INDIANA DEPARTMENT OF TRANSPORTATION

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Michael R. Pence, Governor
Brandye L. Hendrickson, Commissioner

AGENDA

July 21, 2016 Standards Committee Meeting

MEMORANDUM

July 05, 2016

TO: Standards Committee

FROM: Scott Trammell, Secretary

RE: Agenda for the July 21, 2016 Standards Committee Meeting

A Standards Committee meeting is scheduled for 09:00 a.m. on July 21, 2016 in the N955 Bay Window Conference Room. Please enter meeting through the double doors directly in front of the conference room.

The following items are listed for consideration:

A. GENERAL BUSINESS ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

1. Approval of the Minutes from the June 16, 2016 meeting

B. CONCEPTUAL PROPOSAL ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

(No items on this agenda)

C. STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS PROPOSED ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

Item No. 1 (2016 SS)	Ms. Phillips	pg 3
Standard Drawings:		
604-NVUF-01	NON-MOTORIZED VEHICLE USE FACILITY HMA PAVEMENT SECTION	
604-NVUF-02	NON-MOTORIZED VEHICLE USE FACILITY HMA PAVEMENT SECTION ON ABANDONED RAILROAD CORRIDOR	
610-UTMO-01	U-TURN MEDIAN OPENING	

Item No. 2 (2016 SS)	Mr. Pankow	pg 12
702.13(h)	Test Beams	
702.14(B)	Removal	
702.22	Curing Concrete	

Item No. 3 (2016 SS)	Ms. Phillips	pg 17
715.02	Materials	
715.05	Laying Pipe	
715.07	Tee and Stub-Tee Connections	
715.09	Backfilling	
715.13	Method of Measurement	
715.14	Basis of Payment	
907.16	Thermoplastic Pipe Requirements	
907.20	Ribbed Polyethylene Pipe	
908.02	Corrugated Steel Pipe and Pipe-Arches	
908.08	Polymer Precoated Galvanized Corrugated Steel Culvert Pipe and Pipe-Arches	
Standard Drawings Series:		
715-PSLC-01 THRU -03	PIPE SERVICE LIFE CRITERIA	
715-PHCL-01 THRU -23	PIPE HEIGHT OF COVER LIMITS	
715-PIPE-01 AND -02	PIPE CLASSIFICATION TABLES	

cc: Committee Members
FHWA
ICI

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD DRAWINGS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: HMA Type A Mixture eliminated from Standard Specifications effective October 2016 lettings.

PROPOSED SOLUTION: revise Standard Drawings that call out HMA Type A to HMA Type B

APPLICABLE STANDARD SPECIFICATIONS: n/a

APPLICABLE STANDARD DRAWINGS: series 610-UTMO and 604-NVUF

APPLICABLE DESIGN MANUAL SECTION: n/a

APPLICABLE SECTION OF GIFE: n/a

APPLICABLE RECURRING SPECIAL PROVISIONS: n/a

PAY ITEMS AFFECTED: n/a

APPLICABLE SUB-COMMITTEE ENDORSEMENT: none

IMPACT ANALYSIS (attach report):

Submitted By: Elizabeth Phillips

Title: Standards and Policy Manager

Organization: Bridges Division

Phone Number: 232-6775

Date: June 16, 2016

Ms. Phillips
Date: 07/21/16

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD DRAWINGS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? n

Will approval of this item affect the Approved Materials List? n

Will this proposal improve:

Construction costs? n

Construction time? n

Customer satisfaction? n

Congestion/travel time? n

Ride quality? n

Will this proposal reduce operational costs or maintenance effort? n

Will this item improve safety:

For motorists? n

For construction workers? n

Will this proposal improve quality for:

Construction procedures/processes? n

Asset preservation? n

Design process? n

Will this change provide the contractor more flexibility? n

Will this proposal provide clarification for the Contractor and field personnel? n

Can this item improve/reduce the number of potential change orders? y

Is this proposal needed for compliance with:

Federal or State regulations? n

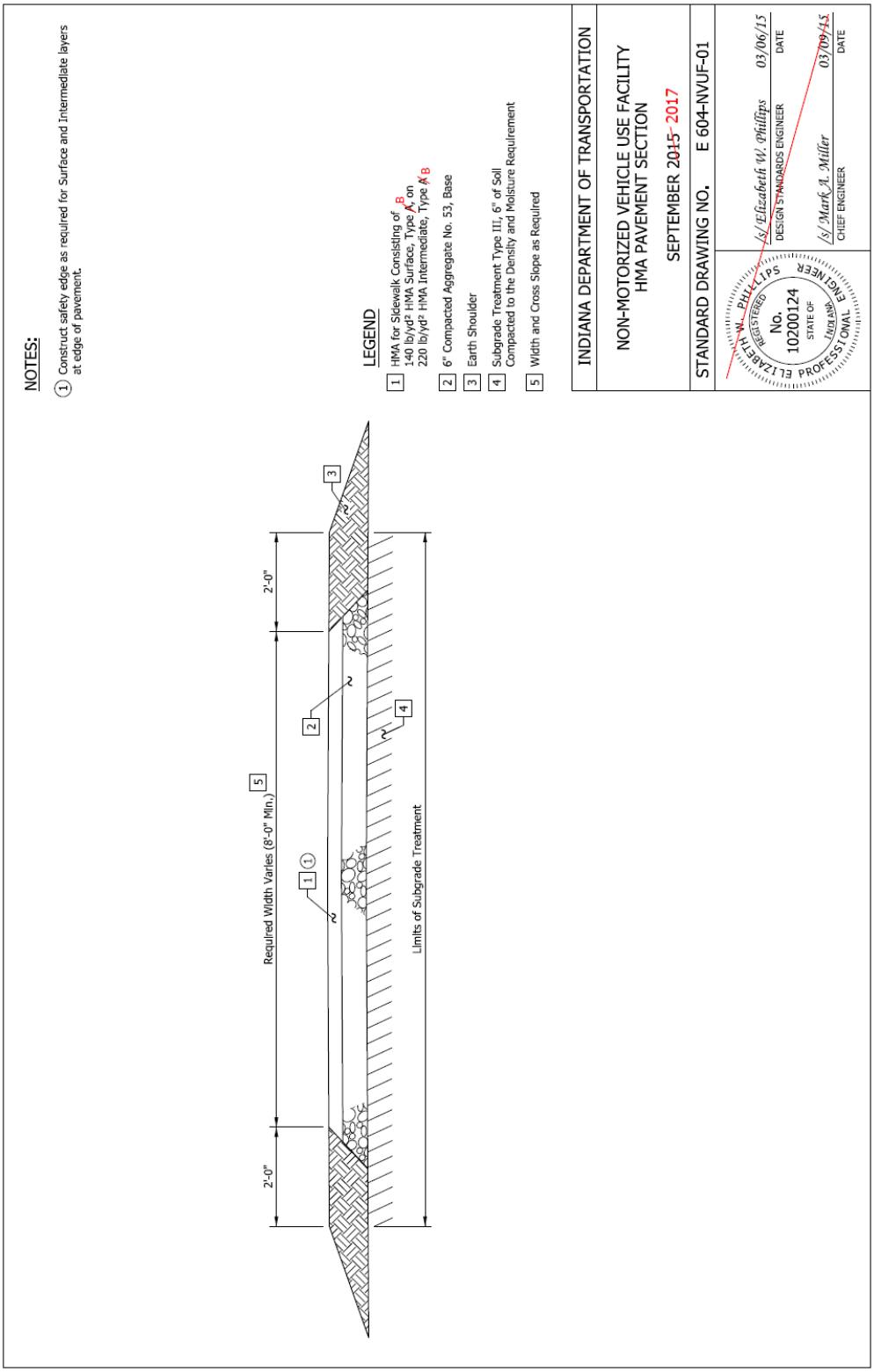
AASHTO or other design code? n

Is this item editorial? n

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda:

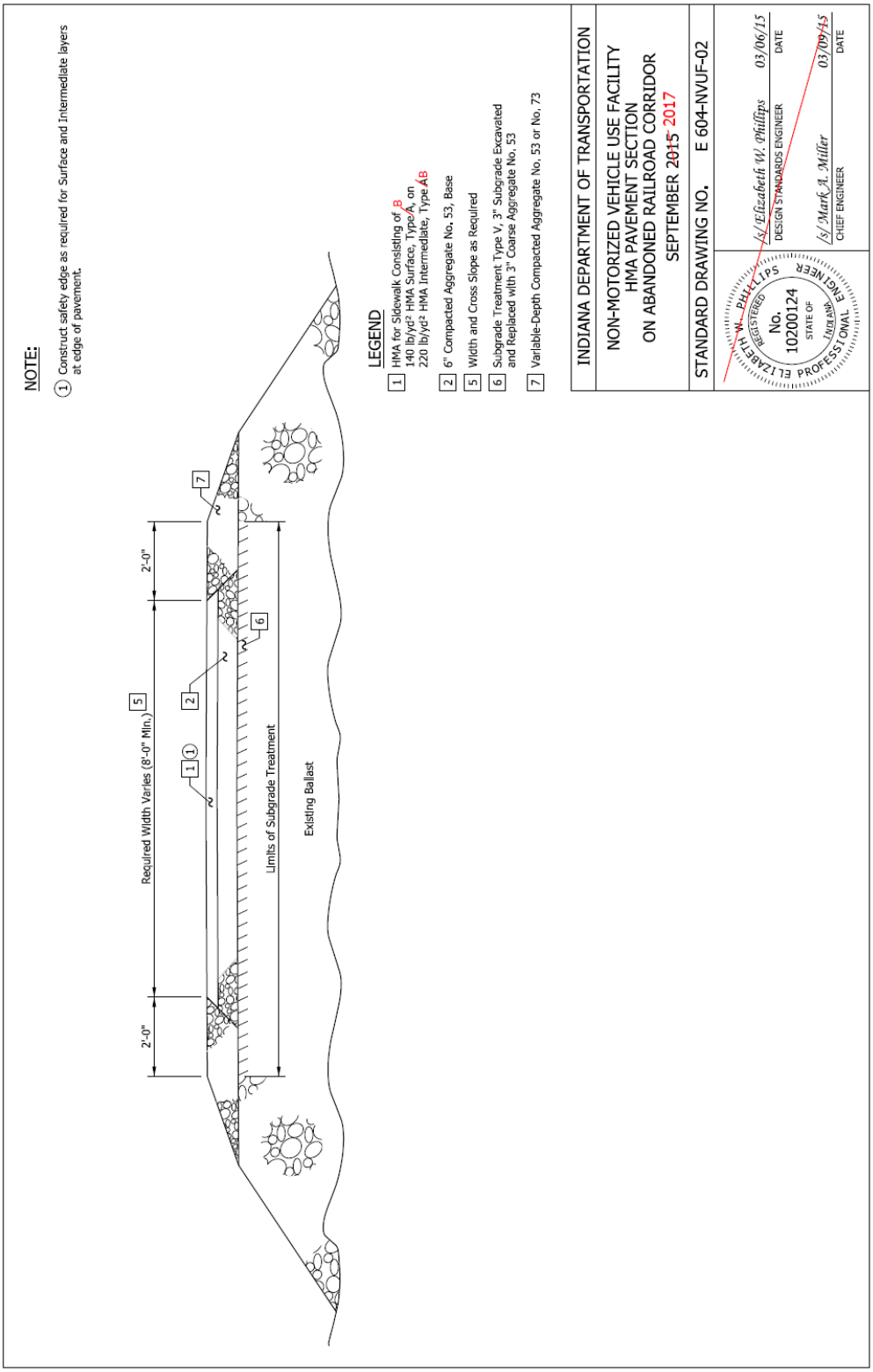
REVISION TO STANDARD DRAWINGS

604-NVUF-01 NON-MOTORIZED VEHICLE USE FACILITY HMA PAVEMENT SECTION (WITH MARKUPS)



