

ADDENDUM NO. 4
CAMILLA GYMNASIUM
ISSUE DATE: July 21st, 2025

Bid Date: Friday 07/25/2025
Bid Time: 11:00 A.M.
Bid Location: Camilla City Hall, 30 E. Broad Street, Camilla, GA 31730
Owner: City of Camilla, GA

THE FOLLOWING ITEMS ARE HEREBY INCORPORATED INTO THE PLANS, SPECIFICATIONS, AND CONTRACT DOCUMENTS FOR THE ABOVE-REFERENCED PROJECT.

DRAWINGS:

1. Replace sheet C501 with the attached revised sheet C501.
2. Replace sheet M501 with the attached revised sheet M501.

SPECIFICATIONS:

1. Replace Bid Form (004101) with the attached revised (four) 4 pages.
2. Replace page 311000-2 (Site Clearing) with the attached revised page. Paragraph 3.05 Disposal was added.
3. Replace page 312316.26-3 (Rock Removal) with the attached revised page. Paragraph H was updated.
4. Add the following Sections to Division 03 (attached).
 - 03 00 00 Concrete,
 - 03 11 00 Concrete Formwork,
 - 03 15 00 Concrete Accessories,
 - 03 20 00 Concrete Reinforcement,
 - 03 60 00 Grout

QUESTIONS/ANSWERS:

1. Need clarification on the grease trap sheet P1.02A says 750 gallons and the detail on sheet P3.01 says 3000 gallons. Can you confirm which is correct?

Answer: Please use 750 gallons as shown on sheet P1.02A and cross out the '3000 gallons' word and replace it with '750 gallons' on the detail sheet P3.01.

2. Please verify the finish for the Aluminum Storefront for the Base Bid, Clear Aluminum or Bronze?

Answer: Per sheets A201 and A202 all store front to be Dark Bronze.

3. Janitor #112 wall finish tags "HPC". This material is not listed on the Interior Finish Schedule. Please clarify.

Answer: All HPC paint is to be One Part Epoxy paint.

4. Is the monument sign provided and installed by others under separate contract?

Answer: Monument sign and all associated work is to be supplied and installed by GC.

5. Is the LED exterior building signage provided and installed by others under separate contract?

Answer: Monument sign and all associated work is to be supplied and installed by GC.

6. How many colors are the walls of the circulation area, The finish schedule indicates "varies" but the color details call out 9 different colors?

Answer: Please refer to interior elevations on A614 for paint colors in circulation areas.

7. A101 and the wall sections show the interior of the gym as metal panel with Fiber Resin Panel, A611 and A612 show interior wall of gym under metal as MDF. Please clarify. Also, if the MDF goes all the way around, what is that wall section?

Answer: At the interior of the gym, the metal liner panels are to be install from floor to bottom of the roof, and painted MDF sheets from floor to 10' above finished floor.

8. Please confirm the Owner will pay for 3rd quality control testing (soils, concrete, asphalt, etc).

Answer: Owner will contract and pay for 3rd party testing and inspections.

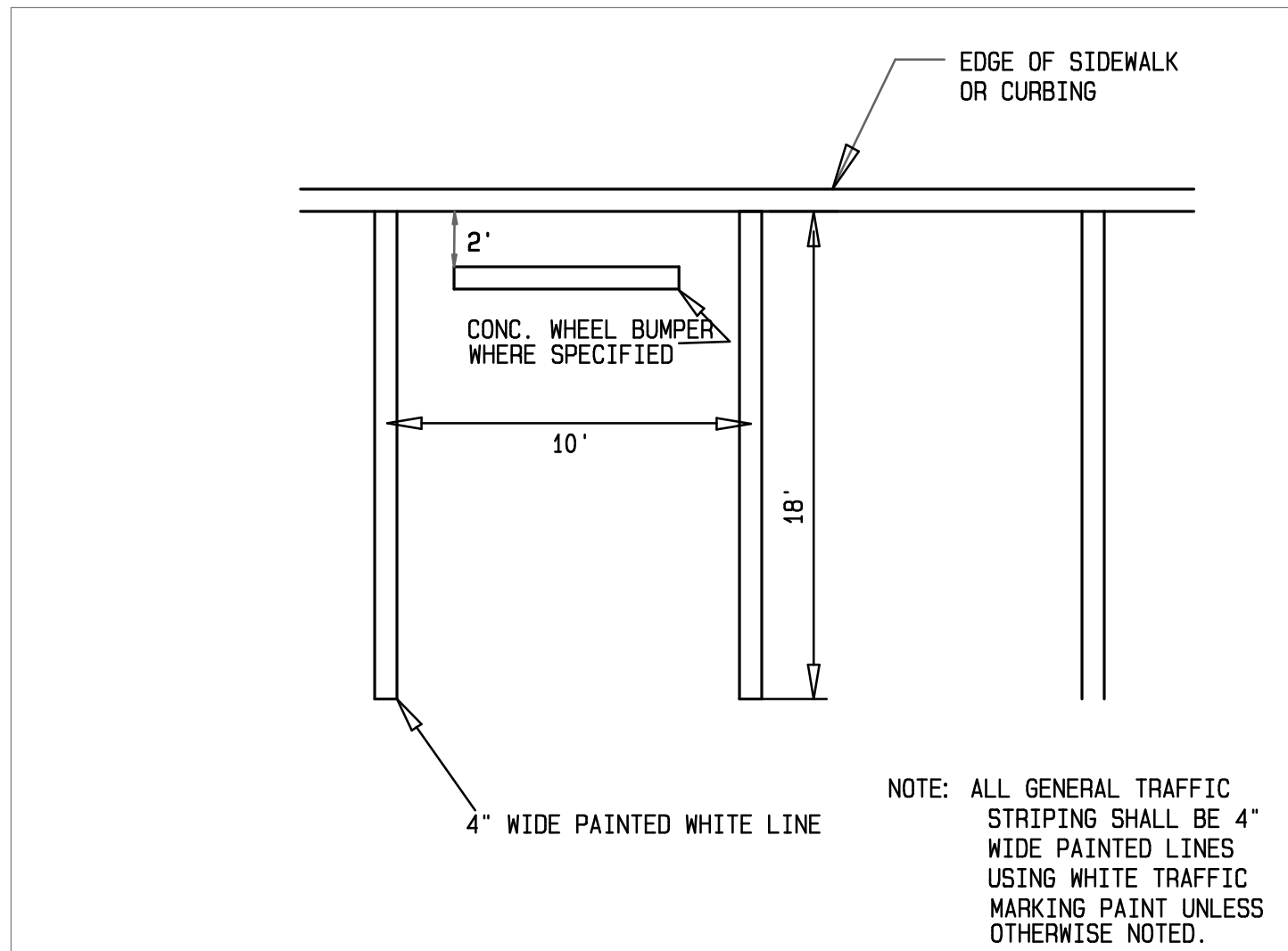
PRODUCT/MANUFACTURER APPROVAL:

1. Baller Ecore is a prior approved manufacturer. So long as the suggested product meets or exceeds the basis of design. Manufacturer Rep Contact: bryan.benzor@thepremosource.com.
2. Plexi Chemie's PlexiCrete SLBQ Seamless flooring system is a prior approved manufacturer. So long as the suggested product meets or exceeds the basis of design. Manufacturer Rep Contact: eself@plexi-chemie.com

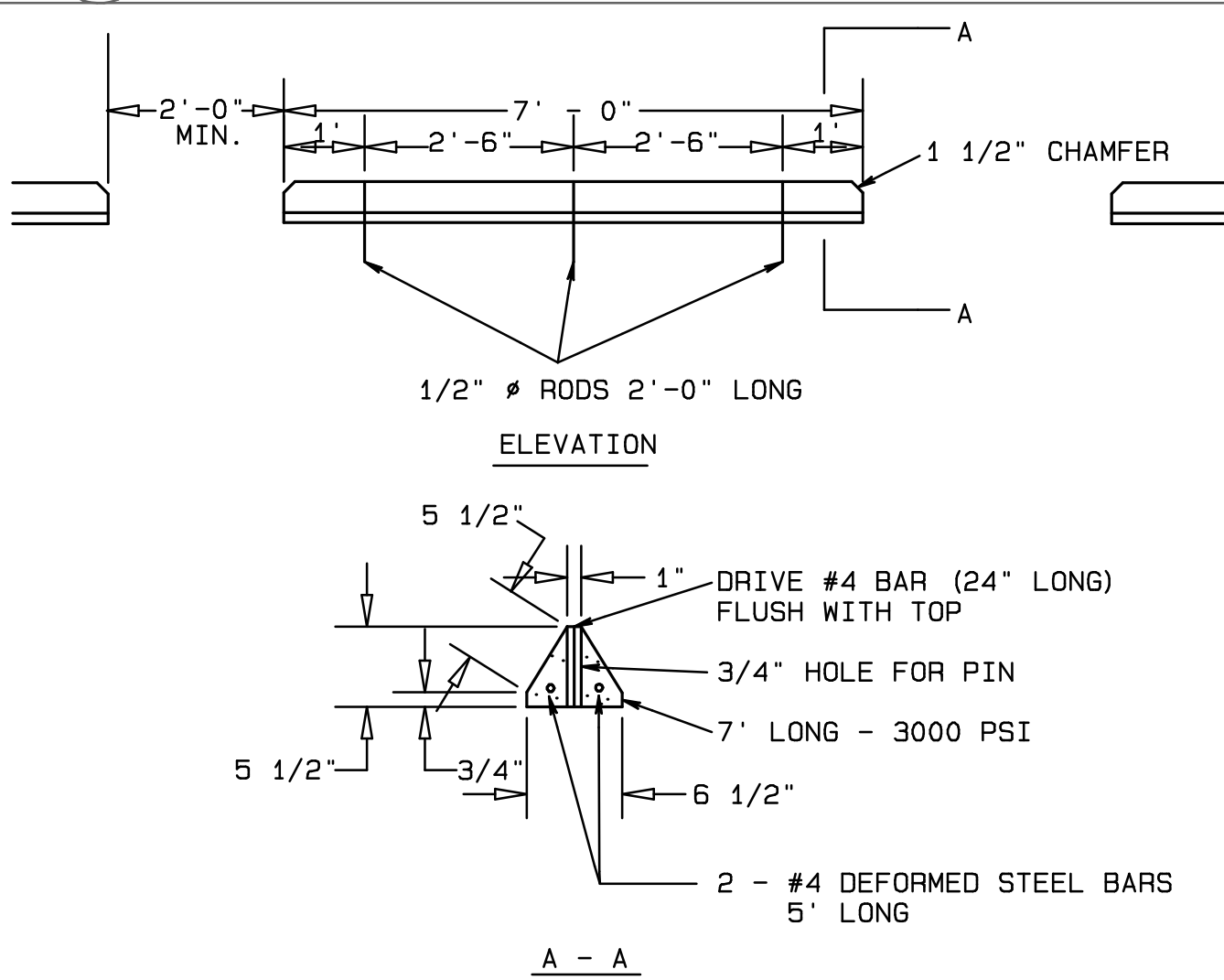
END OF ADDENDUM NO. 4

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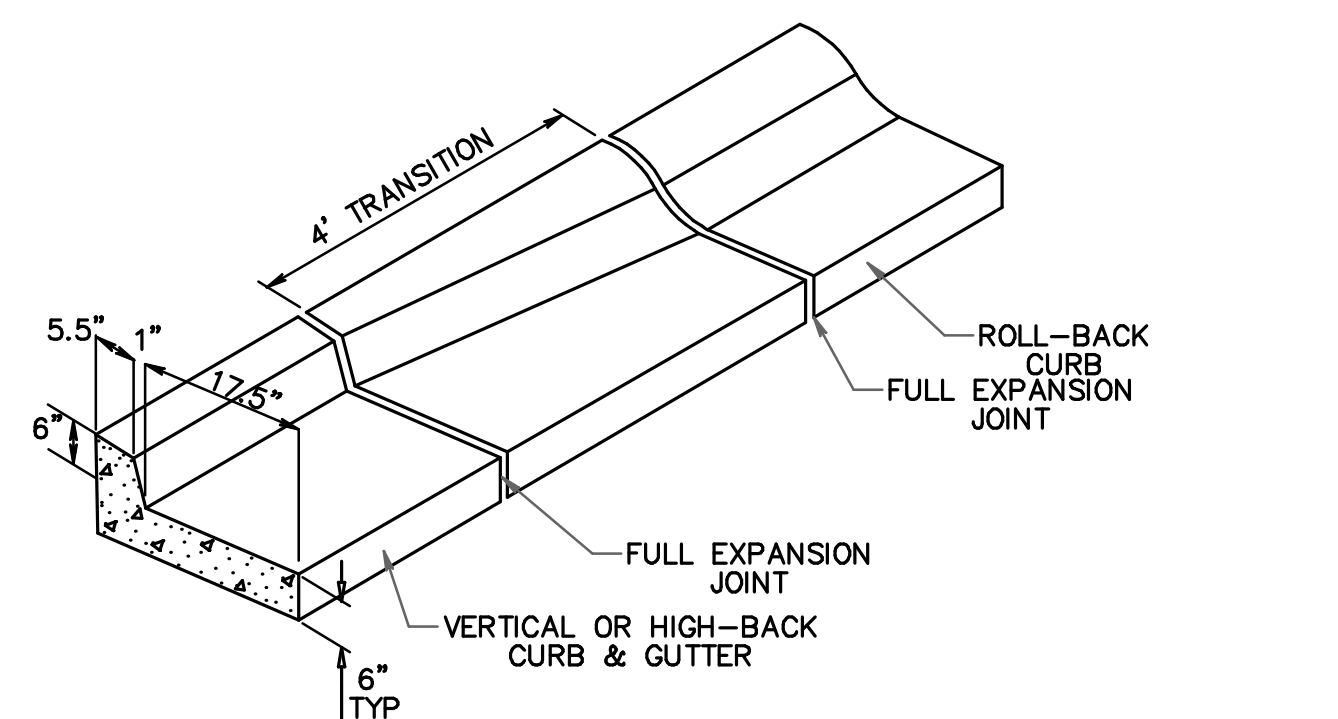
DRWING BY: CHECKED BY:



