SECTION 26 05 33

CONDUIT

PART ONE - GENERAL:

1.01 Minimum size conduit shall be ½". Other sizes shall be as indicated on the Plans, or required by the National Electrical Code for number and size of conductors installed. All conduit joints shall be cut square, threaded, reamed smooth and drawn tight. Bends or offsets shall be made with standard conduit ells, field bends made with an approved bender or hickey, or hub-type conduit fittings. Number of bends per run shall conform to National Electrical Code limitations. All wiring, regardless of voltage, shall be in conduit.

PART TWO - PRODUCTS:

2.01 RIGID METAL CONDUIT (OR IMC):

A. Shall be used for:

1. Service.

2. Exposed branch circuits where subject to damage.

3. Branch circuits underground where outside of building line if not installed under 3" of concrete.

2.02 RIGID NONMETALIC CONDUIT (RNC):

A. Shall be used for:

1. Branch and feeder circuits underslab where inside of the building line (ground floor only).

2. Branch circuits underground where outside of the building line and below at least 3" of concrete or within duct banks

B. Shall be schedule 40 PVC.

2.03 PVC COATED RIGID GALVANIZED METAL CONDUIT

A. Shall be used for:

1. Corrosive exterior environments around cooling towers.

2.04 ELECTRICAL METALLIC TUBING (EMT):

A. Shall be used for:

1. All areas not listed in paragraphs 2.01, 2.02 and 2.03.

PART THREE - EXECUTION:

3.01 RACEWAYS:

A. Horizontal and vertical conduit runs may be supported by one-hole malleable straps, clamp-backs or other approved devices with suitable bolts, expansion shields, or beam clamps for mounting to building structure or special brackets. Adjustable hangers may be used to suspend large conduits when separately located. If adjustable trapeze hangers are used to support groups of parallel conduits, U-bolt or similar type clamps shall be used at the end of a conduit run and at each elbow. J-bolts or approved clamps shall be installed on each third intermediate trapeze hanger to fasten each conduit. Hangers shall be painted with two coats of oil paint. Where excessive corrosive conditions are encountered, hanger assemblies shall be protected, after fabrication, by sheradizing or galvanizing, special paint, or other suitable preservative methods. The use of perforated iron straps, wire, etc., for supporting conduits will not be permitted. The required strength of the supporting equipment and the size and type of anchors shall be based on the combined weight of conduit, hanger, and cable.

B. Conduit installed in exterior wall shall be routed in stud or block cavity not in air spaces between block and brick.

C. Where any run of rigid conduit may change to a run of EMT, or vice-versa, such a change shall be made in a junction or outlet box, as elsewhere required, with each conduit terminating separately therein.

D. Conduit shall be continuous from outlet to outlet and from outlets to cabinets, pull boxes or junction boxes, and shall be secured to all boxes with locknuts and bushings in such a manner that each system shall be electrically continuous throughout. Conduit ends shall be capped to prevent entrance of foreign materials during construction.

E. Conduit terminals at cabinets and boxes shall be rigidly secured with locknuts and bushings as required by the National Electrical Code and other electrical codes. All conduit bushings shall be of the insulating type with two locknuts.

F. All conduit shall be installed complete before conductors are pulled in. All conduit shall be cleaned and free of foreign matter inside before any conductors are pulled in. A run of conduit which has become clogged shall be entirely freed, or shall be replaced.

G. A pullwire shall be left in each run of empty conduit. Pullwire shall be 16-gauge galvanized steel.

H. Run all conduit at right angles to or parallel to walls of building.

I. Use short pieces, approximately two feet, of flexible metal conduit to connect motors and other devices subject to motion and vibration.

J. Support conduit and secure to forms when cast in concrete so that conduit will not be displaced during pouring of concrete. Stuff boxes and cork fittings to prevent entrance of contaminants during concrete pouring and at other times during construction prior to completion of conduit installation.

K. Use expansion fittings with copper bonding jumpers to assure ground continuity across expansion joints in walls, floors, and ceilings. Use double locknuts and bushings on panel feeders at panel enclosures.