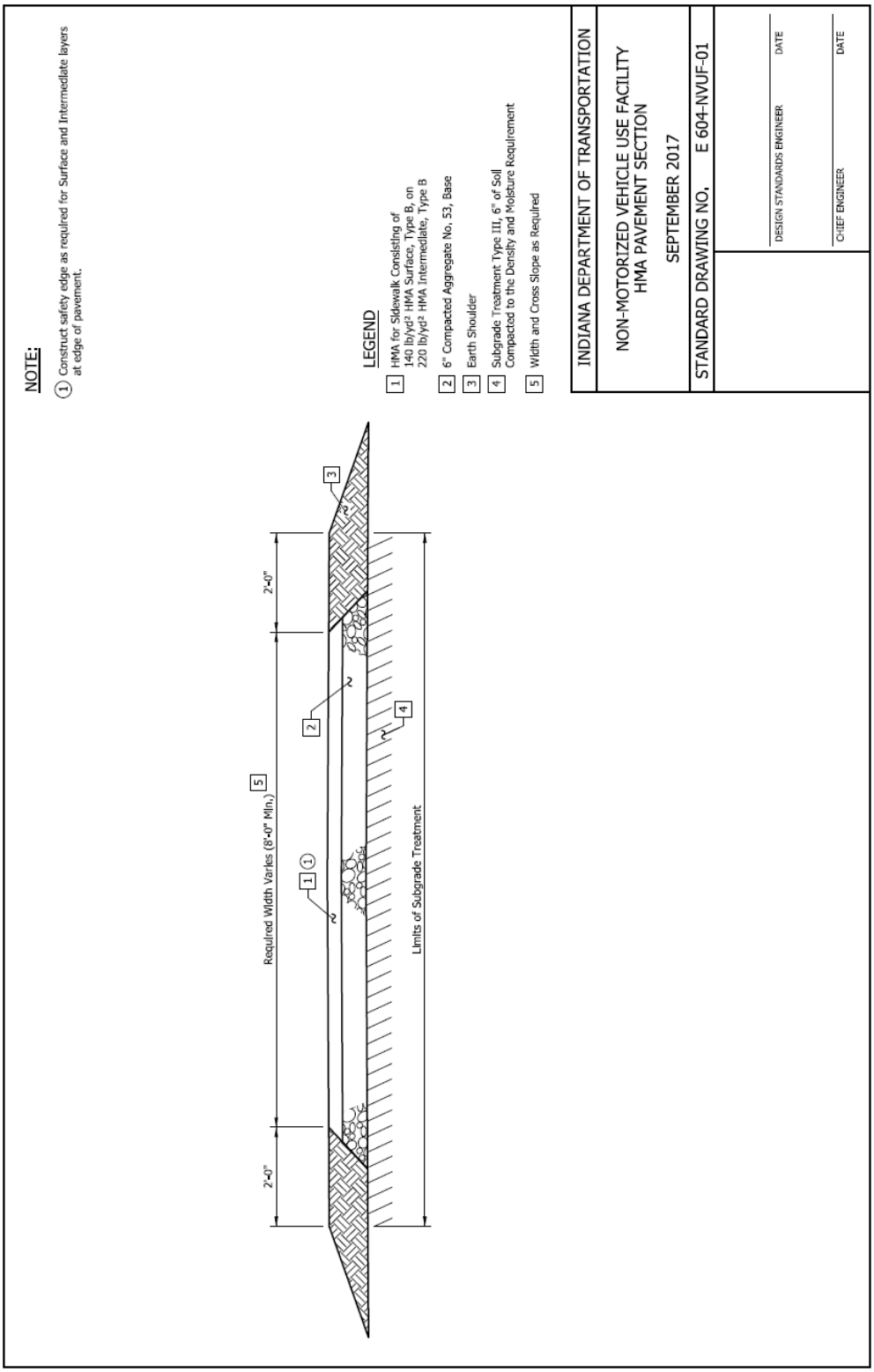
REVISION TO STANDARD DRAWINGS

604-NVUF-02 NON-MOTORIZED VEHICLE USE FACILITY HMA PAVEMENT SECTION ON ABANDONED RAILROAD CORRIDOR (WITH MARKUPS)



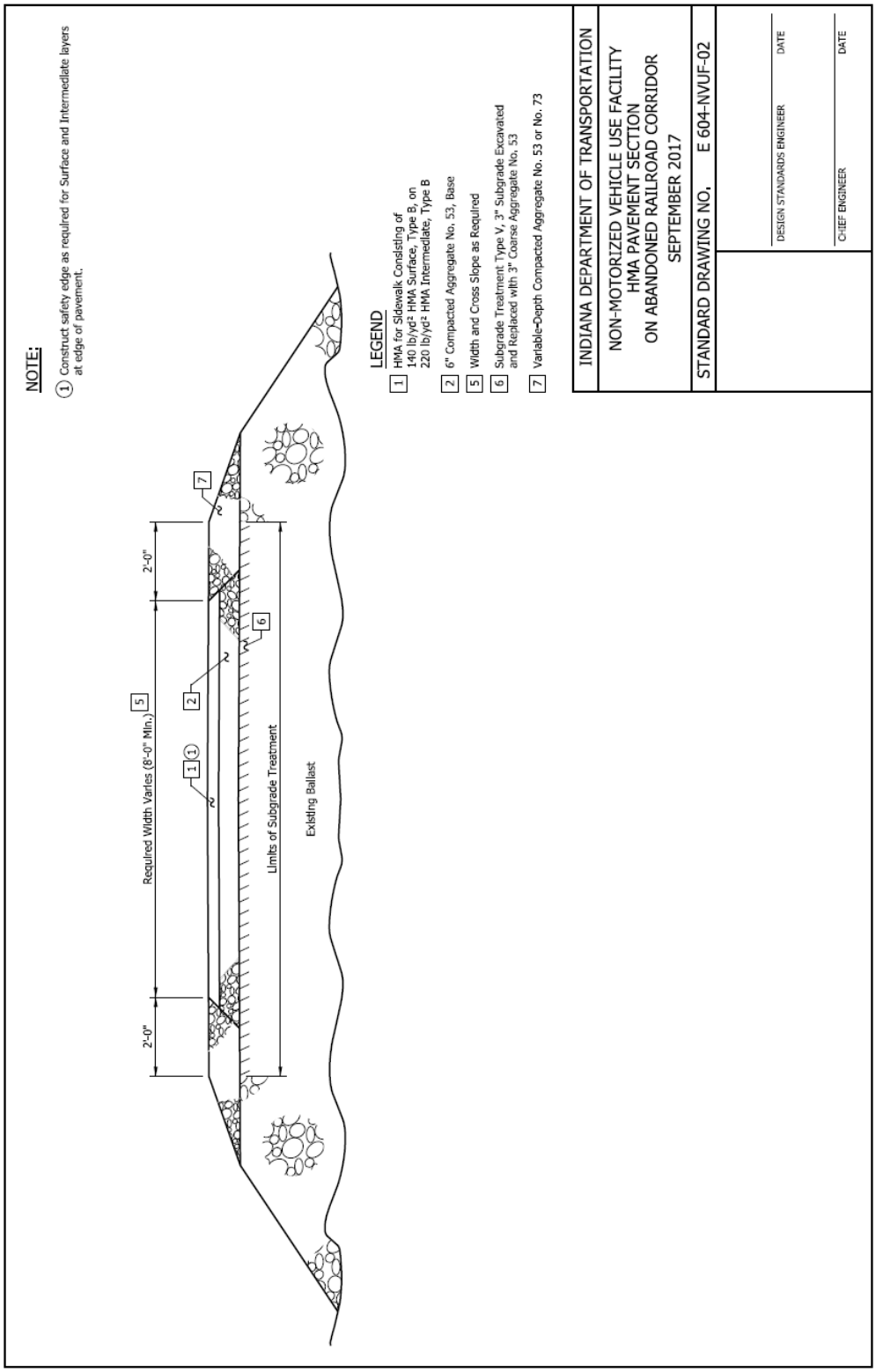
REVISION TO STANDARD DRAWINGS

604-NVUF-01 NON-MOTORIZED VEHICLE USE FACILITY HMA PAVEMENT SECTION (DRAFT)



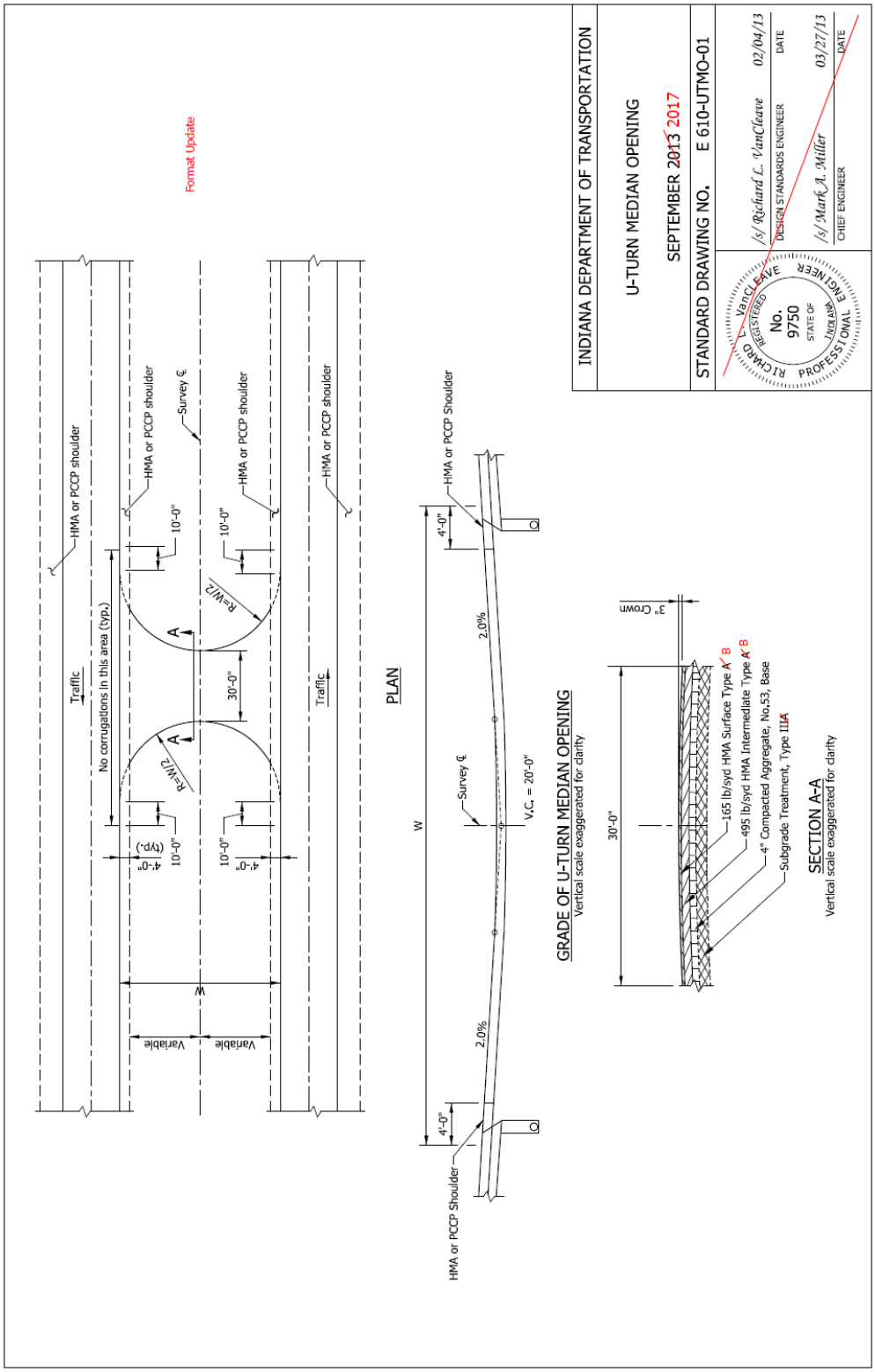
REVISION TO STANDARD DRAWINGS

604-NVUF-02 NON-MOTORIZED VEHICLE USE FACILITY HMA PAVEMENT SECTION ON ABANDONED RAILROAD CORRIDOR (DRAFT)



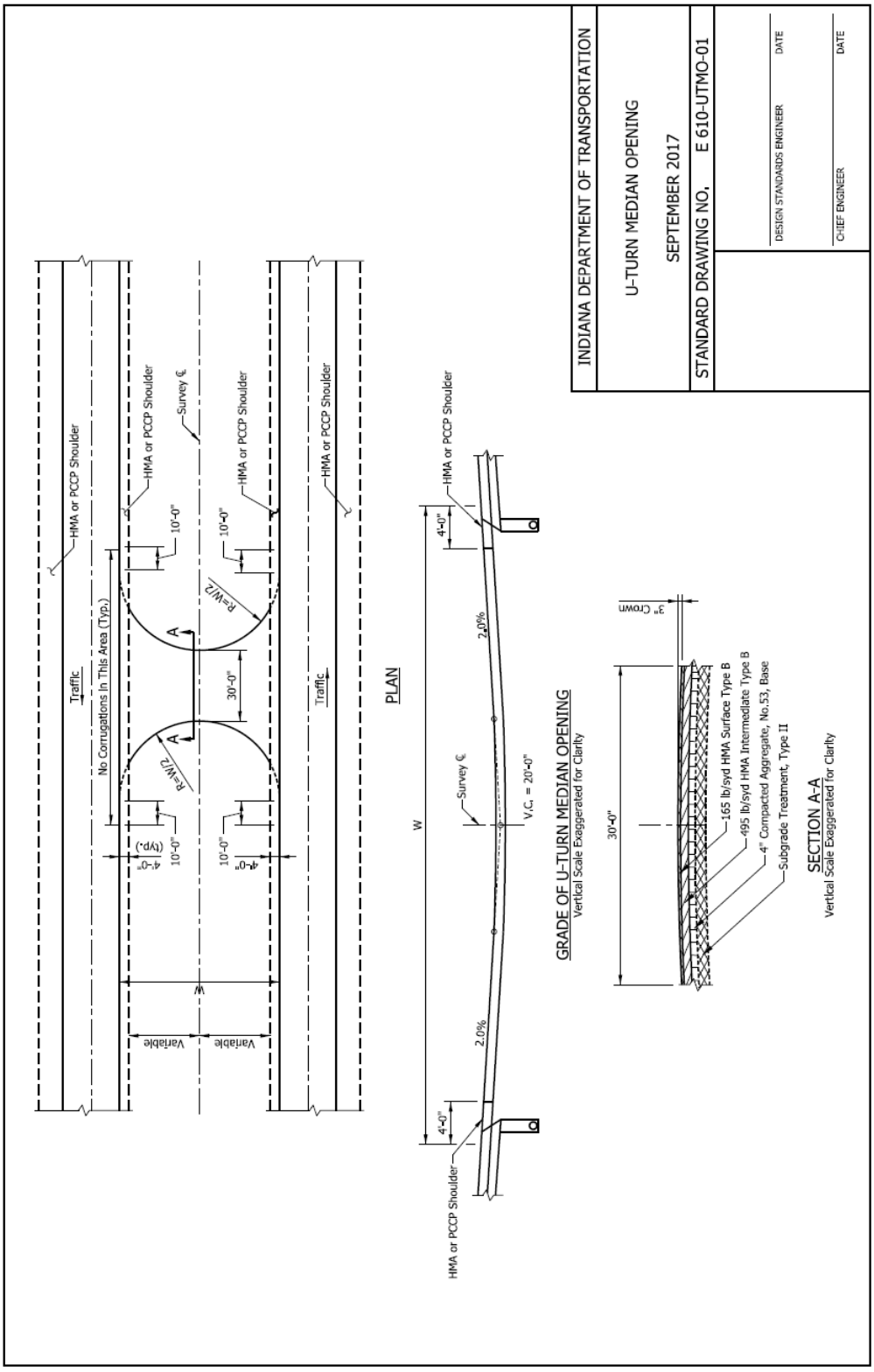
REVISION TO STANDARD DRAWINGS

610-UTMO-01 U-TURN MEDIAN OPENING (WITH MARKUPS)



REVISION TO STANDARD DRAWINGS

610-UTMO-01 U-TURN MEDIAN OPENING (DRAFT)



COMMENTS AND ACTION

604-NVUF-01 NON-MOTORIZED VEHICLE USE FACILITY HMA PAVEMENT SECTION
604-NVUF-02 NON-MOTORIZED VEHICLE USE FACILITY HMA PAVEMENT SECTION ON ABANDONED RAILROAD CORRIDOR
610-UTMO-01 U-TURN MEDIAN OPENING

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: section 604 and section 610 Recurring Special Provision affected: NONE Standard Drawing affected: 604-NVUF-01, -02 and 610-UTMO-01 Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2018 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update _____ SiteManager Update

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Concerns between Industry and INDOT on when falsework removal should be executed for structural concrete.