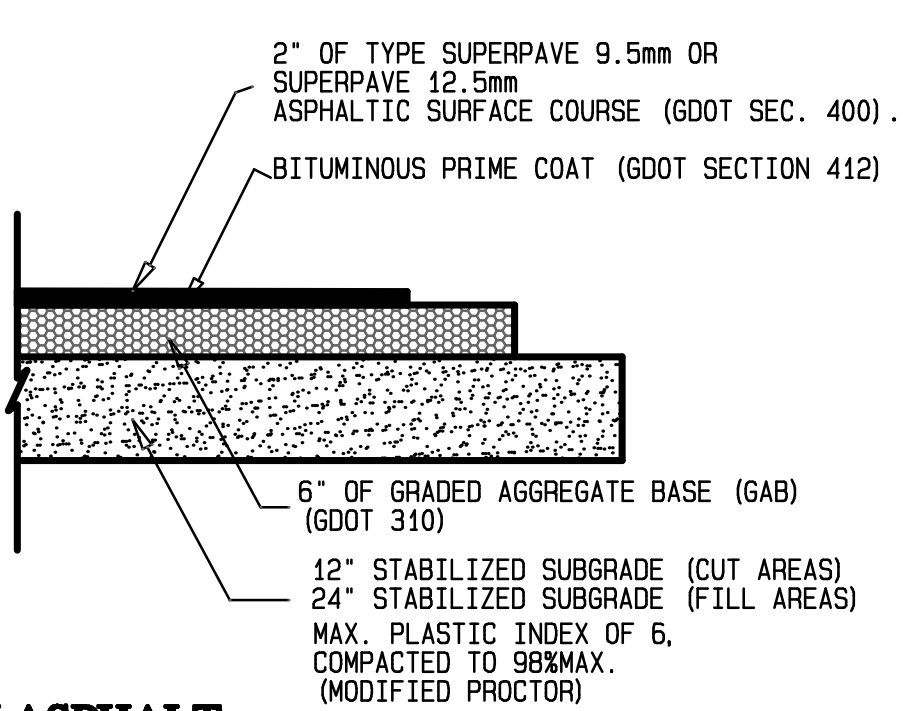
1 PARKING SPACE LAYOUT



2 WHEEL BUMPER



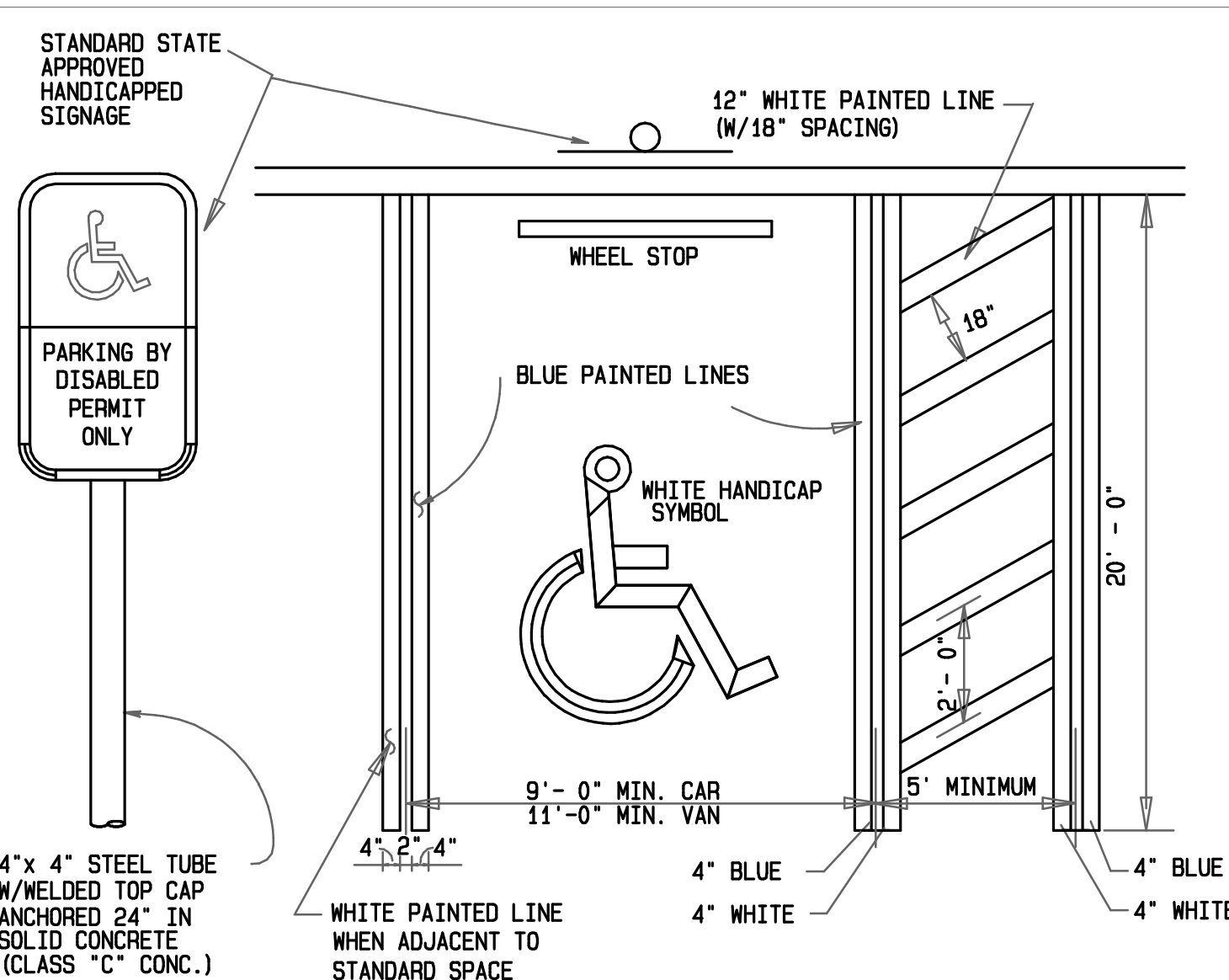
7 VERTICAL TO ROLLED CURB TRANSITION



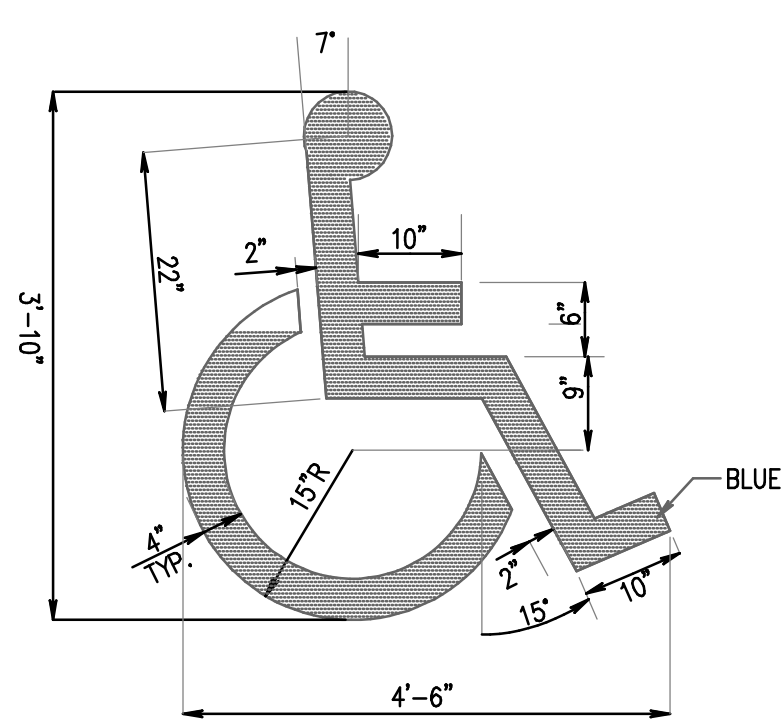
STANDARD DUTY ASPHALT

NOTE: CONTRACTOR TO REFER TO THE GEOTECHNICAL REPORT FOR THE PROJECT FOR ADDITIONAL INFORMATION.
STANDARD DUTY ASPHALT - FOR AUTOMOBILES ONLY
HEAVY ASPHALT - FOR AUTOMOBILES & SEMI-TRUCKS

8 ASPHALT PAVEMENT SECTION

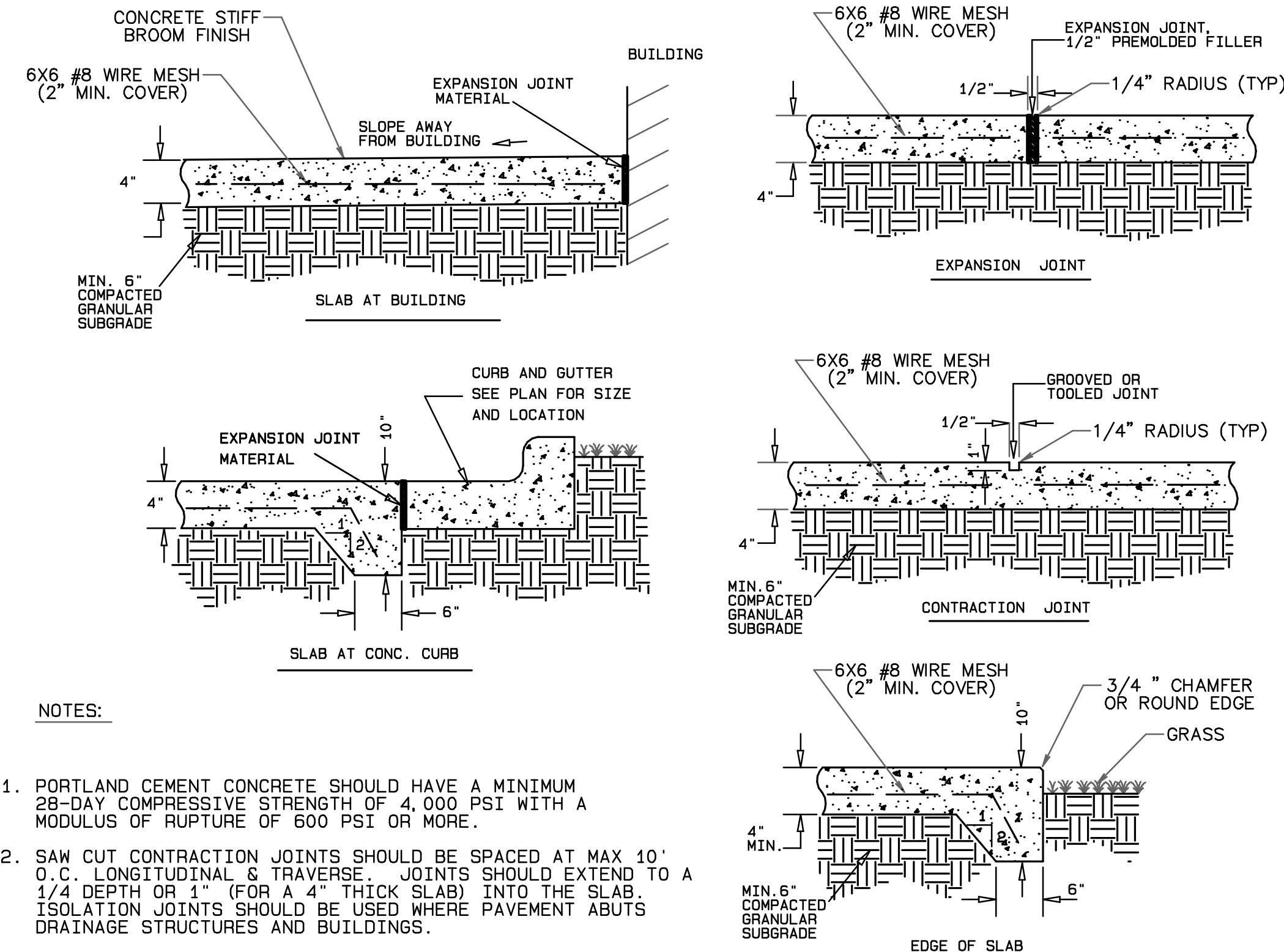


3 HANDICAP PARKING AND STRIPING



N.T.S.

4 PAINTED HANDICAPPED PAVEMENT SYMBOL



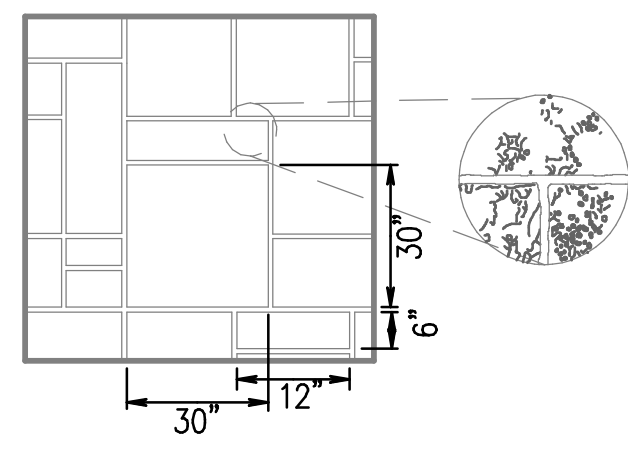
NOTES:

- PORTLAND CEMENT CONCRETE SHOULD HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI WITH A MODULUS OF RUPTURE OF 600 PSI OR MORE.
- SAW CUT CONTRACTION JOINTS SHOULD BE SPACED AT MAX 10' 0\"/>
- CONSTRUCTION JOINTS SHALL BE UNDERLAIN BY A NON-WOVEN GEOTEXTILE (APPROX. 2\"/>
- SUBGRADE SHALL BE COMPACTED TO 95% MODIFIED PROCTOR (MIN.)
- THE MAXIMUM DIMENSION OF THE SLAB POURED AT ONE TIME SHALL NOT EXCEED 60 FEET.
- PROVIDE PREMOLDED EXPANSION JOINTS MATERIAL WHERE SLAB ABUTS MASONRY OR OTHER CONCRETE.

9 CONCRETE PAVEMENT (PEDESTRIAN)

2 Revision

- SELECT DESIRED SEALER:
 - WHITE
 - SEMI GLOSS
 - ACRYLIC
- SELECT DESIRED TEXTURE:
- SELECT DESIRED JOINTS:
- 1/4\"-3/8\" WIDE & DEEP



NOTES:

- PATTERNED CONCRETE® TRADEMARKED STAMPING TOOLS MANUFACTURED AND SUPPLIED BY PATTERNED CONCRETE GLOBAL, LTD. REFER TO PATTERNED CONCRETE GLOBAL ARCHITECTURAL CATALOGUE FOR PATTERN IMPRINT DETAILS.
- CONTACT PATTERNED CONCRETE 416-661-3007 FOR CONTRACTOR LIMITED LICENSING.
- CONCRETE SHOULD HAVE MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI.
- MINIMUM 6\"/>
- SAW-CUT CONTROL JOINTS AS REQUIRED PER SPECIFICATIONS.
- CONTRACTOR TO OBTAIN FULL SET OF STAMPS TO AVOID REPETITION.
- SURFACE (COLOR) HARDENER SHALL BE MANUFACTURED BY PCI OR AN APPROVED EQUIVALENT AS RECOMMENDED BY THE SYSTEM MANUFACTURER.

NOTES:

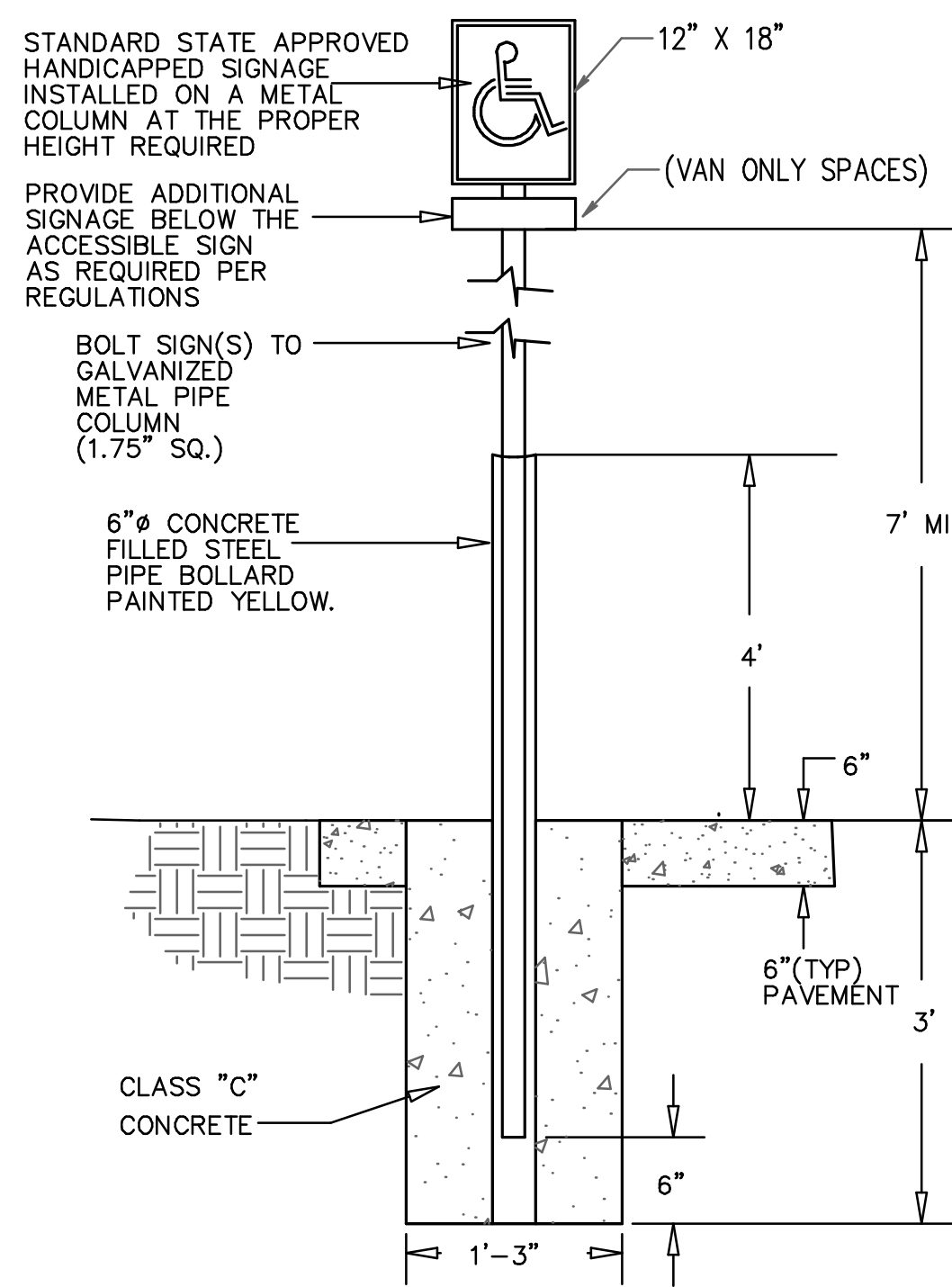
- INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
- DO NOT SCALE DRAWING.
- THIS DRAWING IS INTENDED FOR USE BY ARCHITECTS, ENGINEERS, CONTRACTORS, CONSULTANTS AND DESIGN PROFESSIONALS FOR PLANNING PURPOSES ONLY. THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION.
- ALL INFORMATION CONTAINED HEREIN WAS CURRENT AT THE TIME OF DEVELOPMENT BUT MUST BE REVIEWED AND APPROVED BY THE PRODUCT MANUFACTURER TO BE CONSIDERED ACCURATE.
- CONTRACTOR'S NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT www.casotools.com/info AND ENTER REFERENCE NUMBER.
- SEE PEDESTRIAN CONCRETE PAVEMENT DETAILS FOR THICKNESS AND WELDED WIRE FABRIC (WWF).

