed 25 mm 1 inch per minute.

2.1.14 Attaching and Proof Loading Terminations

****
NOTE: EM1110-2-3200 suggests that pre-stretching the wire rope and proof loading the terminations might be accomplished simultaneously. However, for multi-rope drums the wire rope would need to be pre-stretched first to be sure they are closer to their final correct length before attaching the terminations. If the sockets must be attached in the field delete this paragraph.
****

The manufacturer shall attach the end terminations after pre-stretching the wire rope. The end termination attachment method shall be as indicated on Drawing No. [_____]. After their attachment, the wire ropes shall be proof loaded at 40 percent of nominal strength of the rope. Length of the wire ropes shall be measured to the nearest 0.25 mm 0.01 inch at a load of [_____].

2.2 TOOLS, EQUIPMENT AND EXPERTISE

****
NOTE: The last sentence may or may not be needed, or consider propane powered equipment.
****

The Contractor shall furnish all tools and equipment, and expertise needed to perform the specified work. Note that much of the work will take place in areas with limited ventilation, and only electric or air powered tools and equipment will be allowed within those areas (no internal combustion engines).

2.3 LUBRICATION FOR THE FIELD

****
NOTE: If stainless steel wire rope is used, it may be best to delete this paragraph. As explained in EM 1110-2-3200, in some cases the presence of a heavy lubricant will increase corrosion on stainless steel wire ropes.
****

The Contractor shall furnish the lubricant needed to lubricate the wire rope after installation. The Contractor shall submit the proposed type lubricant. The field and factory lubricants shall be compatible.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

This part covers [removal of the existing wire rope] [and] [installation of the new wire rope].

3.2 WORK PLAN

The work required per this specification is of a complicated nature, requiring technical expertise and planning. The Contractor shall submit a work plan, which will indicate how the existing wire rope will be removed and how the new wire rope will be installed, without damaging either existing equipment or the new wire rope. The work plan shall also include a schedule indicating how the work will be accomplished within the time limit of this contract. The work plan shall be submitted and approved before any work can be performed.

3.3 SAFETY PRECAUTIONS/SAFETY PLAN

The work area and conditions, and type of work required create considerable potential for accidents. The Contractor shall submit a safety plan indicating how accidents will be prevented. The safety plan should include details of how the wire rope will be handled and installed to minimize the risk to personnel. Work shall be in accordance with the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1. The safety provisions of this section shall be included in the safety plan required by Section [01525 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS] [_____].

3.4 CLEAN DRUMS AND SHEAVES

The Contractor shall clean all drum and sheave grooves with a power wire brush, and inspect them for wear, abrasion, corrosion or other roughness and verify their dimensions are suitable for the new wire rope. The Contractor shall immediately advise the Contracting Officer of any problems.

3.5 WORK AND STORAGE AREAS

[The Contractor's work and storage areas are indicated on Drawing No. [_____].] [The work areas are indicated on Drawing No. [_____]. A representative of the Contracting Officer will assign the Contractor a storage area in the vicinity of the work area.]

3.6 UNLOADING AND INSPECTION

****
NOTE: Consider altering or deleting this paragraph to reduce cost if the wire rope can be inspected completely, while being installed.
****

Upon delivery to the Contractor's work or storage area, the wire [ropes] [ropes and sockets] shall be inspected in the presence of the Contracting Officer's Representative. In particular, the wire rope shall be inspected for dings, kinks or other damage. The wire ropes shall be reeled from spool to spool in order to allow complete inspection of the wire ropes over their entire length. The Contractor shall perform the unreeling/reeling operation, and furnish extra spools or any other equipment required. Upon completion of the inspection, the Contractor shall furnish the Contracting Officer with a written report of the results.

3.7 ATTACHING SOCKETS

****
NOTE: Delete this paragraph if the sockets are to be attached at the wire rope factory.
****

The Contractor shall attach the end terminations to the wire rope in accordance with Drawing No. [_____] and the recommendations of FS RR-W-410 Wire Rope and Strand, and the WRTB Wire Rope Users Manual.

3.8 UN-REELING AND INSTALLING WIRE ROPE

****
NOTE: EM1110-2-3200 suggests at least two and preferably three dead wraps of the rope on the drum.
****

The wire rope(s) shall be attached to drums, pulleys as shown on Drawing No. [_____]. The Contractor shall ensure that the wire rope is wound under adequate tension and that the each wind of the rope(s) is guided to its proper location. The wire rope shall be wound in the same direction it was bent during its manufacture. The Contractor shall insure that no twists or loops occur. The Contractor shall submit the proposed method of un-reeling and installing in the work plan.

3.9 FIELD TENSIONING MULTI-LINE HOISTS

The Contractor shall adjust the tension of the wire ropes to insure that they share load equally. The Contractor shall submit the proposed method field tensioning in the work plan. After "break-in/testing" they shall be tested to determine if they share load equally, and if not, they shall be re-tensioned.

3.10 LUBRICATION

****
NOTE: If stainless steel wire rope is used, it may be best to delete this paragraph. As explained in EM 1110-2-3200, in some cases the presence of a heavy lubricant will increase corrosion on stainless

steel wire ropes.
****

The Contractor shall lubricate the wire ropes after they are installed, but before break-in/testing. The Contractor shall submit the proposed method in the work plan. The field and factory lubricant shall be compatible.

3.11 BREAK-IN/TESTING

After installation is complete, the Contractor shall run the gate-operating device through [one] [two] [three] [four] [_____] complete cycles, full open to full closed.

3.12 REMOVAL OF EXISTING (OLD) WIRE ROPE

After its removal, the old wire rope shall become the property of the Contractor. Contractor shall then remove the old wire rope from the project.

3.13 ORDERLY WORK AREA/SITE CLEANUP

The Contractor shall, as much as possible, maintain neat and orderly storage and work areas. The Contract will not be considered complete until all the Contractor's tools, equipment and property have been removed from the site, and the Contractor's storage and work areas have been properly cleaned up. All dirt, debris, litter etc. shall be removed from project and disposed of in a proper manner. Special care shall be taken to insure that no materials fall into or contaminate project waters.

-- End of Section --