PROPOSED SOLUTION: Change the requirements of when to remove falsework for structural concrete. Requirements consist of either remain in-place duration, achievement of flexural strength, or both.

APPLICABLE STANDARD SPECIFICATIONS: 702 – Structural Concrete

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

APPLICABLE SUB-COMMITTEE ENDORSEMENT: N/A

IMPACT ANALYSIS (attach report): Yes

Submitted By: Greg Pankow

Title: State Construction Engineer

Organization: Construction Management

Phone Number: (307) 232-5502

Date: 6/20/2016

Mr. Pankow
Date: 07/21/16

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

Construction costs? No

Construction time? Yes

Customer satisfaction? N/A

Congestion/travel time? N/A

Ride quality? N/A

Will this proposal reduce operational costs or maintenance effort? N/A

Will this item improve safety:

For motorists? N/A

For construction workers? N/A

Will this proposal improve quality for:

Construction procedures/processes? N/A

Asset preservation? N/A

Design process? N/A

Will this change provide the contractor more flexibility? Yes

Will this proposal provide clarification for the Contractor and field personnel? Yes

Can this item improve/reduce the number of potential change orders? N/A

Is this proposal needed for compliance with:

Federal or State regulations? N/A

AASHTO or other design code? N/A

Is this item editorial? No

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda:

REVISION TO STANDARD SPECIFICATIONS

SECTION 702 - STRUCTURAL CONCRETE
702.13(h) TEST BEAMS
702.14(b) REMOVAL
702.22 CURING CONCRETE

The Standard Specifications are revised as follows:

SECTION 702, BEGIN LINE 758, DELETE AS FOLLOWS:

(h) Test Beams

When portland-pozzolan cement, type IP or IP-A, is incorporated into the structural concrete elements listed below, when fly ash or ground granulated blast furnace slag is incorporated into the structural concrete elements listed below, or when field operations are being controlled by beam tests, the removal of forms~~, supports, and housings, and the discontinuance of heating and curing~~ will be allowed when the modulus of rupture reaches or exceeds the following values:

SECTION 702, BEGIN LINE 840, DELETE AND INSERT AS FOLLOWS:

(b) Removal

Unless otherwise specified, the following shall apply to the removal of falsework and centering:

1. Falsework under *a reinforced concrete slab, commonly referred to as a slab top, not supported by* beams~~, slabs~~ *or* girders, ~~interior bent or pier caps, and arches~~ shall~~, in warm weather,~~ *remain in place at least* ~~15~~*seven* days after ~~the~~ concrete ~~is poured except, if directed, this period shall be increased~~*placement and until attaining or exceeding 480 psi flexural strength. Operations on the slab may continue after achieving the required flexural strength.*

2. *Falsework under a bridge deck supported by beams or girders including the bridge deck overhang shall remain in place at least three days post concrete placement and until attaining or exceeding 480 psi flexural strength. Falsework jacks may be loosened, but not removed, and operations may continue on overhangs after three days after concrete placement and after achieving the required flexural strength. Falsework jacks may be removed after seven days.*

3. *Falsework for substructure concrete, such as interior bents and pier caps, shall remain in place at least three days following concrete placement and until attaining or exceeding 480 psi flexural strength.*

~~2~~*4*. Falsework and arch centering under multiple-span arch bridges shall not be released from any one span until the adjacent and spandrel walls have cured for the required time and the next adjacent arch ring has been poured for at least 48 h.

REVISION TO STANDARD SPECIFICATIONS

SECTION 702 - STRUCTURAL CONCRETE
702.13(h) TEST BEAMS
702.14(b) REMOVAL
702.22 CURING CONCRETE

~~3~~*5*. Falsework under continuously reinforced concrete slab and girder units shall not be released from any span until the entire continuous unit has been completed and all concrete cured for the required period.

~~4~~*6*. For concrete poured during March, April, October, and November, or any time between April and October when the average temperature is less than 50°F, the above periods shall be increased 20%. For concrete poured during December, January, and February, they shall be increased 40%.

~~5. If field operations are controlled by beam tests, the provisions of 702.13(h) shall apply to the time of removal of falsework unless other provisions of these specifications prohibit removal.~~

~~6~~*7*. Removal of supports shall be such that it enables the concrete to take the stresses, due to its own weight, uniformly and gradually.

~~7~~*8*. The removal of falsework shall be at the risk of the Contractor. Permission for removal may be refused if it is determined that there may be resulting damage to the structure.

SECTION 702, BEGIN LINE 1172, INSERT AS FOLLOWS:

702.22 Curing Concrete

Concrete in bridge decks or the top surface of reinforced concrete slab bridges shall be cured continuously for a minimum of 168 h commencing immediately after the surface is able to support the protective covering without deformation. Curing time for bridge decks and the top surface of reinforced concrete slab bridges are not controlled by beam tests and the cure time shall not be reduced. *However, in addition to the minimum of 168 h cure period, curing shall continue until a flexural strength of 550 psi has been attained.* Curing of patches or small full depth deck replacement areas on existing bridge decks that are to be overlaid, may be controlled by test beams in accordance with 702.24(a).

Unless otherwise specified, all other concrete shall be cured for at least 96 h commencing immediately after the surface is able to support the protective covering without deformation. If portland-pozzolan cement, type IP or IP-A, or fly ash is used, the concrete shall be cured for at least 120 h. *In addition to the required hours, c*uring shall continue until the flexural strength stated in 702.13(h) has been attained.

COMMENTS AND ACTION

702.13(h) TEST BEAMS
702.14(b) REMOVAL
702.22 CURING CONCRETE

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 702 pg 534, 535 and 543. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2018 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update _____ SiteManager Update

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Requests from industry to incorporate new pipe materials. Height of cover values for reinforced concrete pipe need updating.

PROPOSED SOLUTION: Incorporate new pipe material into applicable Pipe Types (715). Specifications. New materials include spiral rib, polypropylene, and profile wall (closed). Incorporate minimum and maximum height of cover values from research (SPR-3857 Assessment of Pipe Fill Heights) into the *Standard Drawings*.

INDOT uses finite element software CANDE to determine minimum and maximum values.

APPLICABLE STANDARD SPECIFICATIONS: 715, 907, and 908

APPLICABLE STANDARD DRAWINGS: 715-PIPE, 715-PHCL, 715-PSLC

APPLICABLE DESIGN MANUAL SECTION: 203-2.02

APPLICABLE SECTION OF GIFE:

APPLICABLE RECURRING SPECIAL PROVISIONS:

PAY ITEMS AFFECTED:

APPLICABLE SUB-COMMITTEE ENDORSEMENT: Pipe Committee

IMPACT ANALYSIS (attach report):

Submitted By: Elizabeth Phillips

Title: Standards and Policy Manager

Organization: Bridges Division

Phone Number: 232-6775

Date: June 30, 2016

Ms. Phillips
Date: 07/21/16

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? 715, 907, 908

Will approval of this item affect the Approved Materials List? Yes

Will this proposal improve:

Construction costs? yes

Construction time? no

Customer satisfaction? no

Congestion/travel time? no

Ride quality? no

Will this proposal reduce operational costs or maintenance effort? no

Will this item improve safety:

For motorists? no

For construction workers? no

Will this proposal improve quality for:

Construction procedures/processes? no

Asset preservation? no

Design process? no

Will this change provide the contractor more flexibility? yes

Will this proposal provide clarification for the Contractor and field personnel? yes

Can this item improve/reduce the number of potential change orders? yes

Is this proposal needed for compliance with:

Federal or State regulations? no

AASHTO or other design code? no

Is this item editorial? no

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda:

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02 MATERIALS
715.05 LAYING PIPE
715.07 TEE AND STUB-TEE CONNECTIONS
715.09 BACKFILLING
715.13 METHOD OF MEASUREMENT
715.14 BASIS OF PAYMENT
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.20 RIBBED POLYETHYLENE PIPE
SECTION 908 – METAL PIPE
908.02 CORRUGATED STEEL PIPE AND PIPE-ARCHES
908.08 POLYMER PRECOATED GALVANIZED CORRUGATED STEEL CULVERT PIPE AND PIPE-ARCHES

(Note: Proposed changes shown highlighted gray)

The Standard Specifications are revised as follows:

SECTION 715 BEGIN LINE 36, DELETE AND INSERT AS FOLLOWS:

The maximum particle size of backfill material for corrugated pipe shall be less than 1/2 the corrugation depth.

(a) Type 1 Pipe

Type 1 pipe shall be used for culverts under mainline pavement and public road approaches and shall be in accordance with the following:

Clay Pipe, Extra Strength.....907.08
Corrugated Aluminum Alloy Pipe and Pipe-Arches.....908.04
Corrugated Polyethylene Pipe, Type S .....*
Corrugated Polypropylene Pipe .....*
Corrugated Steel Pipe and Pipe-Arches 908.02
Non-Reinforced Concrete Pipe, Class 3.....907.01
Polymer Precoated Galvanized Corrugated Steel
Pipe and Pipe-Arches.....908.08
Profile Wall (Closed) Polyethylene Pipe .....*
Profile Wall (Ribbed) Polyethylene Pipe.....*
Profile Wall PVC Pipe .....*
Reinforced Concrete Horizontal Elliptical Pipe.....907.03
Reinforced Concrete Pipe 907.02
~~Ribbed Polyethylene Pipe~~ .....~~*~~
Smooth Wall Polyethylene Pipe.....*
Smooth Wall PVC Pipe.....*
Spiral Rib Steel Pipe *908.02*
Structural Plate Pipe and Pipe-Arches 908.09

* All thermoplastic pipes shall be from the Department's list of approved thermoplastic pipe and liner pipe in accordance with 907.16

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02 MATERIALS
715.05 LAYING PIPE
715.07 TEE AND STUB-TEE CONNECTIONS
715.09 BACKFILLING
715.13 METHOD OF MEASUREMENT
715.14 BASIS OF PAYMENT
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.20 RIBBED POLYETHYLENE PIPE
SECTION 908 – METAL PIPE
908.02 CORRUGATED STEEL PIPE AND PIPE-ARCHES
908.08 POLYMER PRECOATED GALVANIZED CORRUGATED STEEL CULVERT PIPE AND PIPE-ARCHES

(b) Type 2 Pipe

Type 2 pipe shall be used for storm sewers and shall be in accordance with the following:

Clay Pipe, Extra Strength.....907.08
Corrugated Polyethylene Pipe, Type S .....*
Corrugated Polypropylene Pipe .....*
Fully Bituminous Coated and Lined Corrugated Steel Pipe and Pipe-Arches.....908.07
Non-Reinforced Concrete Pipe, Class 3.....907.01
Polymer Precoated Galvanized Corrugated Steel Pipe and Pipe-Arches *Type IA and Type IIA* 908.08
Profile Wall PVC Pipe .....*
Profile Wall (Closed) Polyethylene Pipe .....*
Profile Wall (Ribbed) Polyethylene Pipe.....*
Reinforced Concrete Horizontal Elliptical Pipe.....907.03
Reinforced Concrete Pipe 907.02
~~Ribbed Polyethylene Pipe~~ .....*
Smooth Wall Polyethylene Pipe.....*
Smooth Wall PVC Pipe.....*

* All thermoplastic pipes shall be from the Department's list of approved thermoplastic pipe and liner pipe in accordance with 907.16

SECTION 715 BEGIN LINE 101, DELETE AND INSERT AS FOLLOWS:

(e) Type 5 Pipe

Type 5 pipe shall be used for broken-back pipe runs where coupled or jointed pipe is desirable and shall be in accordance with the following:

Corrugated Aluminum Alloy Pipe and Pipe-Arches.....908.04
Corrugated Polyethylene Pipe, Type S .....*
Corrugated Polypropylene Pipe .....*
Corrugated Steel Pipe and Pipe-Arches 908.02
Fully Bituminous Coated and Lined Corrugated Steel Pipe and Pipe-Arches.....908.07

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02 MATERIALS
715.05 LAYING PIPE
715.07 TEE AND STUB-TEE CONNECTIONS
715.09 BACKFILLING
715.13 METHOD OF MEASUREMENT
715.14 BASIS OF PAYMENT
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.20 RIBBED POLYETHYLENE PIPE
SECTION 908 – METAL PIPE
908.02 CORRUGATED STEEL PIPE AND PIPE-ARCHES
908.08 POLYMER PRECOATED GALVANIZED CORRUGATED STEEL CULVERT PIPE AND PIPE-ARCHES

Polymer Precoated Galvanized Corrugated Steel
Pipe and Pipe-Arches.....908.08
Profile Wall PVC Pipe .....*
*Profile Wall (Closed) Polyethylene Pipe .....**
*Profile Wall (Ribbed) Polyethylene Pipe .....**
~~Ribbed Polyethylene Pipe .....*~~
Smooth Wall Polyethylene Pipe.....*
Smooth Wall PVC Pipe.....*
Spiral Rib Steel Pipe 908.02

* All thermoplastic pipes shall be from the Department's list of approved thermoplastic pipe and liner pipe in accordance with 907.16

SECTION 715, BEGIN LINE 224, INSERT AS FOLLOWS:

715.05 Laying Pipe

Each section of pipe shall have a full firm bearing throughout its length, true to the line and grade given. All pipes which settle or which are not in alignment shall be taken up and re-laid. Pipe shall not be laid on a frozen trench bottom. Fully bituminous coated and lined corrugated *or ribbed* steel pipe and *corrugated steel* pipe-arches shall only be placed when the ambient temperature is 35°F or above.