L. Install grounding bushing on all conduit entering or leaving main switchboard. Connect each bushing to switchboard ground bus with a separate #4 bare copper conductor, lugged to bus.

M. Any EMT connectors must be all steel compression type with insulated throat. EMT couplings shall be all steel compression type. No cast fittings of any type will be accepted.

N. Color coding shall be provided every 8'-0" on conduit or factory colored conduits shall be used and shall be as follows:

1. 480 volt, single and three phase - Orange

2. 208 volt, single and three phase - Green

3. 120 volt - Yellow

4. Fire alarm system - Red

5. Motor and other control systems - Blue

6. Telephone and communications - White

7. Security - Brown.

O. All firewall penetrations shall be properly fireproofed with U.L. listed system that conforms to the wall or floor type, wall or floor fire rating, and to the size and number of conduits penetrating the wall or floor.

P. Conduit shall not be routed within 1.5” of the underside of a corrugated metal roof deck and shall not be fastened to or supported from the underside of a corrugated metal roof deck.

Q. Underground conduits outside of the building line shall be installed as follows:

1. Conduits shall be a minimum of 30" below grade.

2. Rigid non-metallic conduit shall have an electronically detectable tracing tape installed above them.

3. Rigid non-metallic conduit bends shall be pre-manufactured “factory” bends or field made bends using “hot box” style conduit benders.

4. Rigid non-metallic conduit shall be installed below a minimum of 3" of concrete

5. Rigid non-metallic conduit joints shall be made per the manufacturer’s instructions including use of primer prior to application of glue.

R. Underground conduits inside of the building line shall be installed as follows:

1. Conduits shall be run under vapor barrier and shall be routed or shall be installed deep enough to prevent penetration of building footers or other structural supports.

2. Conduit shall have rigid steel 90's installed where penetrating slab. Rigid steel 90’s shall have two coats of asphaltum and all wrench marks and etc., shall be touched-up after conduit has been assembled.

3. Rigid non-metallic conduit joints shall be made per the manufacturer's instructions including use of primer prior to application of glue.

S. Conduits shall not be installed within the concrete slabs of intermediate floor levels.

T. Conduits which are subjected to large temperature differences or those which enter the building from the exterior shall be sealed. The sealing method shall be equal to poly water FST. Conduits to be sealed include:

1. Those which enter the building from the exterior.

2. Those which enter coolers or freezers.

3. Those which pass through unconditioned portion of the building.

4. Those which supply rooftop equipment.

U. Conduits shall not be installed above or on top of a roof without expressed permission of the engineer. Conduits serving rooftop equipment shall be routed within the building and penetrate the roof plane vertically at the equipment being supplied.

V. Conduits installed in masonry construction shall be routed vertically in block cavities. They shall not be routed horizontally for more than 24" within block wall where such installation requires excessive cutting or notching of each block.

W. Where surface mounted conduits are permitted, they shall be painted to match the adjacent wall surfaces.

X. Bridging between steel joist framing shall not be used to support conduits.

Y. Parallel sets of conductors routed below grade shall be installed in duct banks.

1. Duct bank shall be encased in concrete with at least three inches of concrete at the top and bottom and two inches on each side. A horizontal and vertical separation between the ducts of 3 inches shall be maintained by installing thermoplastic high impact spacers at 4 foot intervals. Spacers shall be equal to Carlon #SPxW30-2.

2. Stagger the joints of the conduits by rows and layers so as to provide a duct line having the maximum strength.

3. During construction, protect partially completed duct lines from the entrance of debris such as mud, sand and dirt by means of suitable conduit plugs.

4. As each section of a duct line is completed, draw a testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the size of the conduit through each conduit, after which draw a brush having the diameter of the conduit, and having still bristles through until the conduit is clear of all particles of earth, sand, and/or gravel; then immediately install conduit plugs.

5. Conduits shall be sized as indicated on project drawings. Provide steel reinforcing in concrete duct bank as indicated on drawings. Separate conduit as

indicated.

6.) Install the top of the concrete envelope not less than 30 inches below grade or as indicated on project Drawings.

Z. Concrete used to cover below grade conduits shall be 3000 psi concrete with 1 inch maximum aggregate

END OF SECTION