MOTIVO MODERNO CONTEMPORARY SERIES
PCRT MM400 SERIES

PATTERNED CONCRETE
110 WEST 7TH STREET SUITE 1010
TULSA, OK 74119
TOLL FREE: 877-758-8266
PHONE: (416) 661-3007
www.patternedconcrete.com

5 STAMPED CONCRETE PATTERN

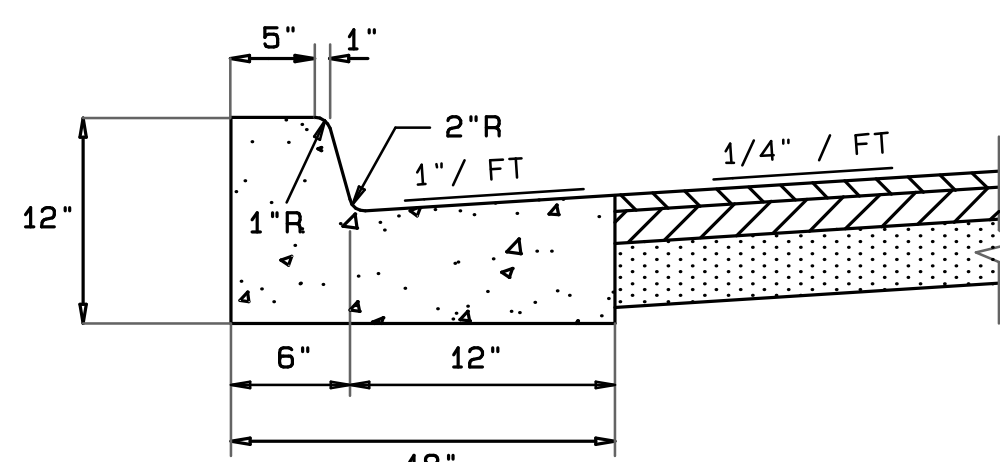
1 Revision



NOTE: SEE SITE PLAN FOR SPACING.

N.T.S.

6 ACCESSIBLE PARKING SIGN DETAIL

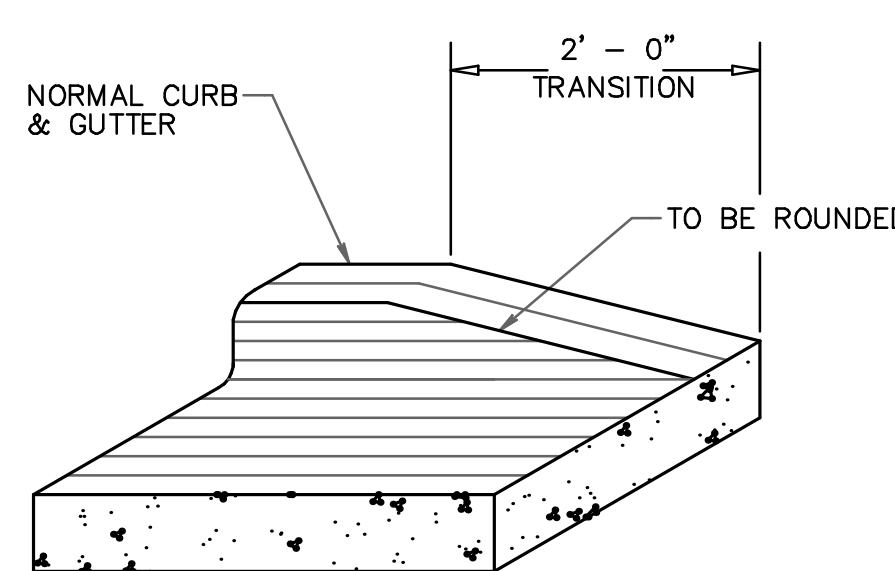


18" CONCRETE CURB & GUTTER

NOTES:

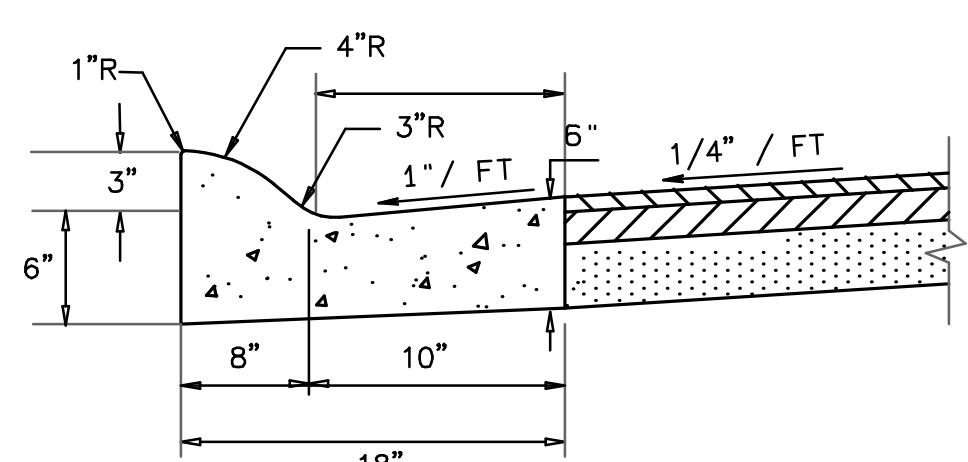
- CONTRACTOR IS TO VERIFY LOCAL REQUIREMENTS PRIOR TO CONSTRUCTION. FOR WORK ON STATE HIGHWAYS REFER TO GA. DOT DETAIL 9032B
- EXPANSION JOINTS REQUIRED AT ALL STRUCTURES, CURB RETURNS AND PLACED EVERY MAXIMUM 50' O.C.
- CONCRETE STRENGTH
GA. DOT - 2200psi (CLASS "B")
CONTRACTOR IS TO VERIFY LOCAL REQUIREMENTS

HIGH BACK CURB (TYP.)



CONC. CURB FEATHERING

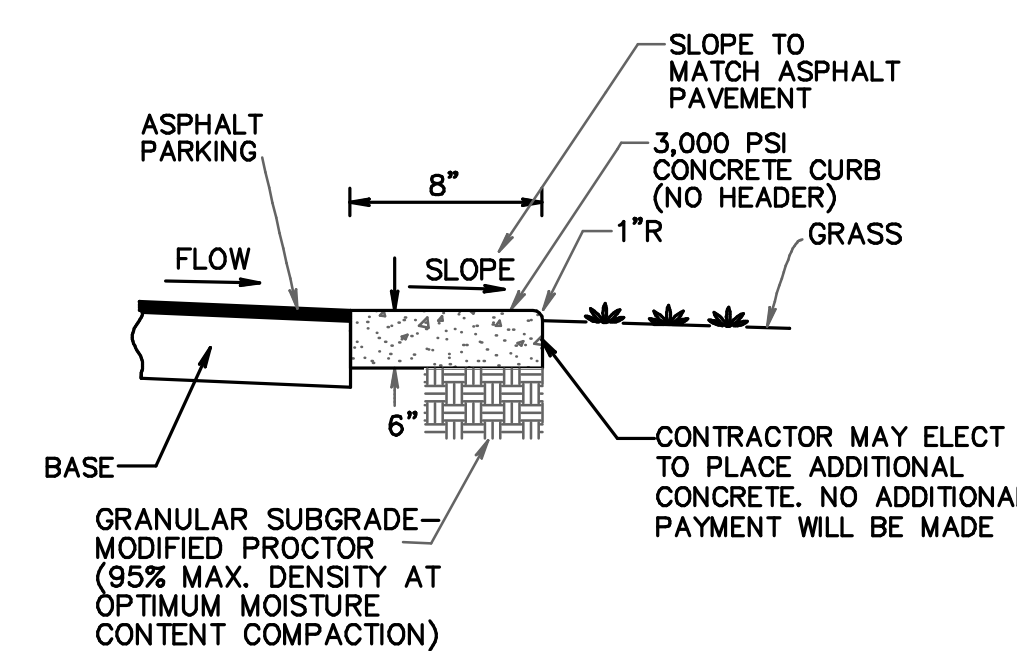
10 CONCRETE CURBS



NOTES:

- CONTRACTOR TO VERIFY EXISTING CONCRETE CURB AND MATCH EXISTING CURB.
- THE RAISED EDGE SHALL BE FORMED MONOLITHIC WITH GUTTER. JOINTS IN RAISED EDGE SHALL MATCH THOSE IN THE GUTTER.
- PITCHED GUTTER TO BE USED IN ALL CASES WHERE PAVEMENT IS SLOPED AWAY FROM CURB.
- CURB & GUTTER TO BE CONSTRUCTED IN 10' LENGTH.
- 1/2" EXPANSION JOINTS REQUIRED AT ALL STRUCTURES, CURB RETURNS AND PLACED EVERY MAXIMUM 50' O.C.
- VERIFY LOCAL REQUIREMENTS PRIOR TO CONSTRUCTION FOR WORK ON STATE HIGHWAYS, REFER TO GA DOT DETAIL 9032B.