SECTION 715, BEGIN LINE 264, INSERT AS FOLLOWS:

715.06 Joining Pipe

Band couplers for AASHTO M 36 type I and type II corrugated steel pipe and pipe-arches shall have corrugations that mesh with the corrugations of the pipe sections being joined or the annular rerolled ends of those pipe sections. Band couplers with projections or dimples may be used with pipe having either annular or helical corrugations only when corrugated band couplers will not provide a matching connection to both pipes. Band couplers for AASHTO M 36 type IA and IIA corrugated steel pipe and pipe-arches shall have corrugations that mesh with the corrugations of the pipe or shall be gasketed flat bands. *Couplers for AASHTO M 36 type IR ribbed steel pipe shall be in accordance with AASHTO M 36 and the manufacturer's recommendations*.

SECTION 715, BEGIN LINE 294, INSERT AS FOLLOWS:

715.07 Tee and Stub-Tee Connections

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02 MATERIALS
715.05 LAYING PIPE
715.07 TEE AND STUB-TEE CONNECTIONS
715.09 BACKFILLING
715.13 METHOD OF MEASUREMENT
715.14 BASIS OF PAYMENT
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.20 RIBBED POLYETHYLENE PIPE
SECTION 908 – METAL PIPE
908.02 CORRUGATED STEEL PIPE AND PIPE-ARCHES
908.08 POLYMER PRECOATED GALVANIZED CORRUGATED STEEL CULVERT PIPE AND PIPE-ARCHES

At locations shown on the plans, or where directed, a stub-tee connection of the size specified shall be furnished and placed as a tee connection to corrugated *or ribbed* metal pipe, corrugated metal pipe-arch, concrete pipe, reinforced concrete pipe, or reinforced concrete horizontal elliptical pipe.

The stub-tee connection to a corrugated metal pipe, *ribbed metal pipe,* or *corrugated metal* pipe-arch shall be constructed of corrugated *or ribbed* metal and the length of the stub shall be no less than that which readily accommodates the connecting band. It shall be made by shop welding a stub of corrugated *or ribbed* metal pipe to the *respective* corrugated metal pipe or pipe-arch *or ribbed metal pipe* at the time of fabrication. Where field conditions warrant, stub-tee or other connections may be field connected by using shop fabricated saddle connectors. Welds, flame cut edges, and damaged spelter coating shall be regalvanized or painted with zinc dust-zinc oxide paint in accordance with Federal Specification TT-P-641, type II or MIL-P-21035. Where applicable, damaged bituminous coating shall be repaired with asphalt mastic in accordance with AASHTO M 243. The pipe connection to the stub shall be made by means of connecting bands of required size or by means of concrete collars as directed.

The stub-tee connection to concrete pipe, reinforced concrete pipe, or reinforced concrete horizontal elliptical pipe may be field constructed or factory constructed. The concrete used in the stub shall be of the same proportions as that used in the construction of such pipe. The length of the concrete stub shall be no less than 6 in. and no more than 12 in. The pipe connection to the concrete stub shall be made by means of a cement mortar bead or concrete collar or as directed.

SECTION 715, BEGIN LINE 348, DELETE AND INSERT AS FOLLOWS:

After the visual or video inspection, the Contractor shall check pipe deflection by performing a mandrel test for all pipes manufactured from materials listed in the following table or as otherwise directed.

PIPES REQUIRED TO BE MANDREL TESTED			
Pipe Material	Standard Specifications	AASHTO	ASTM
Corrugated Polyethylene Pipe	907.17(b)	M 294	

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02 MATERIALS
715.05 LAYING PIPE
715.07 TEE AND STUB-TEE CONNECTIONS
715.09 BACKFILLING
715.13 METHOD OF MEASUREMENT
715.14 BASIS OF PAYMENT
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.20 RIBBED POLYETHYLENE PIPE
SECTION 908 – METAL PIPE
908.02 CORRUGATED STEEL PIPE AND PIPE-ARCHES
908.08 POLYMER PRECOATED GALVANIZED CORRUGATED STEEL CULVERT PIPE AND PIPE-ARCHES

~~Ribbed~~ *Profile Wall* Polyethylene Pipe	907.20		F 894
Smooth Wall Polyethylene Pipe	907.21		F 714
Profile Wall PVC Pipe*	907.22	M 304	
Smooth Wall PVC Pipe	907.23	M 278	F 679

* Mandrel testing will not be required for profile wall PVC pipe in accordance with 907.22 that also is in accordance with ASTM F 949.

SECTION 715, BEGIN LINE 454, INSERT AS FOLLOWS:

715.13 Method of Measurement

The accepted quantities of circular pipe, deformed pipe, slotted drain pipe, slotted vane drain pipe, end bent drain pipe, sanitary sewer pipe, and pipe extensions will be measured by the linear foot, complete in place. The length of pipe to be measured for payment will be based on the net length of pipe used, which will be obtained by multiplying the nominal length of each pipe section by the number of sections used. If the pipe connects to manholes, inlets, or catch basins, the terminal sections will be field measured to the outside face of the structure. The length of beveled or skewed terminal sections of circular corrugated *or ribbed* metal pipe to be measured for payment will be the average of the top and bottom centerline lengths for beveled ends or of the sides for skewed ends. Measurement of deformed pipe will be made along the bottom centerline of the pipe.

SECTION 715, BEGIN LINE 510, INSERT AS FOLLOWS:

For structures for which the plans show pipes of differing sizes for either smooth, *semi-smooth* or corrugated interiors, and *either* the *semi-smooth* corrugated interior alternate is installed, measurement of structure backfill or flowable backfill will be based on the neat line dimensions shown on the plans for the smooth interior alternate.

Grated box end sections will be measured per each for the specified type, surface slope, and pipe size.

Video inspection for pipe will be measured by the linear foot as determined by the electronic equipment.

Geotextile used to wrap backfill material will not be measured for payment.

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02 MATERIALS
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907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.20 RIBBED POLYETHYLENE PIPE
SECTION 908 – METAL PIPE
908.02 CORRUGATED STEEL PIPE AND PIPE-ARCHES
908.08 POLYMER PRECOATED GALVANIZED CORRUGATED STEEL CULVERT PIPE AND PIPE-ARCHES

SECTION 715, BEGIN LINE 556, DELETE AND INSERT AS FOLLOWS:

For structures for which the plans show pipes of differing sizes for ~~entire~~*either* smooth, *semi-smooth* or corrugated interiors, and *either the semi-smooth* the corrugated interior alternate is installed, payment for pipe backfill will be made based on the neat line dimensions shown on the plans for the smooth interior alternate.

Grated box end sections will be paid for at the contract unit price per each for the specified type, surface slope, and pipe size.

Video inspections for pipe will be paid for at the contract unit price per linear foot completed.

SECTION 907, BEGIN LINE 231, DELETE AND INSERT AS FOLLOWS:

907.16 Thermoplastic Pipe Requirements

A list of approved thermoplastic pipe and liner pipe will be maintained by the Department. The list will specify the manufacturer and thermoplastic pipe designation. All of these materials shall comply with the applicable AASHTO or ASTM requirements listed in the following table and will only be accepted from qualified manufacturers. The manufacturer is defined as the plant which produces the thermoplastic pipe. The manufacturer shall become qualified by establishing a history of satisfactory quality control of these materials as evidenced by the test results performed by the manufacturer's testing laboratory.

SUMMARY OF THERMOPLASTIC PIPE SPECIFICATION REQUIREMENTS				
Pipe Material	Standard Specifications	AASHTO	ASTM	Manufacturer Requirements
Corrugated Polyethylene Drainage Tubing	907.17(a)	M 252		ITM 806, Procedure O
Corrugated Polyethylene Pipe	907.17(b)	M 294		ITM 806, Procedure O
Corrugated Polypropylene Pipe	907.19	M 330		ITM 806, Procedure O
Perforated PVC Semicircular Pipe	907.18		D 3034	ITM 806, Procedure A

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02 MATERIALS
715.05 LAYING PIPE
715.07 TEE AND STUB-TEE CONNECTIONS
715.09 BACKFILLING
715.13 METHOD OF MEASUREMENT
715.14 BASIS OF PAYMENT
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.20 RIBBED POLYETHYLENE PIPE
SECTION 908 – METAL PIPE
908.02 CORRUGATED STEEL PIPE AND PIPE-ARCHES
908.08 POLYMER PRECOATED GALVANIZED CORRUGATED STEEL CULVERT PIPE AND PIPE-ARCHES

Profile Wall PVC Pipe	907.22	M 304	F 949	ITM 806, Procedure O
~~Ribbed~~ *Profile Wall* Polyethylene Pipe	907.20		F 894	ITM 806, Procedure A
Schedule 40 PVC Pipe	907.24(b)		D 1785 or D 2665	916, Type C Cert.
Smooth Wall Polyethylene Pipe	907.21		F 714	ITM 806, Procedure A
Smooth Wall PVC Pipe	907.23	M 278	F 679	ITM 806, Procedure A
Type PSM PVC Pipe and Fittings	907.24(a)		D 3034	ITM 806, Procedure A

SECTION 907, BEGIN LINE 271, DELETE AND INSERT AS FOLLOWS:

907.20 ~~Ribbed~~ *Profile Wall* Polyethylene Pipe

Pipe and fittings shall be *either closed profile or ribbed open profile* in accordance with ASTM F 894. Qualification requirements for the manufacturers shall be in accordance with ITM 806, Procedure A.

SECTION 908, BEGIN LINE 5, INSERT AS FOLLOWS:

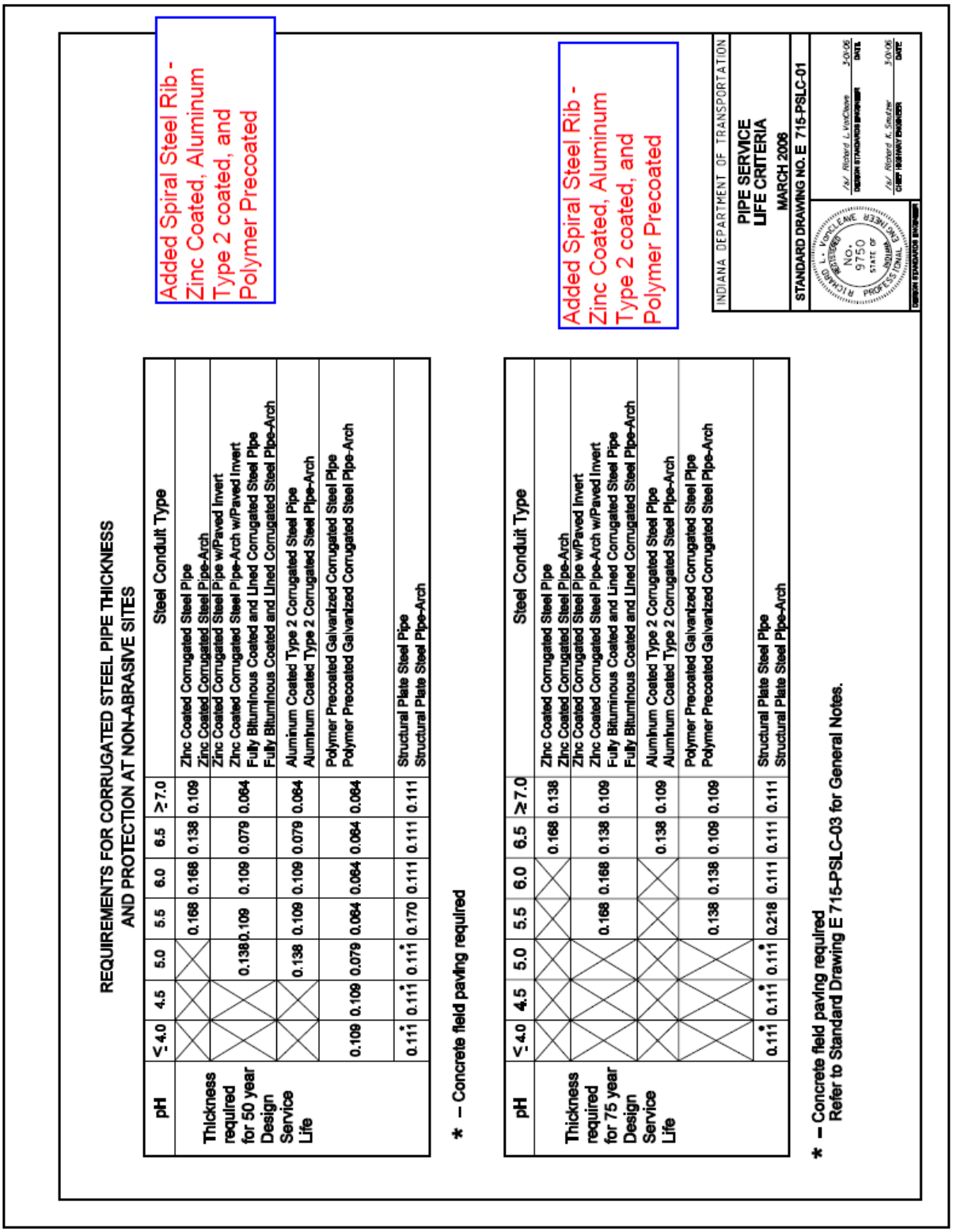
908.02 Corrugated Steel Pipe and Pipe-Arches

Corrugated steel pipe and pipe-arches shall be type I, IA, *IR*, II, or IIA in accordance with AASHTO M 36.

Corrugated steel pipe, pipe-arches, and coupling bands shall be zinc coated steel or aluminum coated steel in accordance with AASHTO M 36, except as noted herein. They may be fabricated with circumferential corrugations and riveted lap joint construction or with helical corrugations *or ribs* with continuous lock or welded seam extending from end to end of each length of pipe. Reforming the ends of helical corrugated pipe to form circumferential corrugations will be allowed to enable use of circumferential corrugated coupling bands. The reforming shall be limited to the length required to accommodate the coupling bands and in such a manner that there is not appreciable slippage of the seam or a plane of weakness created.

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PSLC-01 PIPE SERVICE LIFE CRITERIA (WITH MARKUPS)



REQUIREMENTS FOR CORRUGATED STEEL PIPE THICKNESS AND PROTECTION AT NON-ABRASIVE SITES

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	≥ 7.0	Steel Conduit Type
Thickness required for 50 year Design Service Life				0.168	0.168	0.138	0.109	Zinc Coated Corrugated Steel Pipe Zinc Coated Corrugated Steel Pipe-Arch
			0.138	0.109	0.109	0.079	0.064	Zinc Coated Corrugated Steel Pipe w/Paved Invert Zinc Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous Coated and Lined Corrugated Steel Pipe Fully Bituminous Coated and Lined Corrugated Steel Pipe-Arch
			0.138	0.109	0.109	0.079	0.064	Aluminum Coated Type 2 Corrugated Steel Pipe Aluminum Coated Type 2 Corrugated Steel Pipe-Arch
	0.109	0.109	0.079	0.064	0.064	0.064	0.064	Polymer Precoated Galvanized Corrugated Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
	0.111*	0.111*	0.111*	0.170	0.111	0.111	0.111	Structural Plate Steel Pipe Structural Plate Steel Pipe-Arch

* – Concrete field paving required

Added Spiral Steel Rib - Zinc Coated, Aluminum Type 2 coated, and Polymer Precoated

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	≥ 7.0	Steel Conduit Type
Thickness required for 75 year Design Service Life						0.168	0.138	Zinc Coated Corrugated Steel Pipe Zinc Coated Corrugated Steel Pipe-Arch
				0.168	0.168	0.138	0.109	Zinc Coated Corrugated Steel Pipe w/Paved Invert Zinc Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous Coated and Lined Corrugated Steel Pipe Fully Bituminous Coated and Lined Corrugated Steel Pipe-Arch
						0.138	0.109	Aluminum Coated Type 2 Corrugated Steel Pipe Aluminum Coated Type 2 Corrugated Steel Pipe-Arch
				0.138	0.138	0.109	0.109	Polymer Precoated Galvanized Corrugated Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
	0.111*	0.111*	0.111*	0.218	0.111	0.111	0.111	Structural Plate Steel Pipe Structural Plate Steel Pipe-Arch

* – Concrete field paving required
Refer to Standard Drawing E 715-PSLC-03 for General Notes.

Added Spiral Steel Rib - Zinc Coated, Aluminum Type 2 coated, and Polymer Precoated

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SERVICE LIFE CRITERIA

MARCH 2006

STANDARD DRAWING NO. E 715-PSLC-01

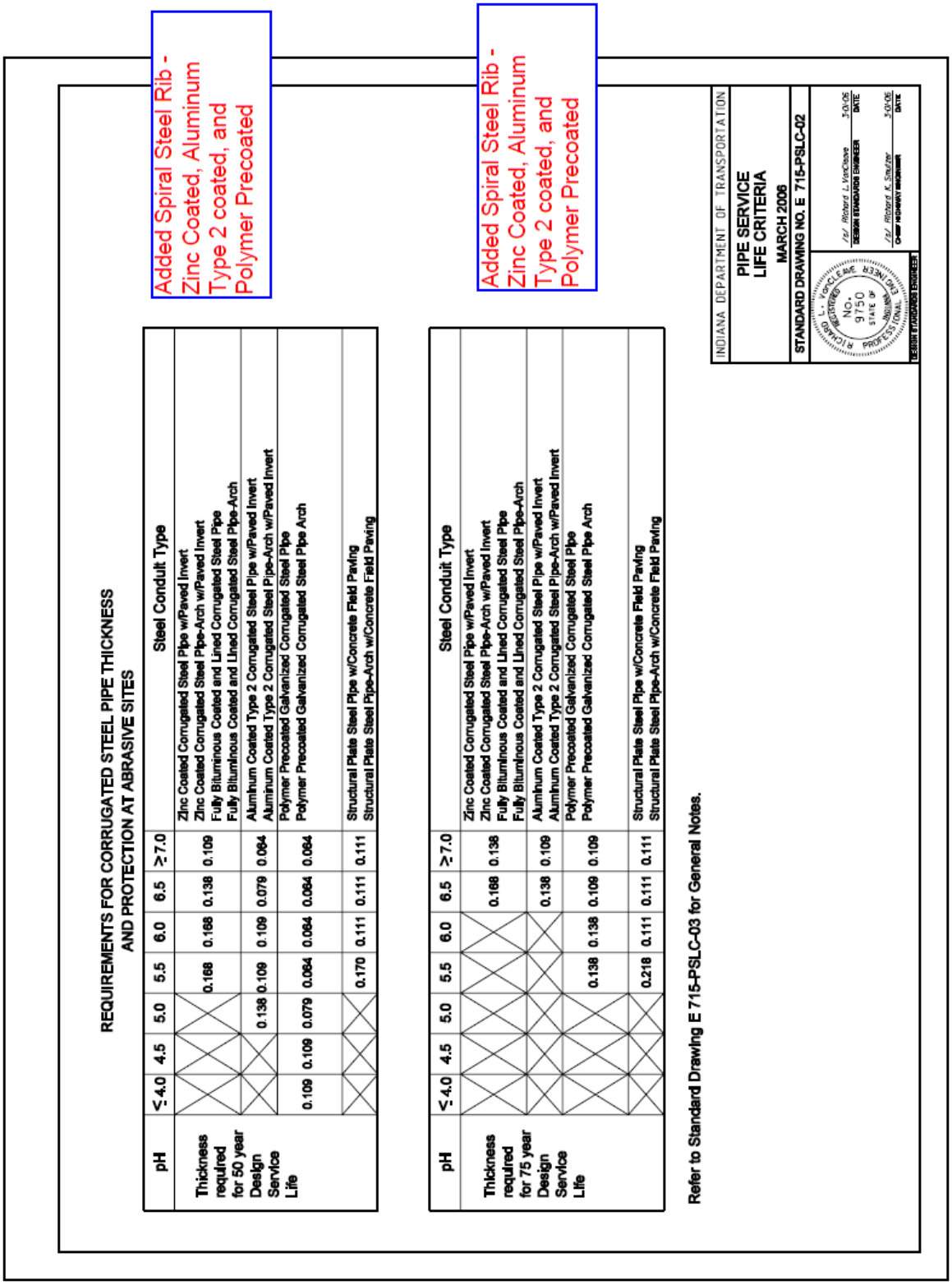
REGISTERED L. VanCleave NO. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 3-0-06
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Swafford 3-0-06
CHIEF HIGHWAY ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PSLC-02 PIPE SERVICE LIFE CRITERIA (WITH MARKUPS)



REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PSLC-03 PIPE SERVICE LIFE CRITERIA (WITH MARKUPS)

Updated format Only

GENERAL NOTES

1. "X" entries in the table indicate that a thickness which satisfies the required design service life is not available.
2. The tabulated plate thickness for Structural Plate Steel Pipe and Pipe-Arches reflects the required thickness for the top and side plates. If the tabulated plate thickness is less than 0.280 in. the bottom plates shall be of the next greater available thickness.
3. Corrugated Aluminum Alloy Pipe and Pipe-Arches and Aluminum Alloy Structural Plate Pipe and Pipe-Arches are acceptable with the minimum thickness required to satisfy cover conditions for all non-abrasive sites with a structure pH ≥ 5.0.
4. Corrugated Aluminum Alloy Pipe and Pipe-Arches with bituminous paved invert and Aluminum Alloy Structural Plate Pipe and Pipe-Arches with concrete field paving are acceptable with the minimum thickness required to satisfy cover conditions for all abrasive sites with a structure pH ≥ 5.0.
5. Service life criteria apply to only reinforced concrete, corrugated metal, and structural plate metal pipe. Other materials which conform to the designated pipe type and height of cover parameters are acceptable for installation.
6. Service life criteria do not apply to Type 4 pipe.

REQUIREMENTS FOR REINFORCED CONCRETE PIPE PROTECTION

Pipe Slope	Minimum pH to Attain Design Service Life	
	50 Year	75 Year
Less than 3%	4.0	4.5
3% to 10%	4.5	5.0
Greater than 10%	5.0	5.5

For a structure pH lower than the minimums listed above, reinforced concrete pipe shall not be used.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SERVICE LIFE CRITERIA

JANUARY 1998

STANDARD DRAWING NO. E 715-PSLC-03

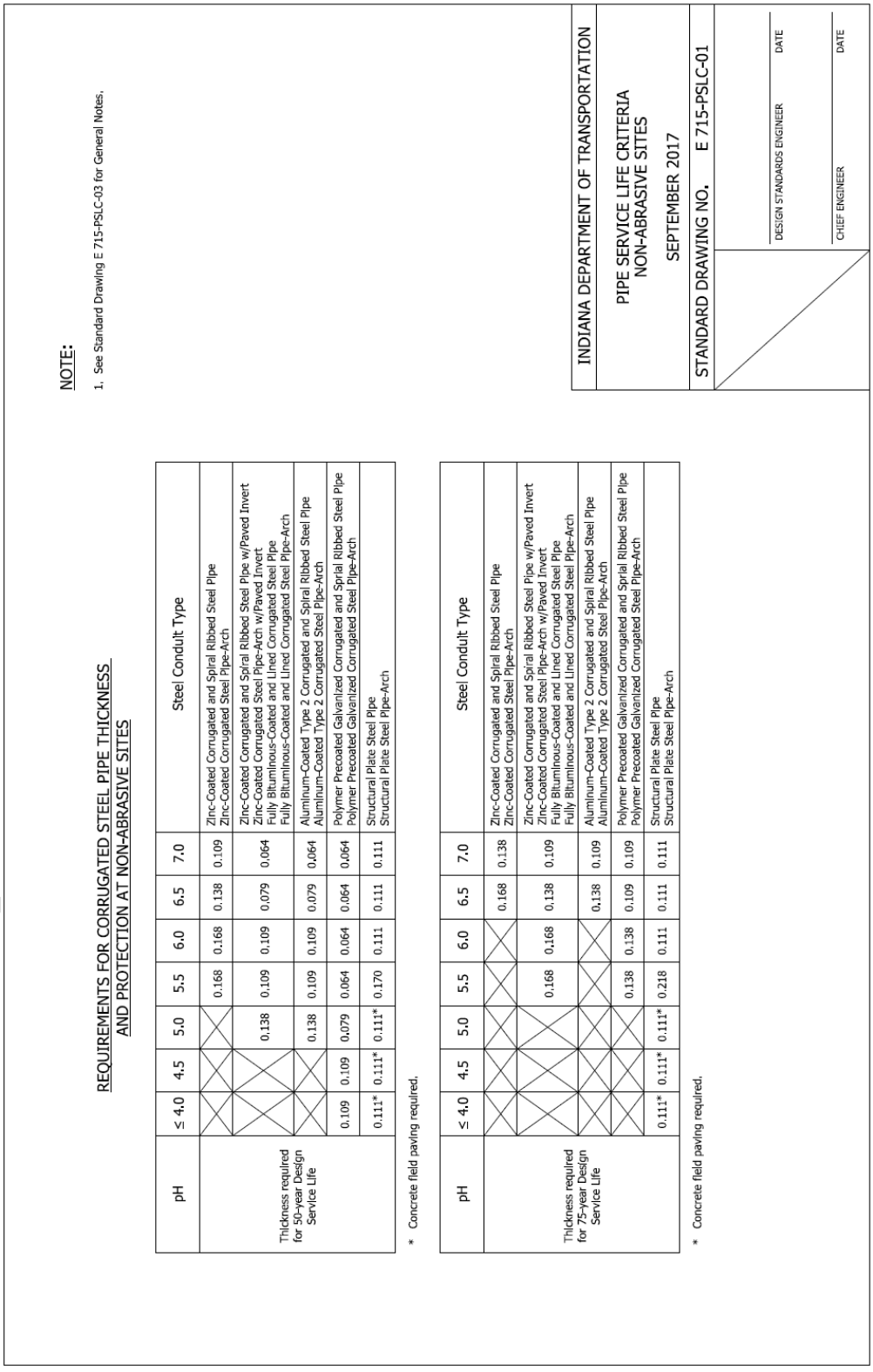
DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Vince Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE
OFFICIALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PSLC-01 PIPE SERVICE LIFE CRITERIA NON-ABRASIVE SITES (DRAFT)