ROLL-BACK CURB

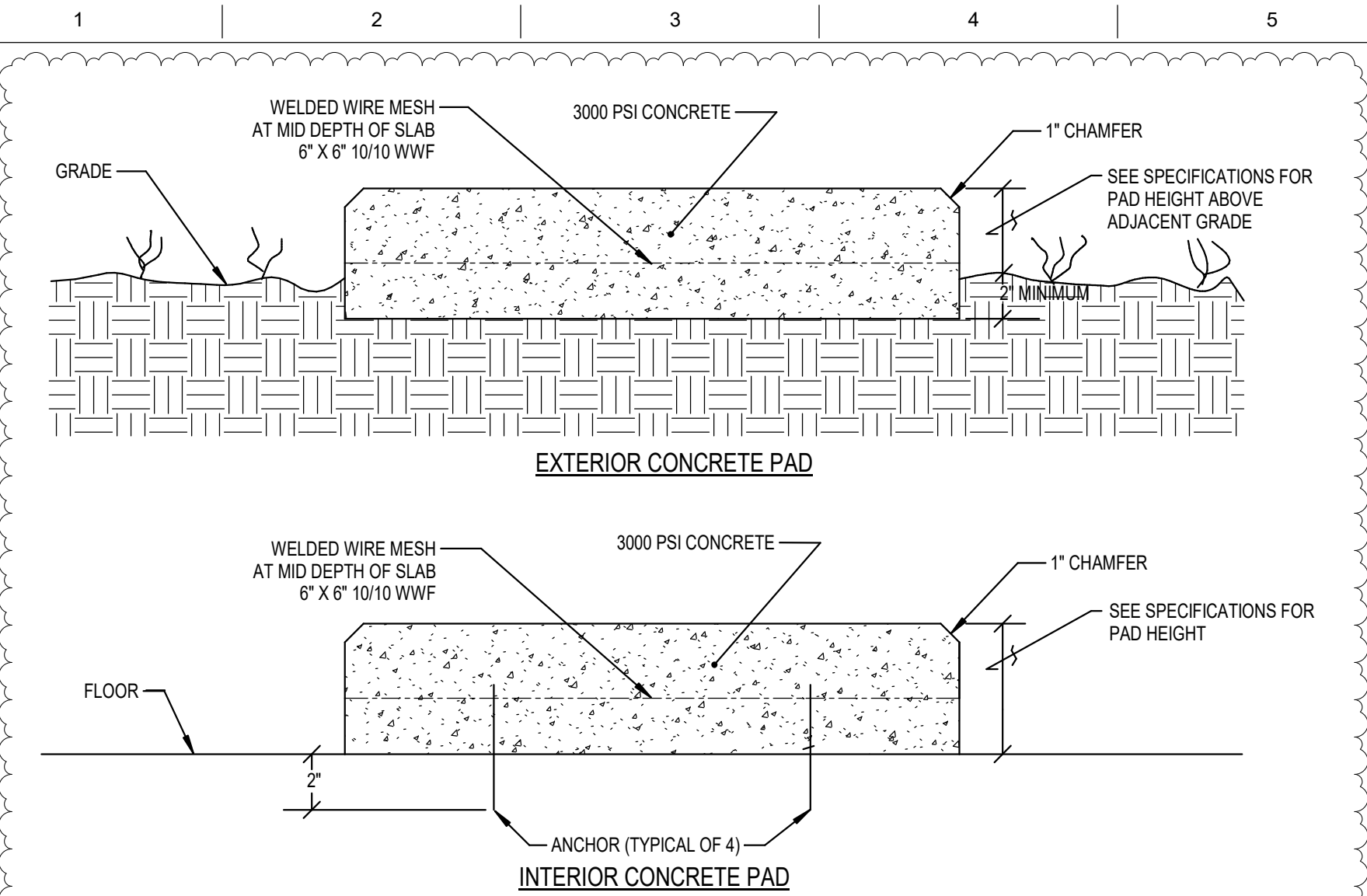


CONCRETE FLAT CURB

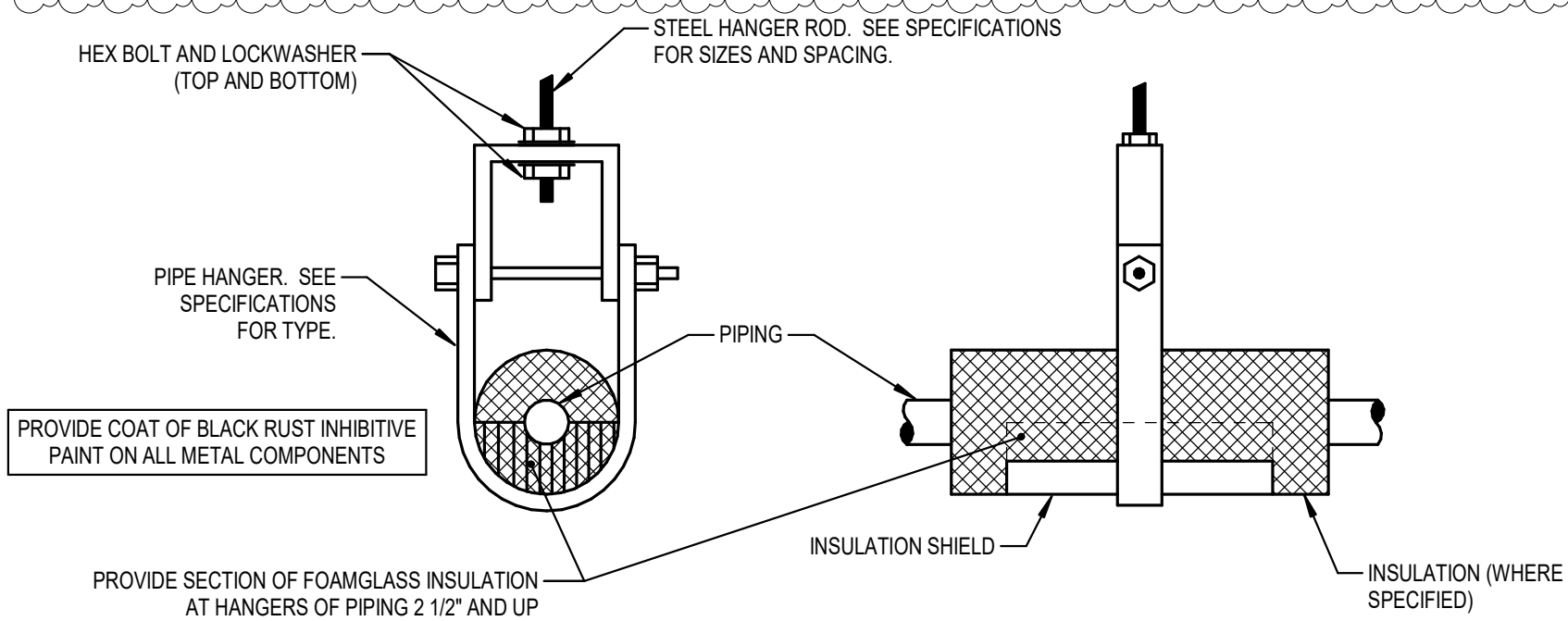


UTILITY DISCLAIMER

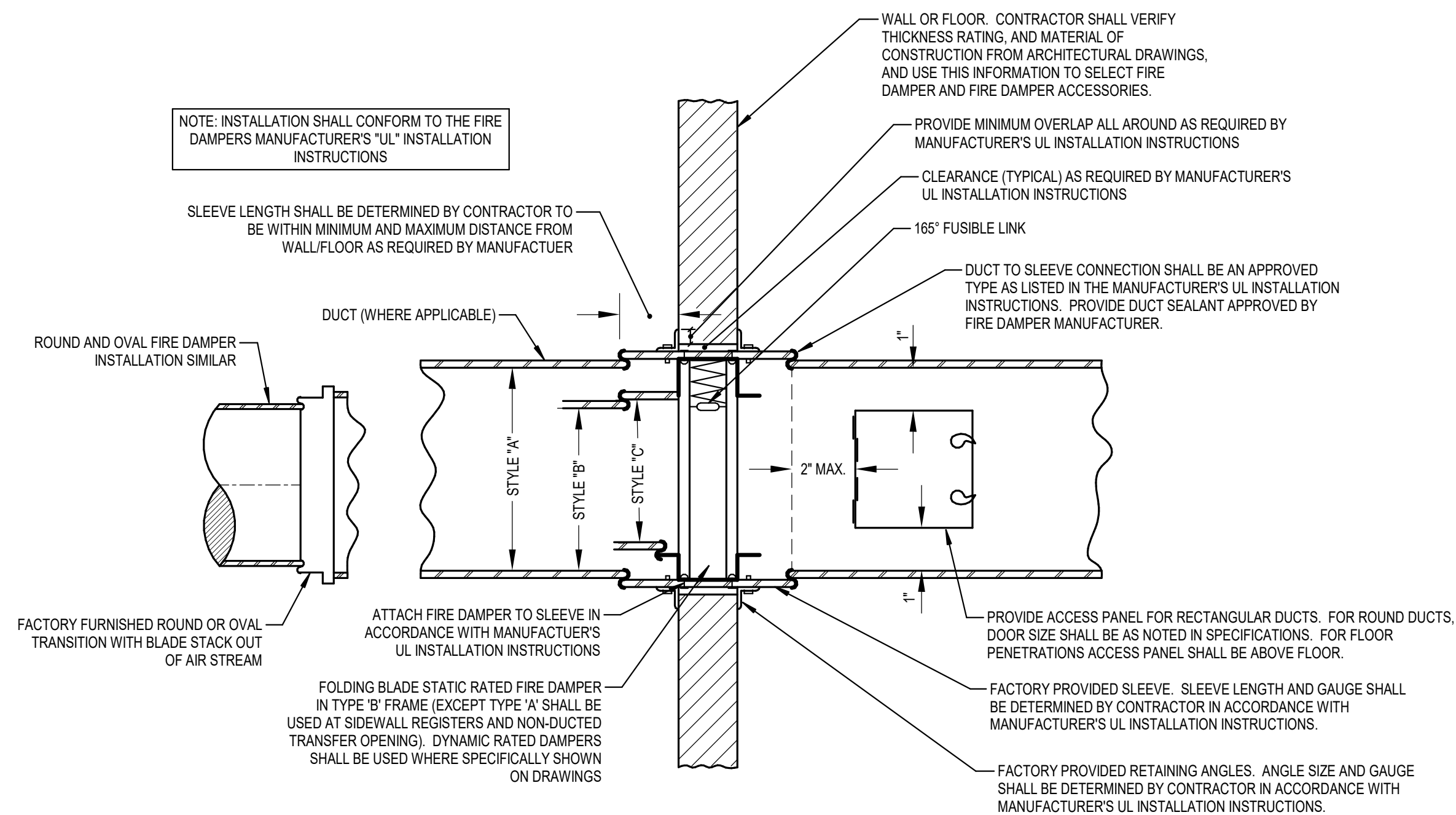
EXISTING UTILITY LINES SHOWN ARE APPROXIMATE LOCATIONS ONLY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING UTILITY LINE LOCATIONS PRIOR TO ANY CONSTRUCTION. ANY DEVIATIONS FROM THE DESIGN LOCATIONS SHALL BE REPORTED TO THE PROJECT ENGINEER PRIOR TO CONSTRUCTION. DAMAGE TO EXISTING UTILITY LINES RESULTING FROM CONTRACTOR NEGLIGENCE SHALL BE REPAIRED AT CONTRACTOR EXPENSE.