NOTE:

1. See Standard Drawing E 715-PSLC-03 for General Notes.

REQUIREMENTS FOR CORRUGATED STEEL PIPE THICKNESS
AND PROTECTION AT NON-ABRASIVE SITES

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	7.0	Steel Conduit Type
Thickness required for 50-year Design Service Life				0.168	0.168	0.138	0.109	Zinc-Coated Corrugated and Spiral Ribbed Steel Pipe Zinc-Coated Corrugated Steel Pipe-Arch
			0.138	0.109	0.109	0.079	0.064	Zinc-Coated Corrugated and Spiral Ribbed Steel Pipe w/Paved Invert Zinc-Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous-Coated and Lined Corrugated Steel Pipe Fully Bituminous-Coated and Lined Corrugated Steel Pipe-Arch
			0.138	0.109	0.109	0.079	0.064	Aluminum-Coated Type 2 Corrugated and Spiral Ribbed Steel Pipe Aluminum-Coated Type 2 Corrugated Steel Pipe-Arch
	0.109	0.109	0.079	0.064	0.064	0.064	0.064	Polymer Precoated Galvanized Corrugated and Spiral Ribbed Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
	0.111*	0.111*	0.111*	0.170	0.111	0.111	0.111	Structural Plate Steel Pipe Structural Plate Steel Pipe-Arch

* Concrete field paving required.

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	7.0	Steel Conduit Type
Thickness required for 75-year Design Service Life						0.168	0.138	Zinc-Coated Corrugated and Spiral Ribbed Steel Pipe Zinc-Coated Corrugated Steel Pipe-Arch
				0.168	0.168	0.138	0.109	Zinc-Coated Corrugated and Spiral Ribbed Steel Pipe w/Paved Invert Zinc-Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous-Coated and Lined Corrugated Steel Pipe Fully Bituminous-Coated and Lined Corrugated Steel Pipe-Arch
						0.138	0.109	Aluminum-Coated Type 2 Corrugated and Spiral Ribbed Steel Pipe Aluminum-Coated Type 2 Corrugated Steel Pipe-Arch
				0.138	0.138	0.109	0.109	Polymer Precoated Galvanized Corrugated and Spiral Ribbed Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
	0.111*	0.111*	0.111*	0.218	0.111	0.111	0.111	Structural Plate Steel Pipe Structural Plate Steel Pipe-Arch

* Concrete field paving required.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SERVICE LIFE CRITERIA
NON-ABRASIVE SITES

SEPTEMBER 2017

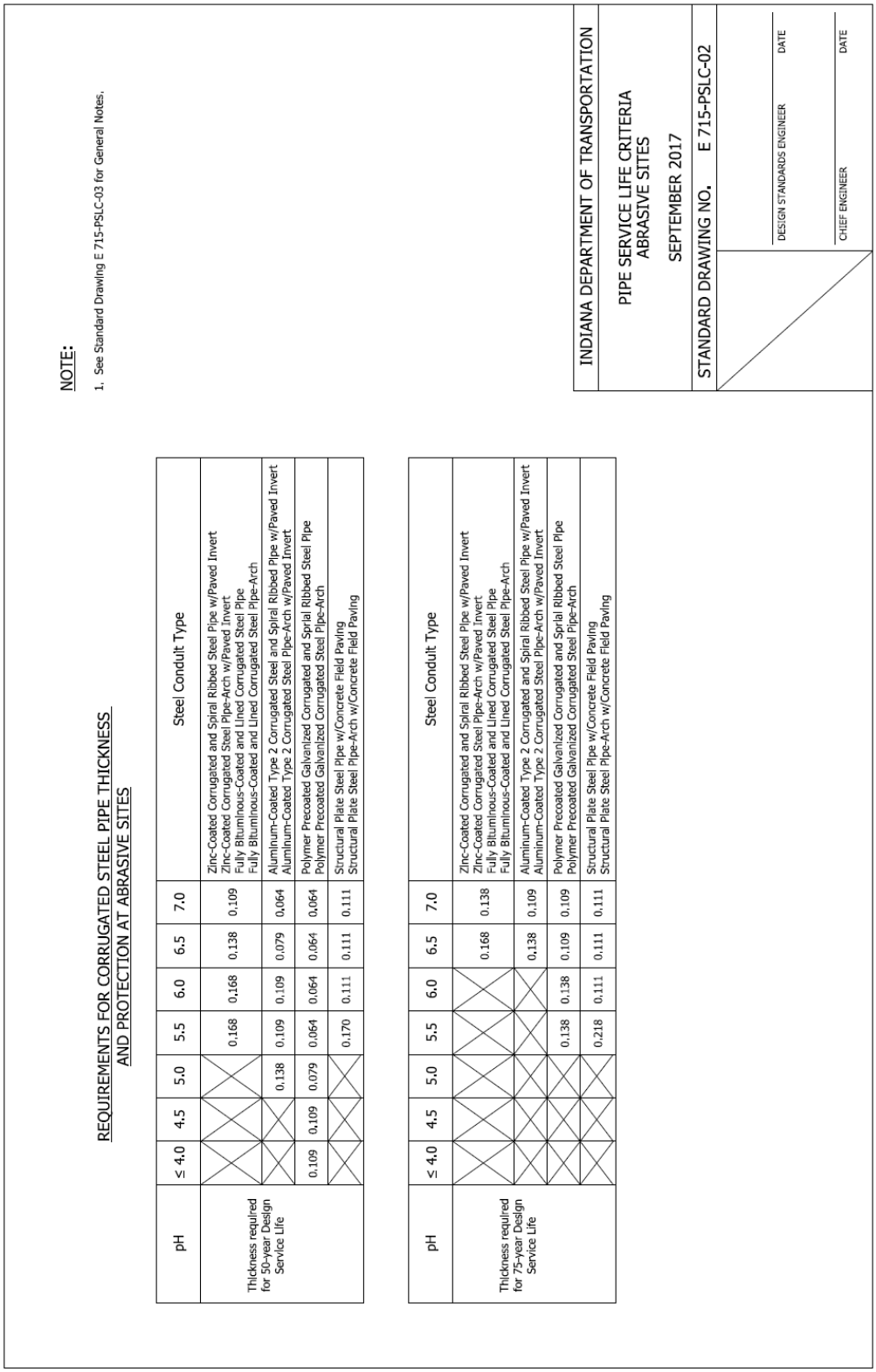
STANDARD DRAWING NO. E 715-PSLC-01

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PSLC-02 PIPE SERVICE LIFE CRITERIA ABRASIVE SITES (DRAFT)



NOTE:

1. See Standard Drawing E 715-PSLC-03 for General Notes.

REQUIREMENTS FOR CORRUGATED STEEL PIPE THICKNESS AND PROTECTION AT ABRASIVE SITES

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	7.0	Steel Conduit Type
Thickness required for 50-year Design Service Life				0.168	0.168	0.138	0.109	Zinc-Coated Corrugated and Spiral Ribbed Steel Pipe w/Paved Invert Zinc-Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous-Coated and Lined Corrugated Steel Pipe Fully Bituminous-Coated and Lined Corrugated Steel Pipe-Arch
			0.138	0.109	0.109	0.079	0.064	Aluminum-Coated Type 2 Corrugated Steel and Spiral Ribbed Pipe w/Paved Invert Aluminum-Coated Type 2 Corrugated Steel Pipe-Arch w/Paved Invert
	0.109	0.109	0.079	0.064	0.064	0.064	0.064	Polymer Precoated Galvanized Corrugated and Spiral Ribbed Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
				0.170	0.111	0.111	0.111	Structural Plate Steel Pipe w/Concrete Field Paving Structural Plate Steel Pipe-Arch w/Concrete Field Paving

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	7.0	Steel Conduit Type
Thickness required for 75-year Design Service Life						0.168	0.138	Zinc-Coated Corrugated and Spiral Ribbed Steel Pipe w/Paved Invert Zinc-Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous-Coated and Lined Corrugated Steel Pipe Fully Bituminous-Coated and Lined Corrugated Steel Pipe-Arch
						0.138	0.109	Aluminum-Coated Type 2 Corrugated and Spiral Ribbed Steel Pipe w/Paved Invert Aluminum-Coated Type 2 Corrugated Steel Pipe-Arch w/Paved Invert
				0.138	0.138	0.109	0.109	Polymer Precoated Galvanized Corrugated and Spiral Ribbed Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
				0.218	0.111	0.111	0.111	Structural Plate Steel Pipe w/Concrete Field Paving Structural Plate Steel Pipe-Arch w/Concrete Field Paving

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SERVICE LIFE CRITERIA
ABRASIVE SITES

SEPTEMBER 2017

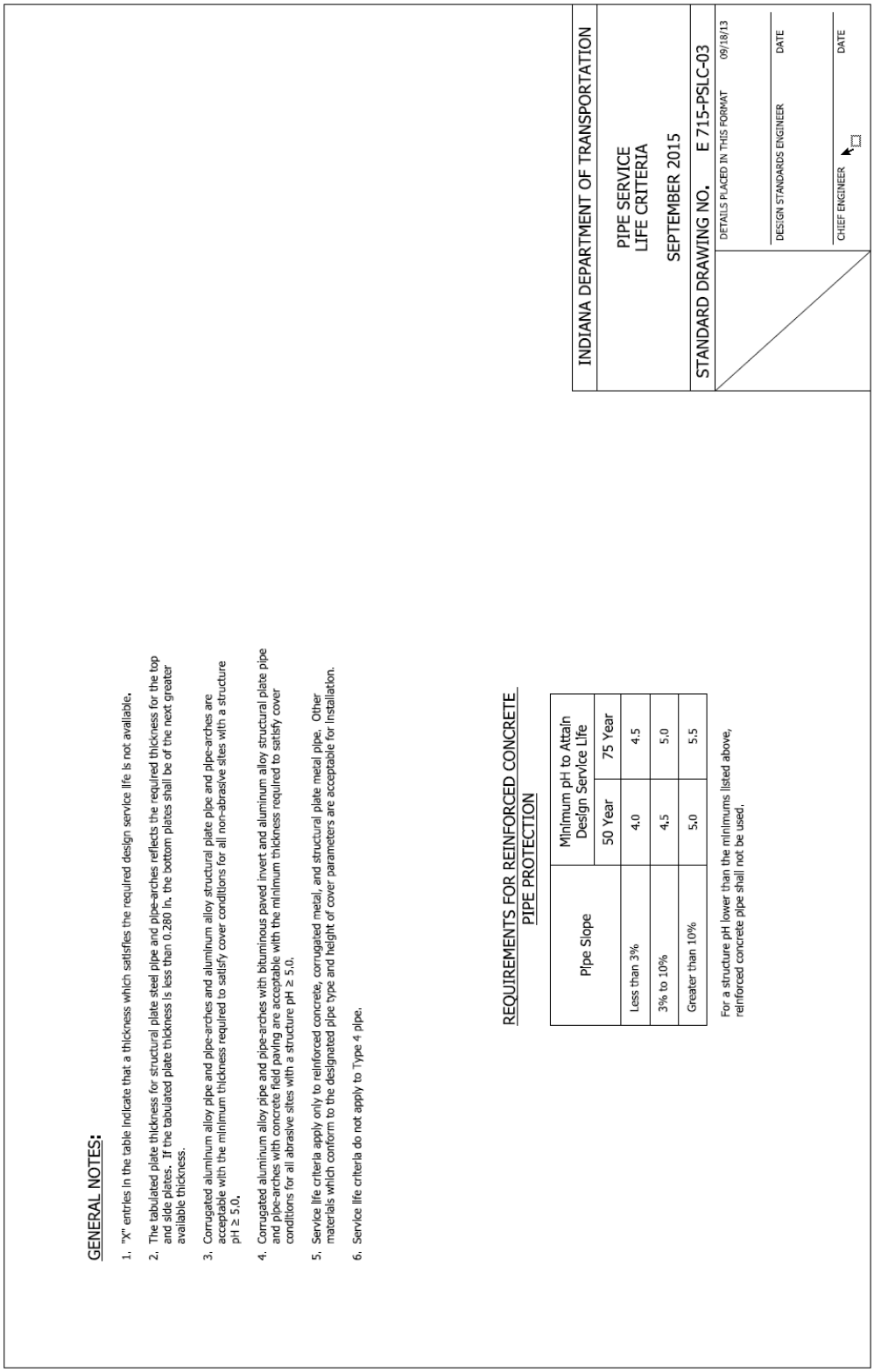
STANDARD DRAWING NO. E 715-PSLC-02

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PSLC-03 PIPE SERVICE LIFE CRITERIA (DRAFT)



GENERAL NOTES:

1. "X" entries in the table indicate that a thickness which satisfies the required design service life is not available.
2. The tabulated plate thickness for structural plate steel pipe and pipe-arches reflects the required thickness for the top and side plates. If the tabulated plate thickness is less than 0.280 in. the bottom plates shall be of the next greater available thickness.
3. Corrugated aluminum alloy pipe and pipe-arches and aluminum alloy structural plate pipe and pipe-arches are acceptable with the minimum thickness required to satisfy cover conditions for all non-abrasive sites with a structure pH ≥ 5.0.
4. Corrugated aluminum alloy pipe and pipe-arches with bituminous paved invert and aluminum alloy structural plate pipe and pipe-arches with concrete field paving are acceptable with the minimum thickness required to satisfy cover conditions for all abrasive sites with a structure pH ≥ 5.0.
5. Service life criteria apply only to reinforced concrete, corrugated metal, and structural plate metal pipe. Other materials which conform to the designated pipe type and height of cover parameters are acceptable for installation.
6. Service life criteria do not apply to Type 4 pipe.