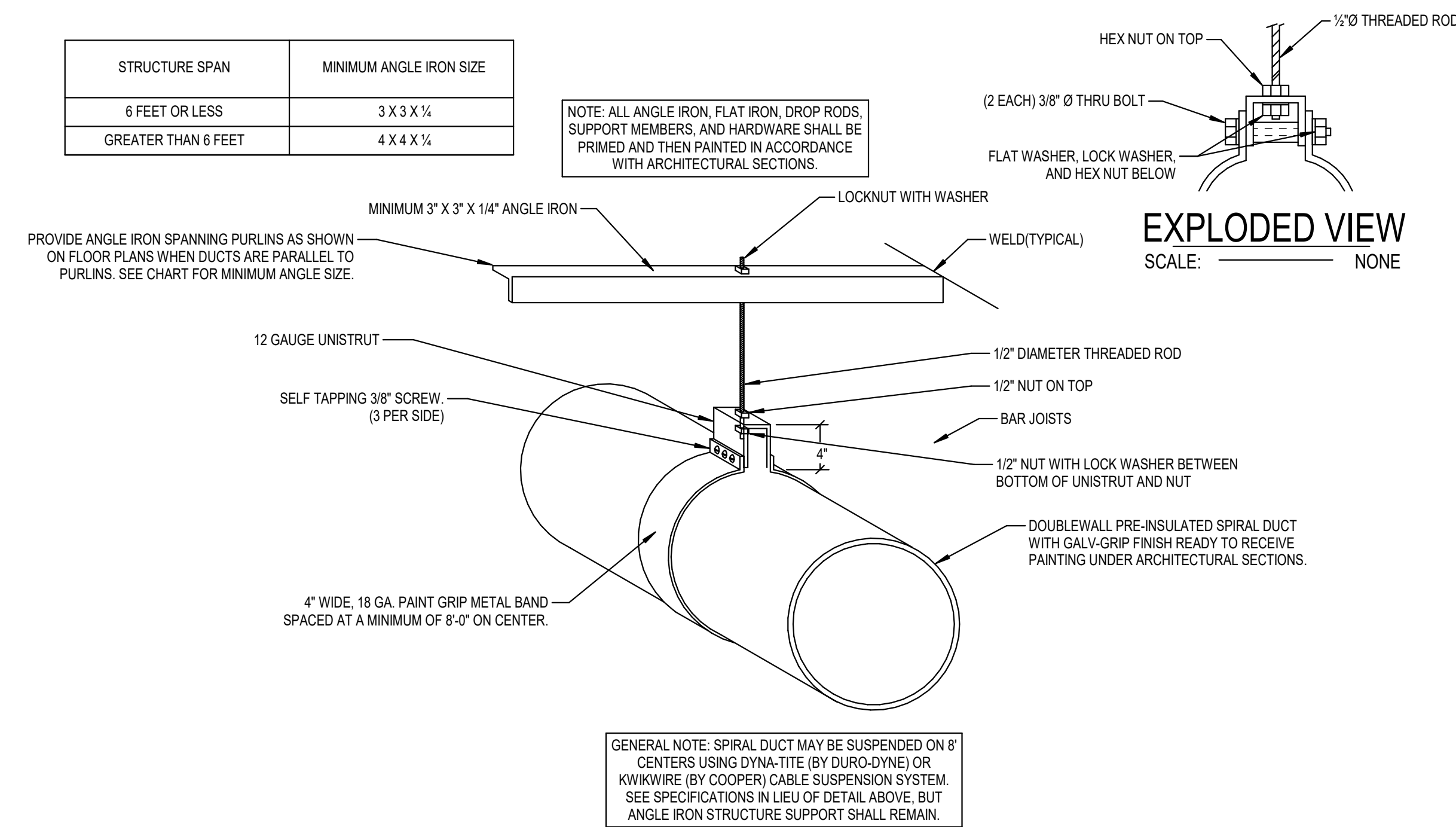
CONCRETE EQUIPMENT PAD DETAIL
NOT TO SCALE



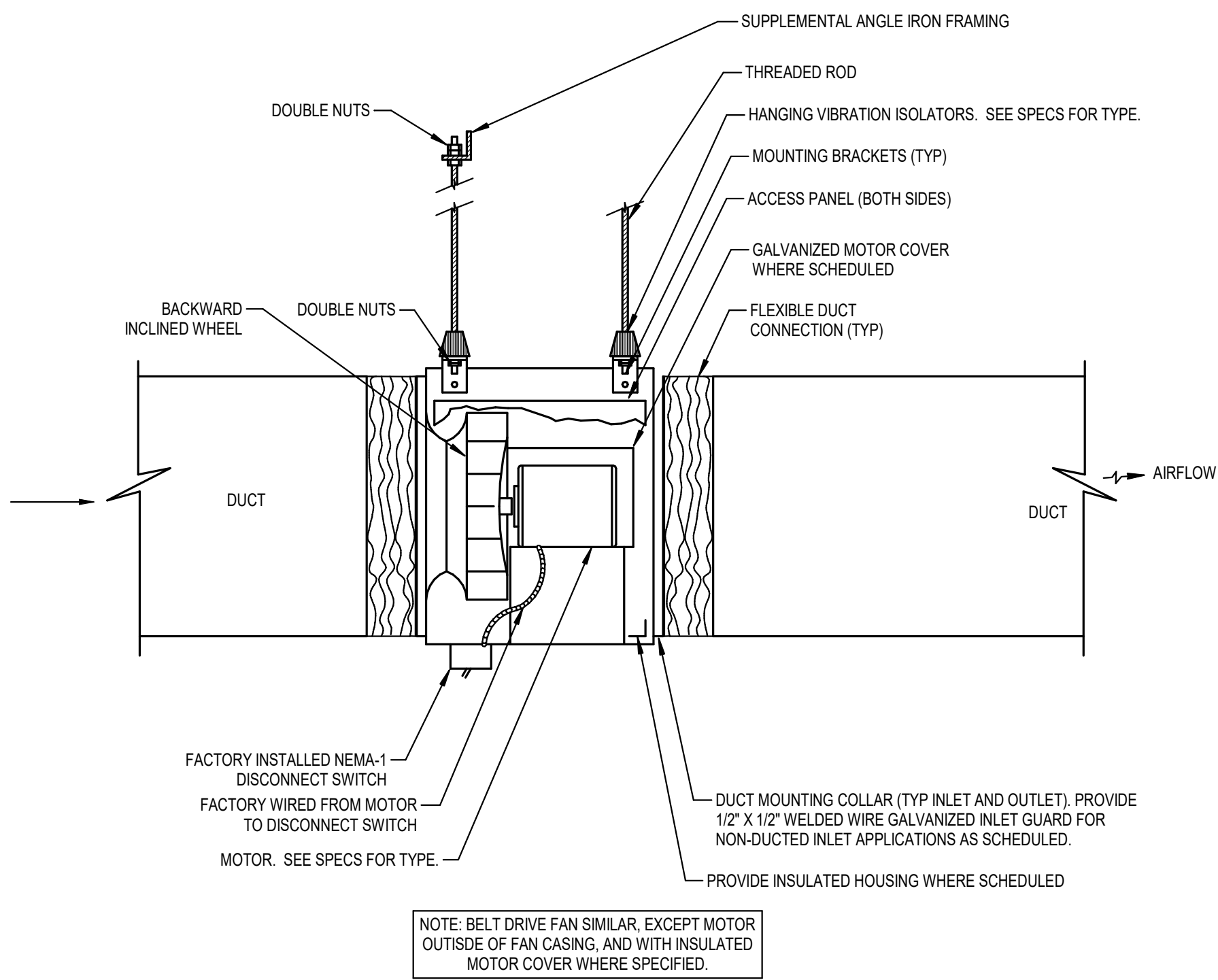
PIPE HANGER DETAIL
NOT TO SCALE



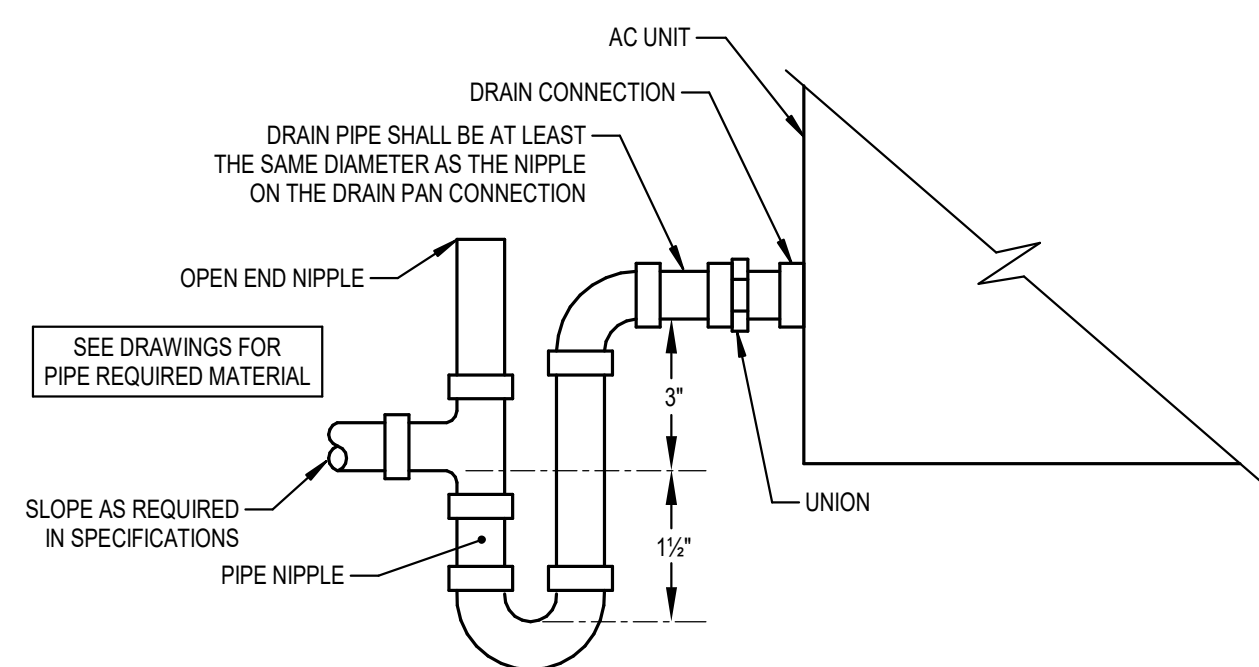
FIRE DAMPER DETAIL
NOT TO SCALE



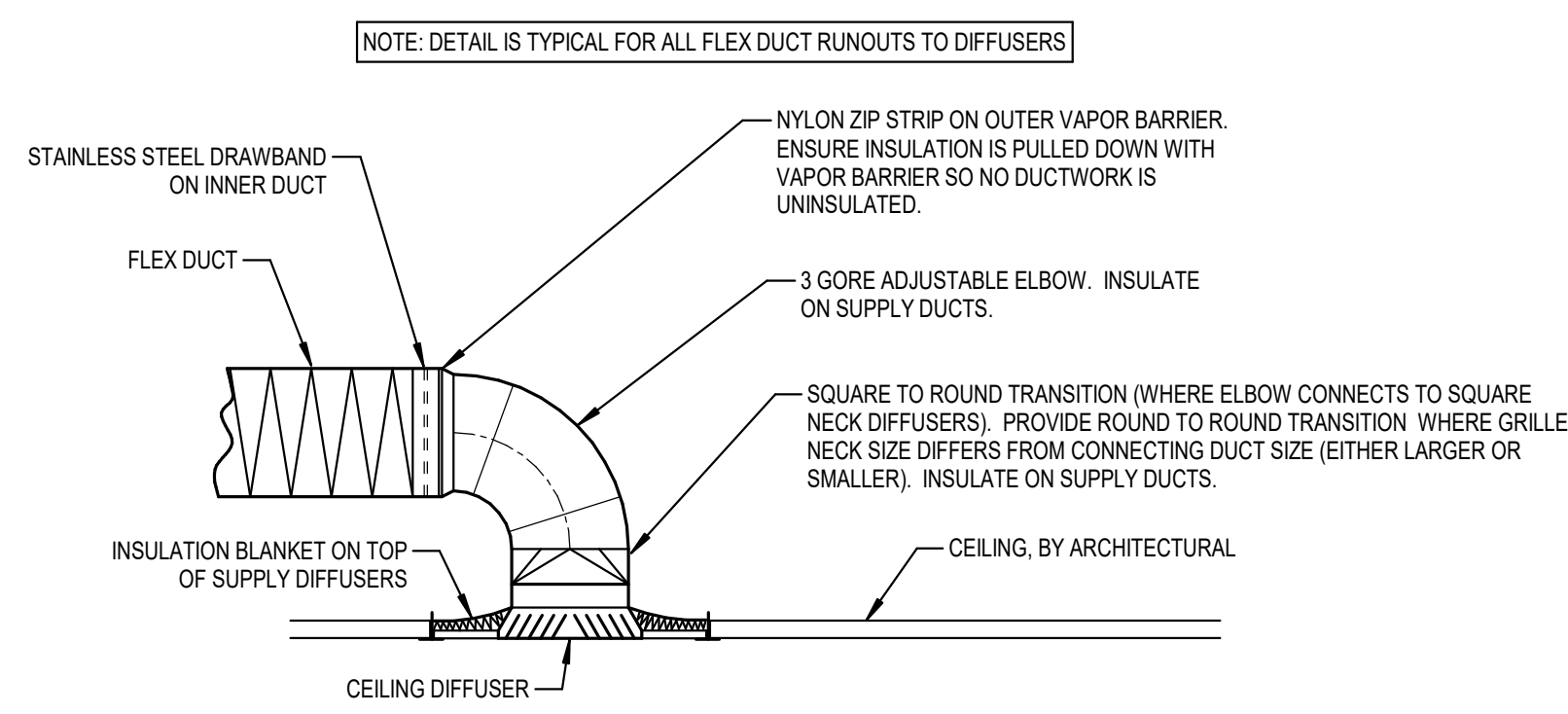
EXPOSED ROUND DUCT SUPPORT DETAIL
NOT TO SCALE



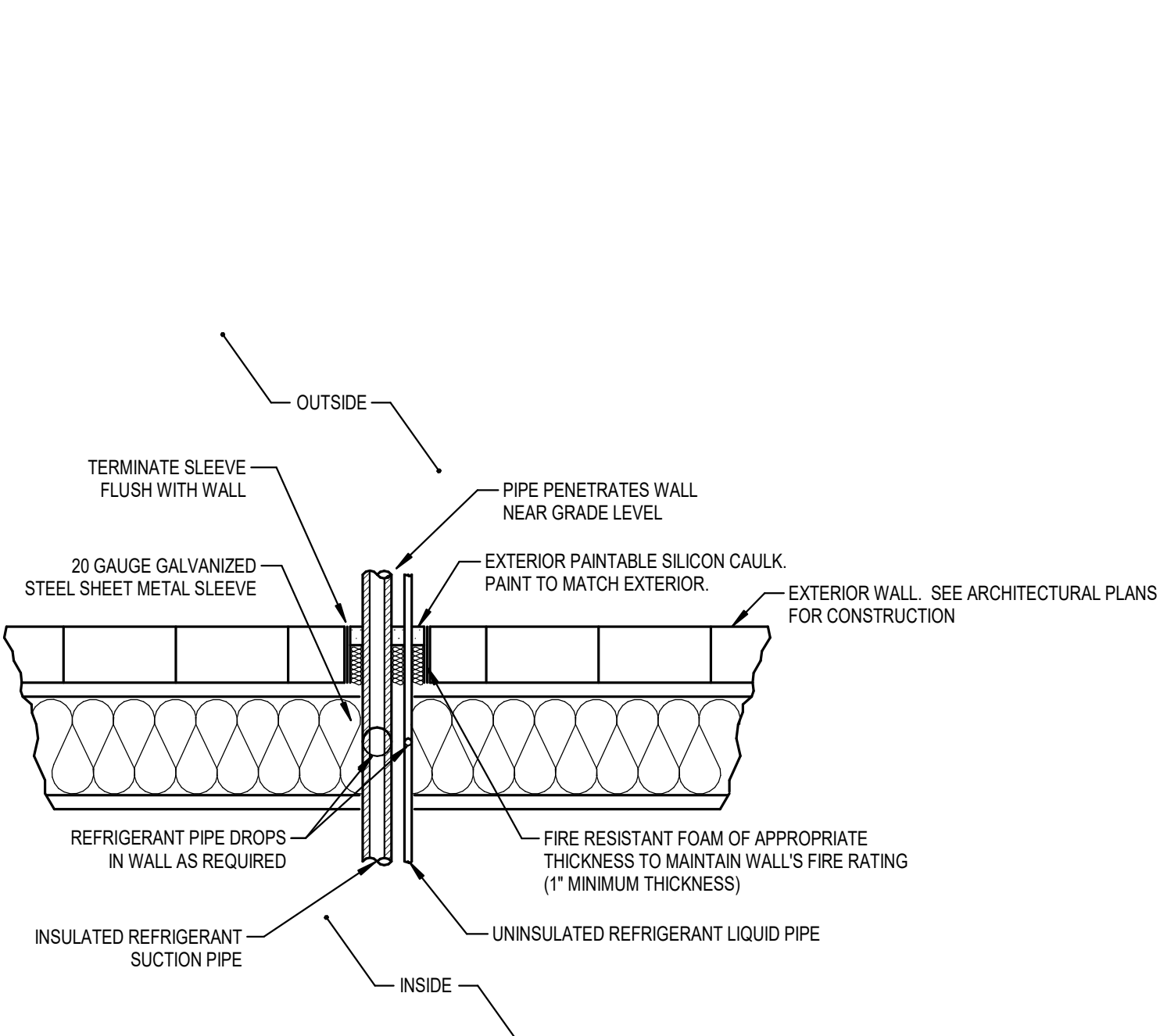
CENTRIFUGAL INLINE FAN DETAIL
NOT TO SCALE



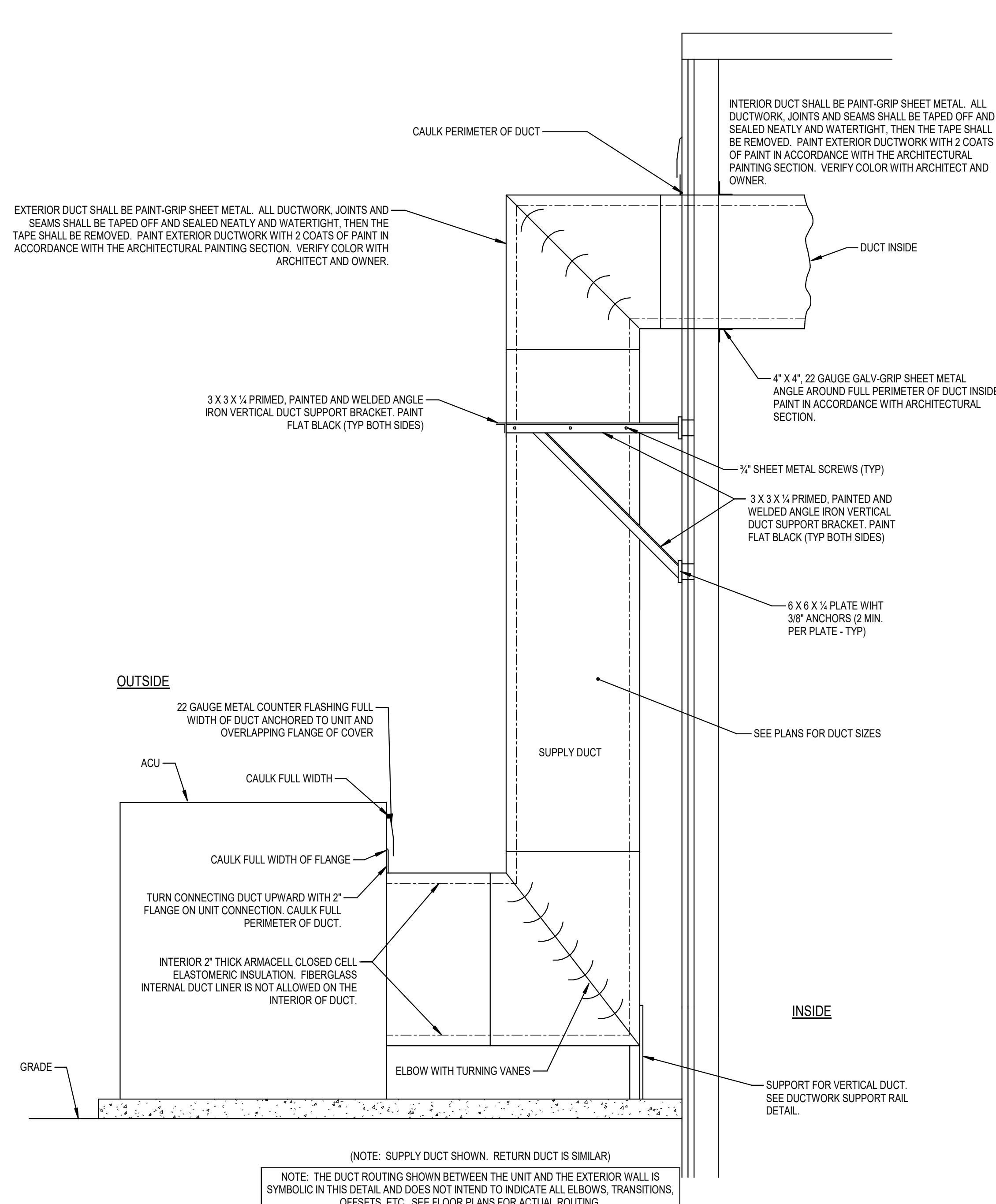
CONDENSATE DRAIN TRAP DETAIL
NOT TO SCALE



CEILING DIFFUSER CONNECTION DETAIL
NOT TO SCALE



PIPE SLEEVE DETAIL - REFRIGERANT PIPE THRU EXTERIOR WALL
NOT TO SCALE



ACU EXTERIOR DUCT DETAIL
NOT TO SCALE

BID FORM

Project: CAMILLA GYMNASIUM

-

THIS BID IS SUBMITTED TO:

CITY OF CAMILLA

30 E. Broad Street

Camilla, Ga 31730

(Telephone) 229-336-2220

(Hereinafter called "OWNER")

THIS BID IS SUBMITTED BY:

(Name)

(Address)

(Telephone)

*(Name, Address and Telephone Number
of Prime/General CONTRACTOR)*

(Hereinafter called "Bidder")

BIDDER, in compliance with the Advertisement for Bids for the construction of this project, having examined the Drawings and Specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials and supplies, and to construct the project in accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the price(s) stated below. This price(s) is to cover all expenses including overhead and profit incurred in performing the Work required under the CONTRACT DOCUMENTS, of which this proposal is a part.

BIDDER hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" from the OWNER and to fully complete WORK within a total construction time of 364 consecutive calendar days.

BIDDER acknowledges receipt of the following addenda:

Addenda No.	Date Received

BIDDER agrees to perform all of the construction of the project complete with appurtenances and accessory work described in the Specifications and shown on the Drawings for the above scheduled price(s).

The above scheduled price(s) shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

BIDDER understands that OWNER reserves the right to reject any or all bids and to waive any informalities in the bidding.

BIDDER agrees that his bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

The undersigned having become familiar with the project plans and specifications for the Camilla Gymnasium Project provides the following lump sum price:

BASE BID \$ _____

ALTERNATE #1 \$ _____

ALTERNATE #2 \$ _____

GRAND TOTAL \$ _____

The following unit prices shall hold and be used in computing changes to the Contract (additions or deletions), except where the contracting parties have mutually agreed to different unit prices before Contract Award. The unit prices shall include all labor, materials, installation, overhead and profit for the Contractor and subcontractors.

Contractor shall provide unit prices for the following:

1.	Mass excavation left on site	\$ _____ per cu. yd.
2.	Mass excavation removed from site with disposal.	\$ _____ per cu. yd.
3.	Filling and backfilling with material brought onto site.	\$ _____ per cu. yd.
4.	Filling and backfilling with on-site material.	\$ _____ per cu. yd.
5.	Selected Backfill material -Sand	\$ _____ per cu. yd.
6.	Selected Backfill material -Gravel #57 Stones	\$ _____ per cu. yd.
7.	Topsoil brought onto the site and placed.	\$ _____ per cu. yd.
8.	Topsoil excavated and stockpiled on-site and placed.	\$ _____ per cu. yd.
9.	Mass Rock Excavation with disposal off-site	\$ _____ per cu. yd.
10.	Trench Rock Excavation with disposal off-site	\$ _____ per cu. yd.
11.	Asphalt Paving- parking lot	\$ _____ per sq. yd.
12.	Curb & Gutter - 8" wide Concrete Flat Curb	\$ _____ per L.F.
13.	Stamped Concrete Pavement (Pedestrian)	\$ _____ per sq. ft.
14.	Broom Finished Concrete Pavement (Pedestrian)	\$ _____ per sq. ft.

Upon receipt of the written notice of the acceptance of this bid, BIDDER will execute the formal Contract attached within ten (10) days and deliver a surety bond or bonds, as required by the General Conditions. The bid security attached in the sum of five (5%) percent of the total bid is to become the property of the OWNER in the event the Contract and bond are not executed within the time set forth, as liquidated damages for the delay and additional expense to the OWNER caused thereby.

Respectfully Submitted: Name: _____

Address: _____

Phone No.: _____

FEDERAL TAX NO. OR
SOCIAL SECURITY NO.: _____

Signature of Principal: _____

Title: _____

Date: _____

Telephone: _____

ATTEST:

Signature: _____

Corporate Secretary/Partner/Notary (SEAL)

Name: _____

(Please type)

NOTE: **Attest for a corporation must be by the corporate secretary; for a partnership by another partner; for an individual by a Notary.**

END OF SECTION

4. Treat stumps over 4" in diameter with herbicide to prevent regrowth. Apply in accordance with manufacturer's instructions. Protect remaining adjacent vegetation from herbicide damage.
5. Water trees and other vegetation as required to maintain their health during the course of construction operations.

3.02 STRIPPING TOPSOIL

- A. Strip topsoil to its full depth at building areas, and all areas to be regraded, resurfaced, or paved within contract limit work area.
- B. Stop topsoil stripping at trees designated to remain, a sufficient distance to prevent damage to the root system.
- C. Stockpile topsoil in a location acceptable to the Engineer, for use in finish grading and preparation of lawns and planting beds.

3.03 SITE IMPROVEMENTS

- A. Remove existing site improvements within contract limits as indicated on plans in acceptable manners to the Engineer.
- B. Remove existing sidewalks, curbs, and paving, including all base material, as required to accommodate new construction. Cut existing sidewalks, curbs, and paving in neat, straight lines to provide uniform, even transition from new to adjacent existing work. Cut back existing paving a sufficient distance to permit forming and installation of new work.
- C. Leave below grade voids open and clean. Fill materials will be provided and grading performed in accordance with specification section entitled - "Earthwork".
- D. Existing materials:
 1. Paving base materials where indicated, may remain in place.