REQUIREMENTS FOR REINFORCED CONCRETE PIPE PROTECTION

Pipe Slope	Minimum pH to Attain Design Service Life	
	50 Year	75 Year
Less than 3%	4.0	4.5
3% to 10%	4.5	5.0
Greater than 10%	5.0	5.5

For a structure pH lower than the minimums listed above, reinforced concrete pipe shall not be used.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SERVICE LIFE CRITERIA

SEPTEMBER 2015

STANDARD DRAWING NO. E 715-PSLC-03

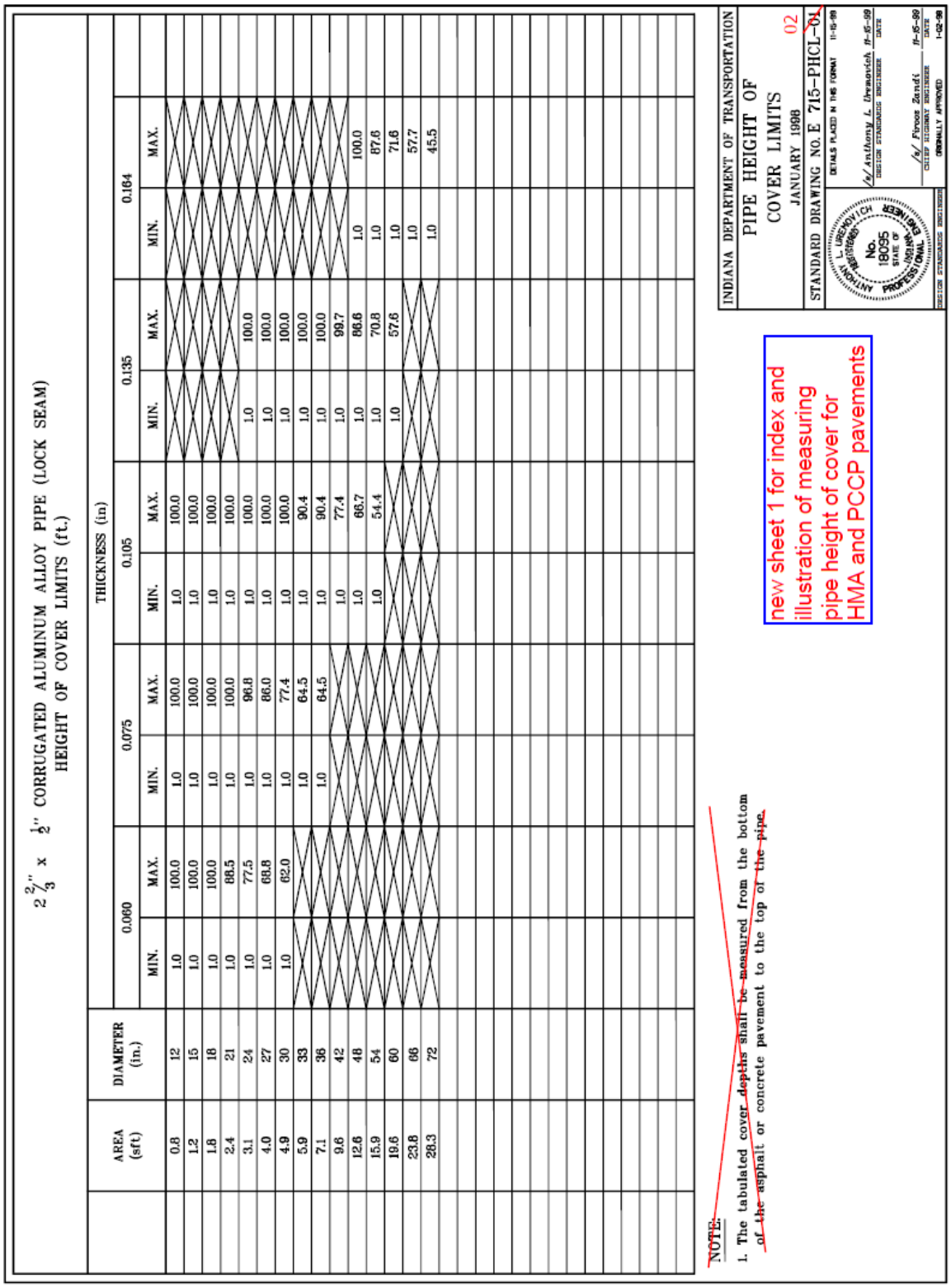
DETAILS PLACED IN THIS FORMAT 09/18/13

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-01 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
0.8	12	1.0	100.0	1.0	100.0	1.0	100.0				
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0				
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0				
2.4	21	1.0	88.5	1.0	100.0	1.0	100.0				
3.1	24	1.0	77.5	1.0	96.8	1.0	100.0	1.0	100.0		
4.0	27	1.0	68.8	1.0	86.0	1.0	100.0	1.0	100.0		
4.9	30	1.0	62.0	1.0	77.4	1.0	100.0	1.0	100.0		
5.9	33			1.0	64.5	1.0	90.4	1.0	100.0		
7.1	36			1.0	64.5	1.0	90.4	1.0	100.0		
9.6	42					1.0	77.4	1.0	99.7	1.0	100.0
12.6	48					1.0	66.7	1.0	86.6	1.0	87.6
15.9	54					1.0	54.4	1.0	70.8	1.0	71.8
19.6	60							1.0	57.8	1.0	57.7
23.8	66									1.0	45.5
28.3	72										

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998
02
STANDARD DRAWING NO. E 715-PHCL-01

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Urbanovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firouz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

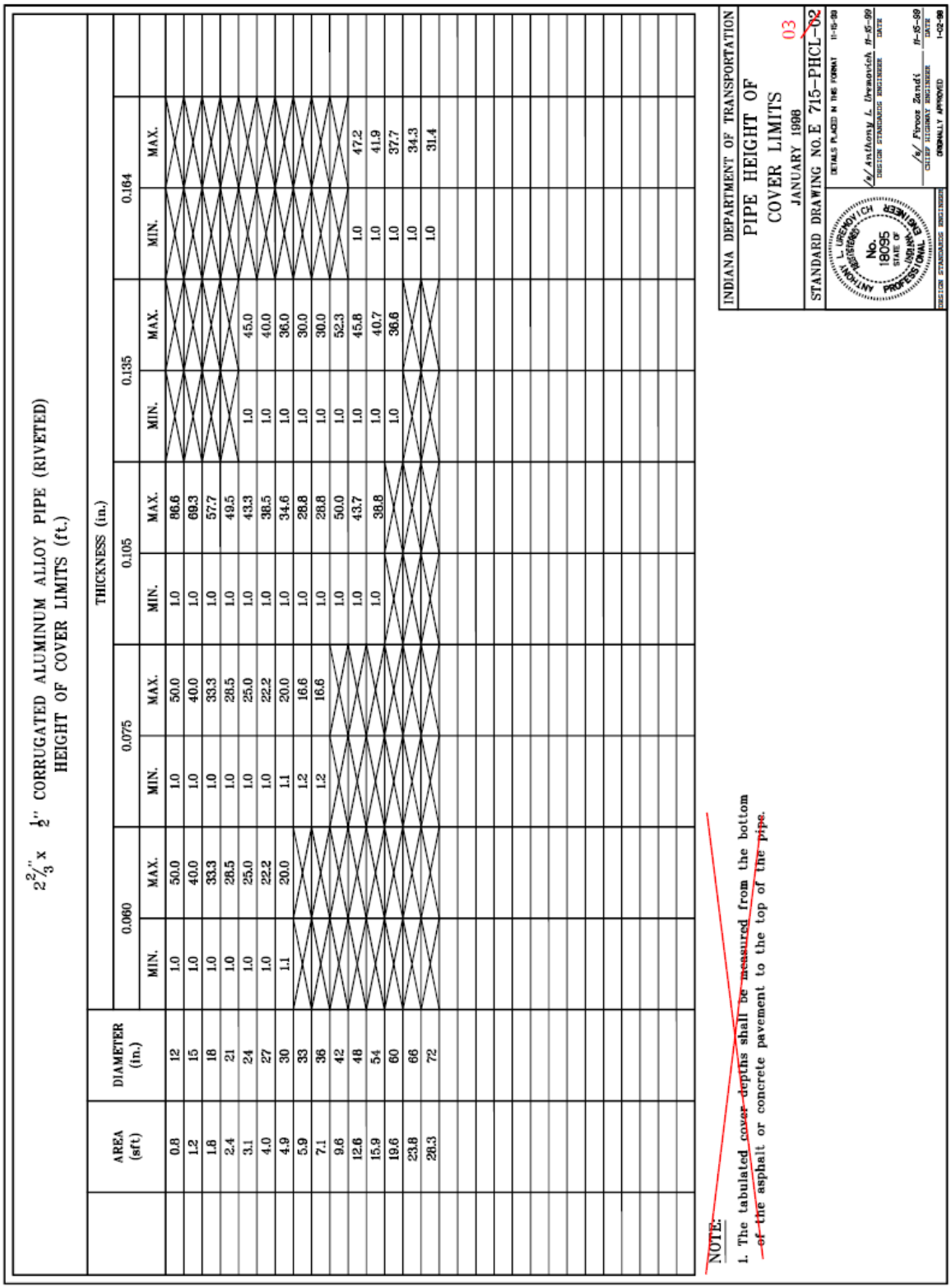
DESIGN STANDARDS ENGINEER
ORIGINALLY APPROVED 1-02-98

ANTHONY L. URBANOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

new sheet 1 for index and illustration of measuring pipe height of cover for HMA and PCCP pavements

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-02 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
0.8	12	1.0	50.0	1.0	50.0	1.0	86.6				
1.2	15	1.0	40.0	1.0	40.0	1.0	69.3				
1.8	18	1.0	33.3	1.0	33.3	1.0	57.7				
2.4	21	1.0	28.5	1.0	28.5	1.0	49.5		45.0		
3.1	24	1.0	25.0	1.0	25.0	1.0	43.3	1.0	40.0		
4.0	27	1.0	22.2	1.0	22.2	1.0	38.5	1.0	36.0		
4.9	30	1.1	20.0	1.1	20.0	1.0	34.6	1.0	30.0		
5.9	33			1.2	16.6	1.0	28.8	1.0	30.0		
7.1	36			1.2	16.6	1.0	50.0	1.0	52.3		
9.6	42					1.0	43.7	1.0	45.8	1.0	47.2
12.6	48					1.0	38.8	1.0	40.7	1.0	41.9
15.9	54							1.0	36.6	1.0	37.7
19.6	60									1.0	34.3
23.8	66									1.0	31.4
28.3	72										

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998 03
STANDARD DRAWING NO. E 715-PHCL-02