3.04 SALVAGED MATERIALS

- A. Remove, store, protect, and reinstall items as directed by the Engineer.
- B. Materials, items, and equipment not scheduled for reinstallation or salvaged for the Owner's use are the property of the Contractor. Remove cleared materials from the site as the work progresses. Storage and sale of Contractor's salvage items on site is not permitted.

3.05 DISPOSAL

- A. Waste material resulting from the Site Preparation and Clearing shall be removed from the work site and disposed of by CONTRACTOR at his expense. No materials will be burned unless directed to do so by the OWNER. The Contractor shall strictly adhere to and be responsible for compliance with all local and State laws relating to the disposal.

- END OF SECTION -

- C. Rock in utility trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

Size of Pipeline (Inches)	Depth of Excavation Below Bottom of Pipe (Inches)
Less than 4	6
4 to 6	8
Over 8	12

Space below grade for pipe shall then be backfilled with minus 3/4-inch crushed rock or gravel or other approved materials and tamped to proper grade.

3.02 ROCK REMOVAL - MECHANICAL METHOD

- A. Excavate for and remove rock by the mechanical method.
- B. Where pipes are constructed on concrete cradles, rock shall be excavated to bottom of cradle as shown on plans.
- C. Where rock foundation is obtained at grade for over 50 percent of area of any one structure, the portion of foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class C concrete.
- D. Where rock foundation is obtained at grade for less than fifty (50%) of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, the rock shall be removed for a depth of twelve (12) inches below grade and the space below grade shall be backfilled with crushed stone as specified for pipelines.
- E. Rock excavation near existing pipelines or other structures shall be conducted with utmost care to avoid damage. Injury or damage to other structures and properties shall be promptly repaired to the satisfaction of OWNER and by CONTRACTOR at his own expense.
- F. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by OWNER shall be completed before construction of any structure is started in the vicinity.
- G. Remove excavated material from site.
- H. CONTRACTOR shall correct unauthorized rock removal by backfill to grade with Class C concrete in accordance with backfilling and compaction requirements of Section 310000 (Earthwork) and Section 3123335 (Trenching and Backfilling) at his own expense.

SECTION 03 00 00

CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Work included in this section consists of, but is not limited to concrete foundation walls, sanitary structures, pipe encasements, and slabs on grade
- B. The work required under this section consists of all materials, equipment, and methods to be used by the Contractor in mixing, placing, testing, finishing and curing concrete. The Contractor shall furnish all cement, aggregate, water, admixtures, and other materials necessary for completing the work described in these Contract Specifications.

1.02 RELATED WORK

- A. Section 03 11 00 - Concrete Forming
- B. Section 03 15 00 - Concrete Accessories
- B. Section 03 20 00 - Concrete Reinforcement

1.03 REFERENCES

- A. ACI 350 - Specifications for Concrete Sanitary Engineering Structures.
- B. ACI 318 - Specification for Building Code Requirements
- C. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Members
- C. ASTM C33 - Concrete Aggregates.
- D. ASTM C94 - Ready-Mixed Concrete.
- E. ASTM C150 - Portland Cement.
- F. ASTM C260 - Air-Entraining Admixtures for Concrete.
- G. ASTM C494 - Chemical Admixtures for Concrete.
- H. Georgia Department of Transportation Standard Specifications (Section 500).
- I. Local Codes

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Minimum of two years's experience on comparable concrete projects.
- B. Obtain materials from same source throughout the WORK.
- C. Allowable Tolerances: Flatwork true to plan 1/8 in. to 10ft.
- D. Tests: As listed in "Methods of Sampling and Testing", Section 18, ASTM C94. Qualifications of laboratory, responsibilities of all parties involved, and designation of the party to employ, and to pay for, specified services are covered in the Supplementary General Provisions.

1. Concrete:

- a) Mix and Control: The verifications and control of concrete mixes shall be the work of an independent testing laboratory. Cost of testing shall be paid by Contractor.
- b) Laboratory Services shall be as follows:
 - (1) Test aggregates for specifications compliance.
 - (2) Test Portland Cement at each car of cement or on marked bin from which shipped.
- 2. Verify design mixes: CONTRACTOR shall submit samples proposed for use in concrete to testing laboratory for making trial batches. Verification tests to be deemed satisfactory must produce minimum 28 day strengths 1200 psi higher than the specified design strength unless standard deviations have been established by the concrete supplier in accordance with Section 4.2.2.1 of ACI 318-71. Furnish written statement of standard deviation, if used, in accordance with ACI 214, established by a registered testing laboratory. Tests for proposed mixes shall consist of making and breaking nine standard cylinders for each mix. Sets of three (3) shall be broken at seven day, fourteen day and twenty-eight (28) day ages. The results of these tests and curves showing the strength of the concrete at various ages shall be submitted to OWNER. If trial mixes fall below test limits, design mixes or materials shall be revised and resubmitted for retesting. A record of field tests for the same proportioning of the same materials will be accepted in lieu of proof testing.

1.05 INSPECTION

The Contractor shall notify the Engineer at least 24-hours prior to scheduled placing of concrete for

inspection of reinforcing steel. No concrete shall be placed until inspected by the Engineer. Such inspection shall not relieve the Contractor of his responsibility for correctness and compliance with the Contract Documents.

1.06 SUBMITTAL

Shop drawings for concrete work shall be submitted to the Engineer for review and approval.

1.07 CEMENT

Cement shall be standard portland cement or high-early strength portland cement, conforming to all of the requirements of ASTM Standard Specifications for portland cement, Type I, Type II and Type III, Serial Designation C-150, latest revision. High-early strength portland cement, Type III, shall be used only when specifically authorized by the Engineer. No cement of dark color shall be used. When weighed in the conventional manner, portland cement shall weigh not less than 94 pounds per standard sack.

Unless otherwise specified as shown on the plans, Type I, portland cement shall be used in all concrete.

1.08 CONCRETE AGGREGATES

- A. Coarse Aggregate: Normal weight concrete (150 lbs per cu.ft.): Crushed stone, gravel or other approved materials having clean, hard, durable uncoated particles. Maximum size of aggregate for slabs, beams, girders, columns and walls shall be sized within the limits of ASTM C-33, size No. 57 (1" to No. 4). Lightweight aggregates for structural concrete shall be in full conformance with ASTM C-330-75 and ACI 211.2-69. Manufacturer or producer of lightweight aggregate shall have been in business of manufacturer for at least five years and able to meet requirements as set out in ACI-318. Gradation of coarse aggregate shall be as that shown for 1" to No. 8 sieve. Semi-light weight or light weight concrete shall not be designed for over 4,000 psi (average 28-day compressive strength).
- B. Fine Aggregate: Clean, hard, durable, natural sand with uncoated grains: free from all organic material or other impurities and shall meet requirements of ASTM C-33 except other materials fine than No. 200 sieve shall be 3% maximum by weight of total sample, and coal and lignite shall be 0.5% maximum by weight of total sample for all concrete. Lightweight structural concrete fine aggregate shall not be used in conjunction with coarse aggregate. Fine aggregate shall be in full conformance with ASTM C-330 latest and ACI 211.2-69. Manufacturer or producer of lightweight aggregates shall have been in business of manufacture for at least five years and able to meet requirements as set out in ACI-318, 4.2 and 4.3. Gradation of fine aggregates shall be as that shown for 3/8" to No. 100 sieve.

1.09 MIXING WATER

Water used in mixing concrete shall be fresh, clean, potable water free from injurious amounts of

oil, acid, alkali, vegetable, sewage and/or organic matter. Water shall be considered as weighting 8.33 pounds per gallon.

1.10 ADMIXTURES

- A. Air-entraining admixtures shall conform to Specifications for Air-Entraining Admixtures for concrete (ASTM C-260). Air content shall be 5% plus or minus 1%, by volume.
- B. Fly Ash or normal Pozzolans in accordance with ASTM C-618, Class F, may be used for all concrete in this section. Chemical admixtures shall not be used without the written permission of the Engineer. Pozzolans shall produce a plastic mix with 5% plus or minus 1% of entrained air by volume. Concrete with fly ash shall contain not greater than 25% Pozzolan by weight of concrete.
- C. A red colorant shall be added to concrete that encases underground ducts. The red colorant shall be Chemtint VC-100 red pigments as manufactured by Chem-Masters Corp., or equal. The concrete mix shall contain 4 lbs colorant per 100 lbs cement to provide a distinct red color throughout a cross-section.
- D. Other admixtures, if used, shall conform to appropriate ASTM standards.

1.11 CURING COMPOUND

Combination sealer and hardener manufactured by Sonneborn, Master Builders, Euclid Chemicals, or equal.

1.12 VAPOR BARRIER

Vapor barriers shall be installed under concrete slabs on ground where shown on the drawings or as directed by the Engineer. Vapor barriers shall be constructed of 0.006 inch (6 mil.) polyethylene sheets placed on a cushion of fine aggregate meeting the requirements of Fine Aggregate of this section. All joints in polyethylene sheets shall be lapped 18 inches and taped.

1.13 CONCRETE MIX

- A. Classes of Concrete
 - 1. Class A - Normal Weight 5,000 psi @ 28 days
 - 2. Class B - Normal Weight 4,000 psi @ 28 days
 - 3. Class C - Normal Weight 3,000 psi @ 28 days

4. Class D - Normal Weight 2,500 psi @ 28 days
- B. Slump for standard concrete, as determined by the method set forth in ASTM Standard C-143, "Method of Test for Slump of Portland Cement Concrete," shall be 4" maximum for fibrated concrete. For thin sections, or for construction with limited clearance between reinforcing steel, the upper limit of slump may be 5". Where concreting conditions preclude the use of vibrators, slump shall be 5". Slumps once fixed for any class of work shall not be charged.
 - C. Proportioning
 1. In each mix design under any design series, the percentage of fine aggregate in the total aggregate shall represent the optimum ratio for good workability in accordance with the aggregates proposed for use.
 2. The proportions of cement, aggregate and water in the mix shall be such as to produce a plastic and workable mass suitable for economical and uniform placements. When dropped from the discharge chute, the concrete mass should flatten out the center and spread out slowly at the edges.
 3. The water-cement ratio of each normal weight concrete mix shall be based on the established relationship between the water-cement ratio and the strength of the concrete with least amount of water consistent with the workability of the fresh concrete. Surface water contained in the aggregates shall be included as part the mixing water in computing water-cement ratio. The following tabulations of minimum cement and maximum water contents shall govern design of normal weight concrete mixes using No. 57 (1" maximum size) coarse aggregate. The slump of the mix shall be 4" plus or minus 1".

Maximum Permissible Water-Cement Ratio

Non air-entrained Concrete			Air-entrained Cement	
Specified Compressive Strength f'_c , psi	Absolute Ratio by Weight	U.S. Gal per 94 lb. Bag of Cement	Absolute Ratio by Weight	U.S. Ga. Per 94 lb. Bag of Cement
2,500	0.67	7.6	0.54	6.1
3,000	0.50	6.6	0.46	5.2
4,000	0.44	5.0	0.35	4.0
5,000	Refer to ACI 318 (Section 4.2, 4.3)	Refer to ACI 318 (Section 4.2, 4.3)	Refer to ACI 318 (Section 4.2, 4.3)	Refer to ACI 318 (Section 4.2, 4.3)

4. When air entrained normal weight concrete is specified, no reduction in cement content shall be made. However, the above minimum cement contents may be reduced by not more than 10% where approved water-reducing admixtures are used, but in no case shall the water content per bag of cement be increased. The Contractor may, at his option and at his risk, alter the specified cement contents when special processes or methods are used in the mixing, placing or curing of the concrete. Any reduction in cement content shall be demonstrated by laboratory tests, at the Contractor's expense, to meet strength and durability requirements of the Specifications, and approved by the Engineer.
5. Each mix design for each specified strength and class of concrete proposed for use by the Contractor and each laboratory verification mix design report shall include the following information:
 - a. Quantity and sources of all materials per cubic yard of concrete based on a saturated surface dried condition for normal weight aggregates.
 - b. Analysis of fine and coarse aggregates showing compliance with Article 2.02, including gradation, specific gravity (bulk S.S.D.) and absorption.
 - c. Design slump range for expected temperature range.
 - d. Design air content.
 - e. Expected 28-day strength for mix design proposed for use by the Contractor and actual 28-day strength for laboratory verification mix design reports.
 - f. Admixtures.
6. Substitution of materials in an approved design mix shall not be made without additional tests for strength and quality. All such tests shall be made at the Contractor's expense.

1.14 CLASS A,B,C, AND D CONCRETE USAGE

Unless noted on the drawings or specified herein to the contrary, all concrete shall be Class B - Normal Weight - 4,000 psi at 28 days. Class A concrete - Normal Weight - 5,000 psi at 28 days shall be in the construction of columns and columns capitals. Fill concrete shall be Class C concrete - Normal Weight - 3,000 psi at 28 days, except in the applications where grout is specifically noted.

1.15 CONCRETE COVER FOR REINFORCING STEEL

- A. Unless shown otherwise on the plans, the protective covering of concrete for reinforcement shall be not less than that specified in ACI-318, Section 7.14. For water-containing surfaces

the concrete cover for reinforcement shall be:

- Support Slabs - 1-1/2 inches, top face and 1 inch, bottom face
- Base Slabs - 2 inches, top face
- Walls, 2 inches
- Beams and girders - 2 inches to stirrups
- Columns - 2 inches to ties

- B. Clean all reinforcing of dust, dirt, rust, grease and all other foreign matter and check to see that such cleanliness has been maintained immediately prior to pouring the concrete.

1.16 MIXING AND TRANSPORTING

- A. Concrete shall be mixed by one of the following methods:

1. Operation of one or more batch type mixing plants, each with a rated capacity of $\frac{1}{2}$ cubic yard or more, installed at the site of the work.
2. Operation of a proportioning plant installed in the vicinity of the work and the use of transit mixers for mixing concrete and transporting it to the forms.
3. Ready-mixed concrete from a central mixing and proportioning plant.

- B. The method selected by the Contractor shall be subject to the approval of the Engineer.

- C. Job Mixed Concrete:

1. All materials shall be measured upon devices approved by the Engineer so that the proportions can be accurately controlled and checked at all times.
2. Concrete shall be mixed until there is a uniform distribution of the materials. It shall be discharged completely before the mixer is recharged. All mixers shall have manufacturer's rating plate, and mixer capacity shall not be exceeded. The mixer shall be rotated at a speed recommended by the manufacture and mixing shall be continued for at least two minutes after all materials are in the mixer.

- D. The mixing and proportioning plants shall be provided with adequate equipment and facilities for accurate measurement and control of the quantities of material and water used the concrete, and for readily changing the proportions to conform to the varying conditions and requirements of the work.

- E. If ready-mixed concrete is to be used in lieu of concrete mixed at the site of the work, materials shall conform to requirements of this section. Proportioning, mixing and transportation of concrete to the forms shall be in accordance with the requirements of ASTM C-94.

- F. Chutes may be used to convey concrete only if the concrete slides without internal motion. Vertical drops shall not be greater than 5 feet. Pumped concrete is permissible. In general, concrete shall be positioned as close as possible to its final location to prevent segregation and this should be accomplished by using bottom dump buckets wherever possible.
- G. If transit of truck mixers are used, the concrete shall be delivered to the forms and discharged from the hauling container within a period of one hour and 30 minutes after the introduction of the mixing water to the cement and aggregates, or the cement to the water and aggregates. During hot weather when the air temperature is above 90 degrees, the delivery time limit shall be reduced to 45 minutes. Prolonged mixing, even at agitating speed, shall be avoided where feasible by stopping the mixer and then agitating intermittently. When concrete cannot be delivered to the forms within the time limit specified, and water-reducing retarder, such as Daratard, as manufactured by Grace Construction Materials; Chemtard, as manufactured by Chem-Masters Corporation; or Pozzolith Retarder, as manufactured by Master Builders Company, or equal, may be used. Such use of a water-reducing retarder will be permitted only as a necessary supplement, not to replace other acceptable hot weather procedures. The admixtures used shall not interfere with strength development and other properties of the concrete and provided this use is carefully controlled by the concrete supplier. Before any such admixture is permitted, it shall be tested with job site materials under job conditions to determine its compatibility with the other materials and its ability under these conditions to produce the desired properties. Retemping of concrete will not be permitted under any circumstances.

1.17 PLACING CONCRETE

- A. Notify ENGINEER minimum 24 hours prior to commencement of concreting operations.
- B. Place concrete in accordance with ACI 304, Chapters 5 & 6
- C. Preparation: Clean and remove water from all spaces to receive concrete before placing. Remove form oil and spattered concrete from reinforcement. All conveyances, buggies and barrows shall be cleaned before and during placing of concrete.
- B. Time of Placing: Concrete shall not be placed except under the following conditions:
 - 1. All reinforcement shall be securely and properly fastened in correct position and protected against displacement during pouring operations.
 - 2. Engineer shall have inspected and approved formwork and reinforcing.
 - 3. All bucks, sleeves, thimbles, hangers, pipes, conduits, bolts, wires and other items to be embedded in concrete shall have been placed and securely anchored in position.

4. Forms shall have been thoroughly wetted or oiled.
 5. Form ties at construction joints have been retightened.
 6. Engineer shall be notified on the day of actual placing of the concrete.
- C. Transporting concrete: Concrete shall be handled from the mixer to the place of final deposit by means of carts, buggies, or conveyors. If the concrete is to be transported more than fifty feet in carts or buggies, they shall be equipped with pneumatic tires. Concrete delivered to the carts, buggies, or conveyors from spouts, troughs, or mixer trucks, shall not have a free fall of more than three feet. Prevent separation or loss of ingredients while transporting the concrete. Delivery carts, buggies, conveyor trucks or barrow shall be kept on temporary runways built over the floor system; runway supports shall not bear upon reinforcing steel or fresh concrete.
- D. Before depositing new concrete on or against concrete that has hardened, the forms shall be retightened and the surface of the hardened concrete shall be roughened, thoroughly cleaned of foreign matter and laitance, and moistened with water. The new concrete placed in contact with hardened concrete shall contain an excess of cement paste to insure bond.
- E. Method of Placing:
1. No water shall be added to the mix without Engineer's approval.
 2. No partially hardened concrete shall be deposited.
 3. The work shall be laid out and carried on so that there are a minimum of construction joints. Obtain Engineer's approval for joint locations. Footings, except wall footings, shall be poured in one operation with no joints.
 4. Placing of concrete shall be rapid and continuous between construction joints. Concrete shall not be placed when the sun, wind, heat or humidity prevents proper placement and consolidation.
 5. Workmen shall not walk on concrete during placing or finishing with any earth or foreign matter on footgear. Hand spreading shall be done with shovels, not rakes.
 6. Concrete shall be distributed so that when consolidated and finished the thickness and surface grade required by the drawings is obtained at all joints.
 7. All floor slabs shall be screeded to an even surface by the use of a straight edge and screening strips accurately and securely set to the proper level. Screeds shall be such type and so arranged so as not to interfere with the top bar reinforcement.
 8. Concrete shall not be placed within twenty-five feet of workmen placing or securing

reinforcement in areas outside of the placement being made.

9. Special care shall be observed to avoid concrete slopping over forms when placing.
 10. Concrete shall be placed with internal type mechanical vibrators, minimum speed 7,000 rpm. Vibration shall be applied at the point of deposit and in the freshly placed concrete. Vibration shall cause the concrete to flow and settle uniformly into place completely embedding reinforcement and fixtures, but shall not cause separation of the mix. Vibration shall be supplemented by hand spading in corners and angles of forms and long form surfaces while the concrete is plastic under vibrator action. Vibrator shall not be used to move concrete laterally within forms.
 11. Unless otherwise specified, all concrete shall be placed upon clean, damp surfaces, free from water, and never upon soft mud, dry absorbent earth or rock, or upon fills that have not been subjected to approved compaction to prevent ultimate settlement. No concrete placement shall be started until the condition of the form or location of placing has been approved by the Engineer.
 12. After the concrete has been deposited it shall be distributed over the entire area within the forms in horizontal layers not more than 18 inches thick. It shall be compacted and worked into all corners and angles and around reinforcement and embedded fixtures in a manner to fill all voids, prevent honeycombing against the forms and avoid segregation of coarse aggregate. This operation shall be performed by the use of spades and internal vibrators. The operation shall be continuous and all concrete shall be in final position before initial set has started.
 13. At least 2 hours shall elapse between pouring of walls or columns and placement of concrete in beams or floor system supported thereon. Brackets, haunches and fillets shall be poured with the floor system.
 14. All top surface not covered by forms and which are not to be covered by additional concrete or backfill shall be carried slightly above grade and struck off by board finish.
 15. Freshly placed concrete shall be protected from wash by rain, flowing water, mud deposits and other injurious conditions. Concrete shall not be allowed to dry out from the time it is placed until the expiration of curing periods.
 16. Imperfect or damaged work, or any materials damaged before final acceptance, shall be replaced by the Contractor in a manner that will not impair the adequacy, stability or appearance of the structure.
- F. Severe Weather Concreting: Special measures shall be taken in both severe hot and cold weather and shall be in accordance with ACI Recommended Practice (ACI 305 and ACI 306).

1. Cold Weather Concreting: Equipment shall be provided during freezing weather to prevent freezing of newly placed concrete. When air temperature of surrounding air is below 40 degrees F., concrete placed in forms shall have a temperature between 70 degrees for three days, or 50 degrees F. for five days or for as much more time as is necessary to insure proper curing of the concrete. Housing or covering or other protection used in connection with heating shall remain in place and intact at least 24 hours after the artificial heat is discontinued. The use of calcium chloride or other chemicals to prevent freezing shall not be permitted.
2. Hot Weather Concreting
 - a) Hot weather precautions shall be taken whenever the maximum air temperature during the day exceeds 85°F. When rapid mixing water evaporation in transit causes the concrete to be delivered in an unworkable condition, initial correction may be made at the job site, provided that water added is in the form of a cement paste containing the same W/C ratio as the batch in the truck, and provided that the drum or mixer blades be operated at mixing speed for at least 70 revolutions after the paste addition. Once need for water has been observed, subsequent additions shall be at the batching plant until the need has passed. Correction shall consist of simultaneous and proportionate increase of water and cement up to 10% of the stated quantity of each material in the batch. Such increase in cement shall not constitute an extra or increase in contract price.
 - b) During hot weather, extra caution shall be taken to prevent too quick evaporation of water. Flat work shall be protected from drying winds, direct sun, and high temperatures whenever conditions of temperature and humidity are such as to cause plastic shrinkage cracking.

1.18 CURING OF CONCRETE

- A. Curing of concrete shall be started as soon as practicable to prevent evaporation of water. Provisions shall be made to maintain all concrete in a moist condition for seven days. Concrete shall be kept moist by a combination of the following methods:
 1. Spraying surfaces with water or ponding. Spraying or ponding shall begin one hour after concrete surface is finished or, for formed surfaces, immediately after forms are stripped. Standard canvas seep hose placed in paralleled runs at 8 ft. o.c. are recommended for ponding.
 2. Slabs shall be covered with wet sand, burlap or similar material where necessary to hold water. Polyethylene film shall not be used for flat exposed areas.
- B. Except at floors to receive liquid hardener, a liquid sealer type curing compound may be used in lieu of the above methods.

1.19 PATCHING

- A. Patching shall be done where permitted by the Engineer as soon as possible as follows; however, permission to patch shall not waive the Engineer's right to have the defective work completely removed if the patch or repairs do not, in the Engineer's opinion, satisfactorily restore the quality and appearance of the work.
- B. For patching of cast-in-place concrete see Section on Grout.

1.20 BONDING NEW CONCRETE TO EXISTING CONCRETE

- A. Where indicated on the drawings that new concrete is to be bonded to an existing concrete surface by the use of an epoxy bonding agent, the existing concrete shall be cut back to provide a minimum of 1- inch thickness of new concrete. Feather edges shall not be permitted.
- B. The existing concrete surface shall be bare, clean, dry, and structurally sound. All loose and unsound material shall be removed by the use of jackhammers, sandblasting and/or wire brushing. All grease, oil, wax or other residue shall be removed by a grease and stain remover that is compatible with the type epoxy bonding agent used.
- C. After all loose material, grease, etc., have been removed, the surface of the existing concrete shall be etched by either sandblasting or cleaning with a 10% solution of muriatic acid followed by a thorough rinsing with clean water. The surface shall then be allowed to dry completely before application of the epoxy bonding agent.
- D. When the surface is dry and just prior to placing new concrete, an epoxy bonding agent shall be applied to the surface of the existing concrete with a whitewash brush or stiff broom. The epoxy bonding agent shall be spread evenly over the surface, avoiding holidays, to wet film thickness of 40 to 60 mils. The new concrete shall be placed as soon as the epoxy bonding agent becomes tacky. In the event that the epoxy bonding agent is allowed to dry before placement of the new concrete, the surface shall be recoated with epoxy.
- E. Adequate safety precautions shall be taken during the handling and use of the epoxy bonding agent.

1.21 FORMS (see Section 031100 - Concrete Formwork)

1.22 CONSTRUCTION JOINTS

- A. Construction joints, as necessary, shall be made only at locations approved by the Engineer.
- B. Keys shall be 1/3 the width of the walls in width and 1/6 the width of the walls in depth. All keys shall be continuous and none shall be smaller than 3-1/2 inches in width and 1-1/2 inches in depth or as shown on the drawings.

- C. A jet of air and water shall be applied to the surface of horizontal construction joints to remove all laitance when the concrete has set sufficiently for the jet to expose the coarse aggregate without loosening same. Immediately prior to placing another lift, the surface shall be thoroughly cleaned and washed by water jet followed by air jet to remove standing water. The surface shall then be covered with a ½ inch thick layer of 1:3 cement-sand mortar evenly distributed and of the same water-cement ratio as the concrete to follow. No vertical construction joints in walls shall be used except by special permission, or as shown on the plans.

1.23 EXPANSION AND CONTRACTION JOINTS AND WATER STOPS

Expansion and contraction joints and water stops shall be constructed where shown on the plans. They shall be of type and detail indicated on the plans.

1.24 FINISHING

- A. All permanently exposed surfaces shall be expected to be smooth and of uniform texture and appearance. All holes, pits or imperfections in the surface of the concrete shall be cleaned with a wire brush, thoroughly wetted and completely filled with damp cement mortar composed of 1 part cement to 2 parts concrete sand. The entire surface shall be left smooth and all lines or markings shall be smoothed over to obtain uniform appearance. In the event the Contractor fails to obtain a satisfactory appearance of the concrete in the opinion of the Engineer, the entire surface shall be thoroughly wetted down, kept wet continuously and rubbed with a No. 20 carborundum stone until all lines, markings and surplus materials have been removed from the surface and until the surface shows a uniform smooth finish. After rubbing is completed the concrete surface shall be washed clean with water. Rubbing may be done by hand or with power tools.
- B. No special concrete or cement mortar topping course shall be used for slab finish unless so shown on the plans. The base slabs shall be brought to a true and even finish by power or hand floating. Where a trowel finish is shown on the plans, it shall be made with steel trowels in such a manner as to produce a dense, smooth, impervious surface, free from blemishes. Care shall be taken that no excess water is present when the finish is made. All permanently exposed edges shall be chamfered with ¾ inch approved edging tool unless other treatment is indicated on the plans. All slabs shall be finished carefully to the true surfaces shown on the plans so no water can stand on the surface.

1.25 FIELD QUALITY CONTROL

- A. Concrete Control: The verification and control of all concrete shall be performed by an independent testing laboratory. Cost of testing shall be paid by CONTRACTOR.
- B. Laboratory Services shall be as follows:

1. Make, cure, store and break test cylinders conforming to requirements of ASTM C31 "Standard Method of Making and Curing Concrete Test Specimens in the Field"; ASTM C39 "Standard Method of Test for Compressive Strength of Cylindrical Specimens"; ASTM C143 "Standard Method of Test for Slump of Portland Cement Concrete"; ASTM C172 Test cylinders and slump tests shall be made at job site and under no circumstances shall they be taken at a central mixing plant.
2. Reports on all tests conducted by laboratory shall be rendered promptly and distributed as follows:
 - a) ENGINEER - Three (3) copies.
 - b) CONTRACTOR - Two (2) copies.
3. Reports of control cylinders for job placed concrete shall contain the following:
 - a) Time of batching.
 - b) Time of sampling.
 - c) Concrete and air temperature.
 - d) Slump.
 - e) Other information furnished by CONTRACTOR.
 - f) Full description of the location of the concrete from which the concrete for test specimen was taken.

C. Contractor's Function in Concrete Testing

1. Deliver samples of aggregate and cement in quantities established by laboratory for tests of aggregate and design mixes.
2. Follow instructions of laboratory in proportioning mixes.
3. Coordinate laboratory's services with building operation. CONTRACTOR shall supply barrows, shovels, mixing boards, shaded work space for molding cylinders, and similar equipment required by laboratory representative for molding test cylinders. Contractor shall provide insulated storage boxes, equipped with thermostatically controlled heat for the storage of cylinders in accordance with ASTM Standard C-31.
4. Keep a daily log, recording quantities of each class of concrete used, the area of location of each quantity of concrete relating to its controlling cylinder and the slump of this concrete, and general weather conditions. The CONTRACTOR shall furnish this information to the laboratory for inclusion in the test reports. The CONTRACTOR shall obtain delivery tickets showing the class and strength of concrete, the size of coarse aggregate and the slump order. The CONTRACTOR shall identify these tickets relative to the area of placement of the concrete and shall retain them on file. He shall produce the tickets, should ENGINEER so request.

D. Detailed Requirements

1. One set of 4 cylinders shall be made for each 100 cubic yards or fraction thereof for each class of concrete in each day's pour. Of each set of test cylinders, one shall be broken at 7 days, two shall be broken at 28 days and one held in reserve.
2. The primary function of compression tests in field concrete is to insure production of uniform concrete of desired strength and quality. Compressive strength is not necessarily the most critical factor in proportioning concrete mixes since other factors, such as durability, may impose lower water-cement ratios that are required to meet strength requirements. In such cases, strength will, of necessity, be in excess of structural demands. To obtain maximum information, a sufficient number of field compression tests should be made to be representative of the concrete produced and appropriate statistical methods should be used to interpret the test result. Statistical methods provide the best basis for assessing from such results the potential quality and strength of the concrete in a structure and expressing the results in a useful form. The ACI Standard Recommended Practice for Evaluation of Compression Test Results of Field Concrete, ACI 214-65 shall be used. The Statistical method of determining acceptable concrete will govern operations of costing.

1.26 WATERTIGHT STRUCTURES

It is the intention of these specifications to provide impervious concrete. All pits below groundwater level and all structures for holding or carrying water must be watertight. A loss of not more than 1/4 inch depth in 24 hours will be permitted when water-holding structures and interior surfaces of pits below groundwater level shall be free from visible damp spots or seepage before acceptance. Repeated tests and repairs may be required by the Engineer to obtain watertight structures. All structures shall be tested at the completion of tests unless otherwise directed by the Engineer. The cost and expense of testing and providing watertightness in structures and of remedying defects shall be paid for by the Contractor.

1.27 PAYMENT

No separate payment will be made for furnishing all labor, materials, equipment, tools, plant services and other expenses in connection with or incidental to the concrete work, except as may be otherwise stipulated in the Bid Schedule. The cost of the work, and all costs incidental, thereto, shall be included in the lump sum price bid or unit prices bid, as applicable, for the other items of work.

END OF SECTION

SECTION 03 11 00

CONCRETE FORM WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
- B. Openings for other affected work.
- C. Form accessories.
- D. Stripping forms.

1.02 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

- A. Section 03 15 00 - Concrete Accessories

1.03 REFERENCES

- A. ACI 350 - Specifications for Concrete Sanitary Engineering Structures
- B. ACI 347 - Recommended Practice for Concrete Formwork.
- C. PS 1 - Construction and Industrial Plywood.

1.04 SYSTEM DESCRIPTION

- A. Forms shall be fabricated, erected, and removed as specified herein and shall be of a type, size, shape, quality and strength to provide hardened concrete having the shape, lines, and dimensions indicated on Drawings. The forms shall be true to line and grade in accordance with the tolerances as specified in Section 03 00 00, Cast-In-Place Concrete, and shall be mortar tight and sufficiently rigid to resist deflection during concrete placement. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes that would deface the finished surfaces.
- B. The responsibility for correctly assessing and analyzing the erection stresses induced upon the structure, its elements and supporting foundations during construction will be the total obligation of CONTRACTOR. Since ENGINEER does not dictate or determine CONTRACTOR's sequence of operations of construction, ENGINEER cannot determine erection stresses and therefore assumes no responsibility or obligation to do so. CONTRACTOR must employ or otherwise provide for adequate professional structural engineering supervision to determine erection stresses and notify ENGINEER of results of study.

1.05 QUALITY ASSURANCE

- A. The responsibility for adequate formwork design for construction of cast-in-place, reinforced concrete will be the total obligation of CONTRACTOR. CONTRACTOR shall employ competent professional engineering services to design formwork and supervise the erection of all formwork needed for the Work.
- B. Except as modified herein, form design, fabrication, and erection shall conform to the requirements of ACI 347 latest edition and ACI 350 latest edition and shall be acceptable to ENGINEER. Design criteria for plywood shall conform to APA Form V345.

1.06 REGULATORY REQUIREMENTS

- A. Formwork shall comply with requirements of ANSI A10.9 and OSHA Construction Standards, Part 1926, Subpart Q, Concrete, Concrete Forms, and Shoring.

1.07 STORAGE

- A. All form materials and accessories shall be stored above ground on framework or blocking and shall be covered with a suitable waterproof covering providing adequate air circulation and ventilation.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Plywood: Product Standard PS-1, waterproof, resin-boned, exterior type Douglas Fir.
- B. Prefabricated Steel Forms: Will be of sufficient quality to assure the structure will meet all code requirements.
- C. Lumber: Straight, dressed all sides, uniform width and thickness, free from surface defect and of a sufficient grade to support the designed loads.

2.02 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off metal of fixed length; cone type; free of defects that will leave holes no larger than 7/8 inch diameter in concrete surface, with waterproofing washer.
- B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture. Manufactured by Richmond "Rich Cote", L & M "Debond", or equal.
- C. Fillets for Chamfered Corners: 3/4 inch wood strips

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify lines, levels, and measurements before proceeding with formwork.

3.02 PREPARATION

- A. Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.
- B. Minimize form joints. Symmetrically align joints.
- C. Arrange and assemble formwork to permit stripping, so that concrete is not damaged during its removal.
- D. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3.03 ERECTION

- A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- B. Camber slabs and beams to achieve ACI 350 tolerances.
- C. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.
- D. Provide chamfer strips on external corners of beams and walls.
- E. Install void forms. Protect from moisture before concrete placement. Protect from crushing during concrete placement.
- F. Construct formwork to maintain tolerances in accordance with ACI 350.

3.04 APPLICATION OF FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for work embedded in or passing through concrete.

- B. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.06 FORM REMOVAL

- A. Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead and live loads. Shoring beneath beams or slabs shall be left in place and reinforced as necessary to carry any construction equipment or materials placed thereon.
- B. No forms shall be removed without the approval of ENGINEER. In general and under normal conditions ENGINEER will approve removal of forms after following time as elapsed:

ITEM	TIME AFTER PLACEMENT
Elevated slabs and beams	14 days
Walls	3 days

- C. Reshore structural members due to design requirements or construction conditions to permit successive construction.
- D. Remove formwork progressively so no unbalanced loads are imposed on structure.
- E. Do not damage concrete surfaces during form removal.
- F. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

3.07 CLEANING

- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean-out ports.
- C. During cold weather, remove ice and snow from forms. Do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

END OF SECTION

SECTION 03 15 00

CONCRETE ACCESSORIES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work required under this section consists of furnishing and placing all materials associated with expansion joints, waterstops, anchors and inserts.

1.02 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM), as referenced.
- B. American National Standards Institute (ANSI), as referenced.

1.03 QUALITY ASSURANCE

- A. Expansion joints, control joints and waterstops will be subject to inspection for defects in materials and placement.

PART 2 PRODUCTS

2.01 EXPANSION JOINTS AND CONSTRUCTION JOINTS

- A. Expansion joints and construction joints shall be constructed of resin by W. R. Meadows, or equal, and include an expansion type PVC waterstop. The top of the joint shall be filled with sealant conforming to ANSI A116.1, Class B.

2.02 WATERSTOPS

- A. Except where specified, all waterstops shall be polyvinyl-chloride ribbed center bulb Type 9380 by W. R. Meadows, Inc.; Volco Type 8017 by Vulcan Metal Products, Inc.; Type RB9-12 by Vinylex Corporation, or equal.

2.03 MEMBRANE - Forming Curing Compound (AASHTO:M148)

- A. Membrane-forming Curing Compounds, Type 1-D, Class A or B, or Type 2, Class A or B, White Pigmented shall be used as the curing agent subject to the following limitations:
 - 1. The curing compound shall be uniformly applied to unformed areas when the water sheen disappears from the concrete surface. Formed surfaces shall receive an application of curing compound if forms are removed during the five day curing period.

2. Areas to be rubbed shall be cured with Liquid Membrane-Forming Compounds for Curing Concrete, Type 1-D, Class A or B, (Non-Acrylic).

PART 3 EXECUTION

3.01 PLACEMENT

- A. Joint fillers and/or molded waterstops shall be properly inserted in forms and supported at the locations where called for on the drawings and where required in such manner that it will not become displaced during placing of concrete.
- B. Concrete shall be coated with approved bituminous material to prevent bonding of concrete at step joints and where necessary or required. The bituminous material may also be used for holding joint filler in place.
- C. The surface to which sealant is applied shall be clean, dry, sound and free of soil, grease, dirt and loose particles. Sealant shall be mixed and applied according to manufacturer's recommendations.
- D. Anchors and inserts shall be firmly positioned so as to prevent displacement during placing of concrete.
- E. Curing compound shall be applied to all exposed surfaces with equipment which will produce a fine spray, and all compounds shall be thoroughly agitated just prior to use. The surface shall be sprayed again immediately at right angles to the first application. The rate of each application shall be not less than 1 gallon for each 150 square feet of surface. Care shall be taken to prevent application to joints where concrete bond is required, to reinforcement steel, and to joints where joint sealer is to be placed.
- F. No pedestrian or vehicular traffic shall be allowed over the surface for seven days unless the surface is protected by planks, plywood, or a layer of sand at least 1 inch thick. The protection shall not be placed until at least 12 hours after the application of the curing compound.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete.
- B. Support chairs, bolsters, bar supports, and spacers for supporting reinforcement.

1.02 RELATED WORK

- C. Section 03 00 00 - Concrete: Concrete placement.

1.03 REFERENCES

- A. ACI 350 - Specifications for Concrete Sanitary Engineering Structures.
 - B. ACI 315 - Details and Detailing of Concrete Reinforcement.
 - C. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
 - D. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - E. CRSI - Manual of Practice.
 - F. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
 - G. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.
- ##### 1.04 QUALITY ASSURANCE

- A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice, and Documents 63 and 65.
- B. Conform to ACI 350 and 315.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel: ASTM A615, 40 ksi yield grade billet-steel bars, uncoated finish.
- B. Welded Steel Wire Fabric: ANSI/ASTM A185 plain type; in coiled rolls; uncoated finish.

- C. Stirrup Steel: ANSI/ASTM A82.

2.02 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage, annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.

2.03 FABRICATION

- A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03 30 00.
- B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Before placing concrete, clean reinforcement of foreign particles or coatings.
- B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.

3.02 STORAGE

- A. Storage of reinforcement shall be in such a manner as to prevent damage to the reinforcing bars. All steel shall be kept clear of the ground, protected from the weather.

END OF SECTION

SECTION 03 60 00

GROUT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. WORK required under this section consists of mixing, forming, placing and curing. CONTRACTOR shall furnish all cement, aggregate, water, labor, equipment and other materials necessary or convenient to him for completing the WORK described in these Specifications.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
- B. National Concrete Masonry Association (NCMA)
- C. American Concrete Institute (ACI)

1.03 DELIVERY AND STORAGE

- A. Prevent damage to or contamination of grouting materials during delivery, handling and storage.
- B. Store all grouting materials in undamaged condition with seals and labels intact as packaged by manufacturer.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Minimum of two years's experience on comparable concrete projects.
- B. Allowable Tolerances: Flatwork True to Plane 1/8 inch in 10 feet.
- C. Tests
 - 1. Mix and Control
 - a. Verification and control of grout mixes shall be work of an independent testing laboratory. Cost of testing shall be paid by CONTRACTOR.
 - b. Laboratory services shall be as follows:
 - 1) Test aggregates for specifications compliance.

- 2) Test portland cement at each car of cement or on marked bin from which shipped.

D. Strength

Grout shall attain a minimum 28 day compressive strength as listed below. Take one sample and cast two specimens for each 30 cubic yards of grout of fraction thereof being placed.

Test Specimens

- | | | |
|----|---------------------|----------|
| 1. | Masonry Grout | 300 psi |
| 2. | Non Shrink Grout | 3000 psi |
| 3. | Flowable Fill Grout | 500 psi |

E. Casting of grout specimens shall be as follows:

1. On flat nonabsorbent base, form a space approximately three inches by three inches by six inches (3" x 3" x 6") high, i.e., twice as high as it is wide, using masonry units having the same moisture condition as those being laid. Line the space with permeable paper or porous separator, e.g., absorptive paper towel, so that water may pass through the liner into the masonry units. Thoroughly mix or agitate grout to obtain a fully representative mix and place into molds in two layers and puddle each layer with a one-inch by two-inch (1" x 2") puddling stick to eliminate air bubbles. Level off and immediately cover molds and keep them damp until taken to laboratory. After 48 hours set, have the laboratory carefully remove masonry units and place them in the fog room until tested in damp condition. Cap the specimens in accordance with applicable provisions of "Method of Capping Cylindrical Concrete Specimens", ASTM C-617 Test in accordance with applicable provisions of ASTM C-39, "Method of Test for Compressive Strength of Cylindrical Concrete Specimens".
2. Cost of the testing and laboratory reports shall be paid for by CONTRACTOR.

PART 2 PRODUCTS

2.01 MATERIALS

A. Masonry Grout

1. Portland Cement: ASTM C-150, Type 1.
2. Fine Aggregate: Sand in accordance with ASTM C-33.

3. Coarse Aggregate: Pea gravel in accordance with ASTM C-33, graded so that at least 90 percent passes 3/8-inch sieve and 90 percent is retained by a No. 4 sieve.
- B. Non Shrink Grout
1. Premixed/Preproportioned Grout
 - a. Five Star Brand Non Shrink Grout or approved equal.
 - b. Grout shall not contain gypsum, aluminum or iron powders and shall meet the shrinkage requirements of ASTM C-883. Epoxy grout will not be permitted if the substrate is to be exposed to temperatures greater than 140°F.
 - c. Minimum time of workability shall be 30 minutes at ambient temperature.
 - d. Application shall be in conformance to manufacturer's specifications.
 2. Site Proportioned/Mixed Grout
 - a. Site mixed grout shall be of "dry pack" or "earthmoist" consistency with 0-1 inch slump. Grout shall consist of three parts sand to one part portland cement with only enough water added to wet all the material.
 - b. All surfaces shall be cleaned of all dirt and oil prior to application.
 - c. Prior to placement of grout, the substrate shall be wetted with potable water until saturated without ponding.
 - d. Grout shall be applied by packing by hand or with the use of a wooden plunger.
- C. Flowable Fill Grout: Flowable fill grout shall be a mixture of sand, fly ash cement and water that will produce a material that can be used in lieu of compacted soil. Air entrainment may be used up to 30% maximum. The finished produce shall have a 28 day compression strength of 100 psi.
- D. Flowable fill shall be used to fill unused casings or fill in narrow trenches that are difficult to compact backfill. CONTRACTOR shall submit mix design for approval by ENGINEER.

PART 3 EXECUTION

3.01 MIXES

- A. Mix design shall be submitted to ENGINEER for approval. It shall be used in reinforced

unit masonry and as shown on Drawings for leveling surfaces.

- B. Masonry Grout shall be used for the following: Leveling surfaces; sloping surfaces; and patching anchor holes or small defective areas of concrete.
- C. Masonry Grout shall be proportioned and mixed in accordance with ASTM C-476 for coarse grout, Table 1.
- D. Non Shrink Grout shall be used for column bases or under equipment bases. Non Shrink Grout shall be placed by packing by hand or with a wooden plunger.

3.02 MIXING

- A. Masonry grout shall be mixed and placed in accordance with NCMA, "Specification for the Design and Construction of Load-Bearing Concrete Masonry, Chapter 4.
- B. Mix non-shrink grouting materials and water in a mechanical mixer for no less than 3 minutes. After the grout has been mixed, do not add more water for any reason. Do not retemper grout
- C. Mix grout as close to WORK area as possible and transport the mixture quickly and in a manner that does not permit segregation of materials. Do not mix more grout than can be placed within 20 minutes.

3.03 PROCEDURES

- A. Installation methods and procedures shall be as recommended by manufacturer and/or as approved by ENGINEER before WORK is begun.
- B. Type of grout and method of installation for Tunneling, Boring and Jacking shall be furnished to ENGINEER for his review and approval prior to use in construction operation.

3.04 FORMWORK

- A. Build leakproof forms that are strong and securely anchored and shored to withstand grout pressures.
- B. Provide enough clearance between the formwork and the area to be grouted to permit proper placement of grout.

3.05 SURFACE PREPARATION FOR GROUT

- A. Remove all defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces by bush-hammering, chipping or other similar means, until a sound, clean concrete surface is achieved.

- B. Lightly roughen the concrete, but not enough to interfere with the proper placement of grout.
- C. Cover concrete areas with waterproof membrane until ready to grout.
- D. Remove foreign materials from all steel surfaces in contact with grout.
- E. Align, level and maintain final positioning of all components to be grouted.
- F. Take special precautions during extreme weather conditions according to manufacturer's published instructions.
- G. Immediately before grouting, remove waterproof membranes and clean any contaminated surfaces.
- H. Saturate all concrete surfaces with clean water; remove excess water and leave none standing.

3.07 PLACING NON-SHRINK GROUT

- A. Place non-shrink grouting material quickly and continuously by the most practical means permissible: pouring or under gravity pressure.
- B. Do not used either pneumatic-pressure or dry packing methods without written permission of the Engineer.
- C. Apply grout from one side only to avoid entrapping air.
- D. Final installation shall be thoroughly compacted and free from air pockets.
- E. Do not vibrate the placed grout mixture, or allow it to be placed if the area is being vibrated by nearby equipment.
- F. Do no removed leveling shims for at least 48 hours after grout has been placed.
- G. After shims have been removed, fill voids with non-shrink grout.
- H. Perform all non-shrink grouting work in accordance with the recommendations of the ACI and the approved manufacturers' published specifications for mixing and placing.

3.08 PATCHING CONCRETE

- A. Defects in formed concrete surfaces shall be repaired within 24 hours of placement, to the satisfaction of ENGINEER, and defective concrete shall be replaced within 48 hours after the adjacent forms have been removed. All concrete which is honeycombed or otherwise defective, shall be cut out and removed to sound concrete, with edges square cut to avoid

feathering.

- B. Except as modified herein, concrete repair work shall conform to Chapter 9 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. All repair work shall be adequately cured.
- C. Where authorized by ENGINEER, repair may be accomplished by patching conducted as specified herein. However, permission to patch shall not waive the ENGINEER's right to have the defective work completely removed if the patch or repairs do not, in ENGINEER's opinion, satisfactorily restore the quality and appearance of the WORK. Patching shall be conducted as follows:
 - 1. Chip away defective areas at least 1-1/2 inch deep perpendicular to the surface, wet the area and 6 inches around it to prevent absorption of water from patching mortar, and brush a sand-cement grout consisting of one part fine aggregate to one part portland cement onto the surface.
 - 2. Masonry grout shall be used for patching. Use the minimum amount of mixing water required for placing.

3.09 CURING

- A. Cure exposed grout for 3 days after placing by keeping wet or coating with a curing compound.

END OF SECTION