DETAILS PLACED IN THIS FORMAT 11-15-99

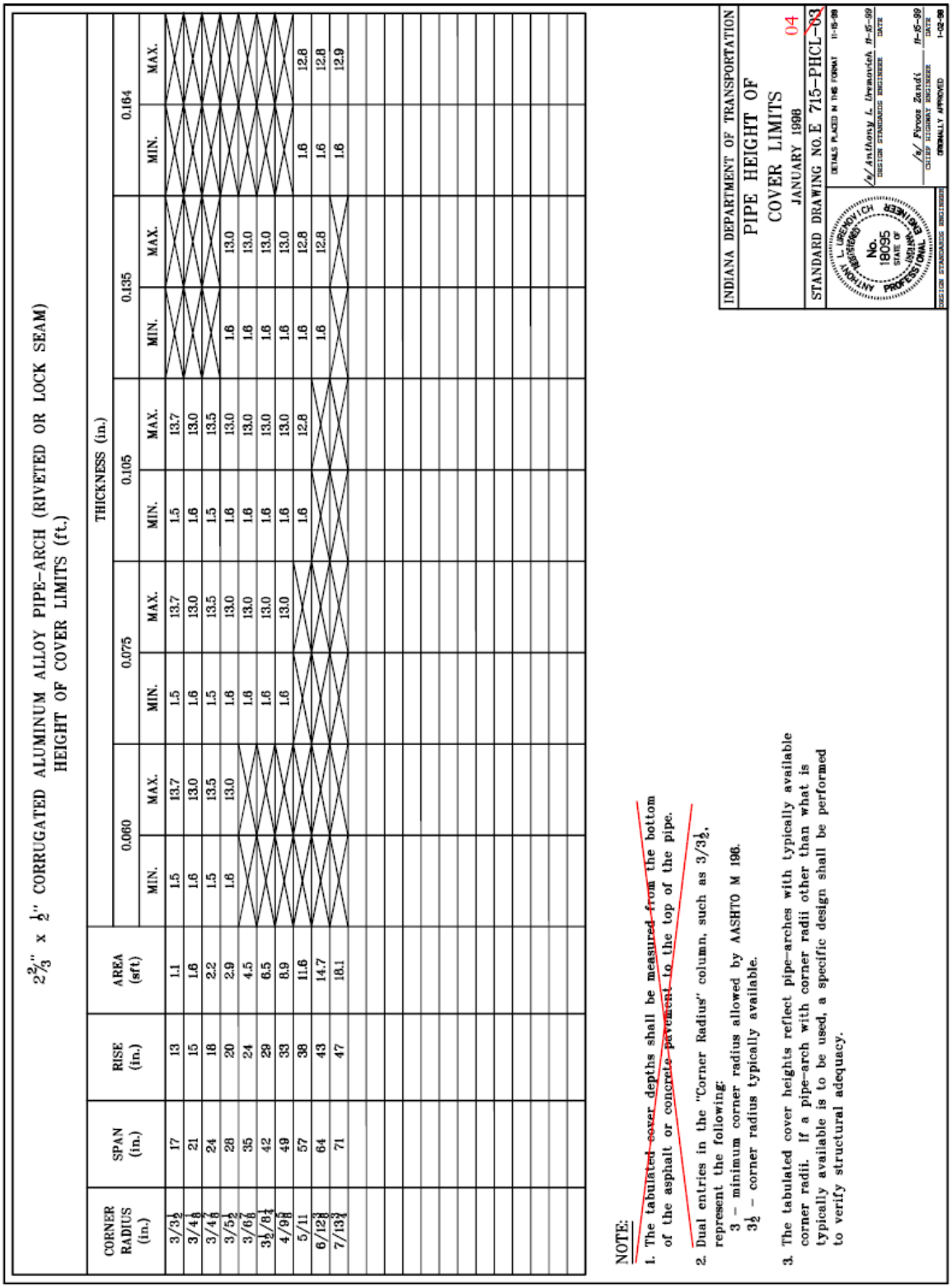
/s/ Anthony L. Ovanovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-03 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
3/32	17	13	1.1	1.5	13.7	1.5	13.7	1.5	13.7				
3/16	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0				
3/16	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5				
3/32	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0		
3/64	35	24	4.5			1.6	13.0	1.6	13.0	1.6	13.0		
3/64	42	29	6.5			1.6	13.0	1.6	13.0	1.6	13.0		
1/98	49	33	8.9			1.6	13.0	1.6	13.0	1.6	13.0	1.6	12.8
5/11	57	38	11.6					1.6	12.8	1.6	12.8	1.6	12.8
6/128	64	43	14.7							1.6	12.8	1.6	12.8
7/134	71	47	18.1									1.6	12.9

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.
2. Dual entries in the "Corner Radius" column, such as 3/32, represent the following:
   3 – minimum corner radius allowed by AASHTO M 196.
   32 – corner radius typically available.
3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998 04
STANDARD DRAWING NO. E 715-PHCL-03

DETAILS PLACED IN DGN FORMAT 11-15-99

ANTHONY L. URGOVICH — No. 18095 — STATE OF INDIANA — REGISTERED PROFESSIONAL ENGINEER

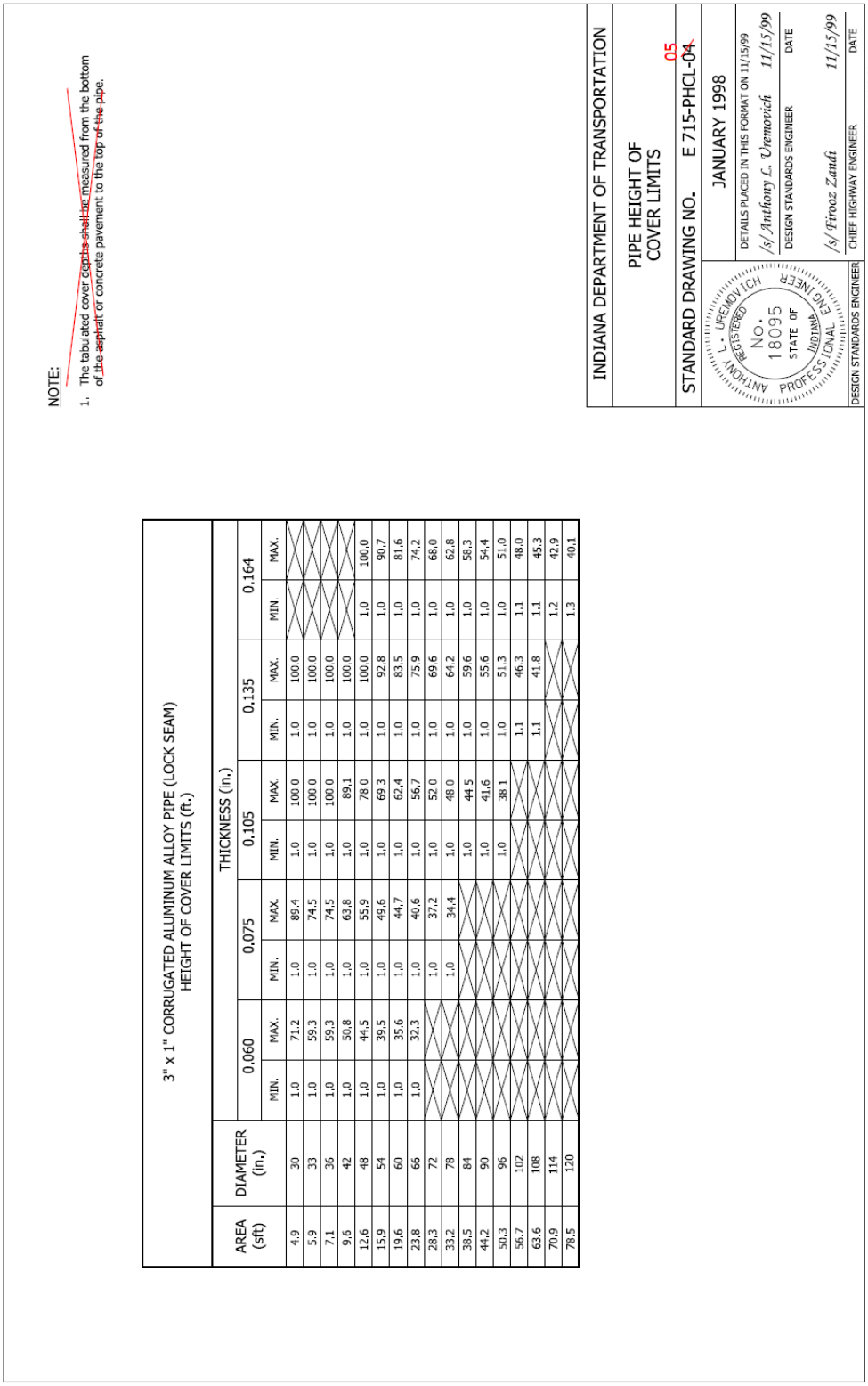
/s/ Anthony L. Urgovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 1-02-98

DESIGN STANDARDS ENGINEER

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-04 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



NOTE:

1. The tabulated cover ~~depths shall be~~ measured from the bottom of ~~the asphalt~~ or concrete pavement to the top of ~~the~~ pipe.

3" x 1" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
4.9	30	1.0	71.2	1.0	89.4	1.0	100.0	1.0	100.0		
5.9	33	1.0	59.3	1.0	74.5	1.0	100.0	1.0	100.0		
7.1	36	1.0	59.3	1.0	74.5	1.0	100.0	1.0	100.0		
9.6	42	1.0	50.8	1.0	63.8	1.0	89.1	1.0	100.0		
12.6	48	1.0	44.5	1.0	55.9	1.0	78.0	1.0	100.0	1.0	100.0
15.9	54	1.0	39.5	1.0	49.6	1.0	69.3	1.0	92.8	1.0	90.7
19.6	60	1.0	35.6	1.0	44.7	1.0	62.4	1.0	83.5	1.0	81.6
23.8	66	1.0	32.3	1.0	40.6	1.0	56.7	1.0	75.9	1.0	74.2
28.3	72			1.0	37.2	1.0	52.0	1.0	69.6	1.0	68.0
33.2	78			1.0	34.4	1.0	48.0	1.0	64.2	1.0	62.8
38.5	84					1.0	44.5	1.0	59.6	1.0	58.3
44.2	90					1.0	41.6	1.0	55.6	1.0	54.4
50.3	96					1.0	38.1	1.0	51.3	1.0	51.0
56.7	102							1.1	46.3	1.1	48.0
63.6	108							1.1	41.8	1.1	45.3
70.9	114									1.2	42.9
78.5	120									1.3	40.1

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

STANDARD DRAWING NO. E 715-PHCL-04 ~~03~~ 05

JANUARY 1998

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DETAILS PLACED IN THIS FORMAT ON 11/15/99

/s/ Anthony L. Uremovich 11/15/99
DESIGN STANDARDS ENGINEER DATE

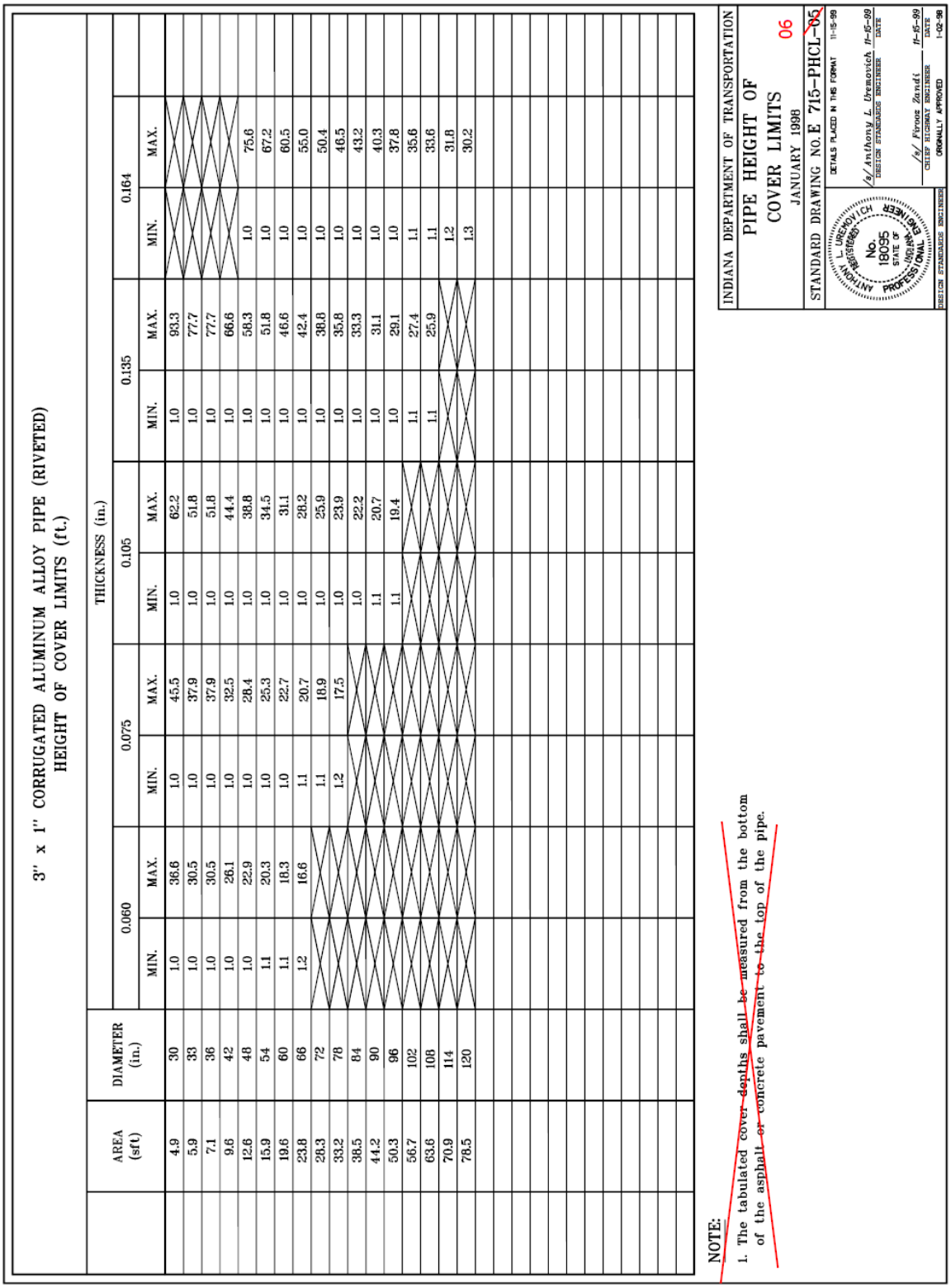
/s/ Firooz Zandi 11/15/99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

ORIGINALLY APPROVED 1/02/98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-05 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



3" x 1" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
4.9	30	1.0	36.6	1.0	45.5	1.0	62.2	1.0	93.3		
5.9	33	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7		
7.1	36	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7		
9.6	42	1.0	26.1	1.0	32.5	1.0	44.4	1.0	66.6		
12.6	48	1.0	22.9	1.0	28.4	1.0	38.8	1.0	58.3	1.0	75.6
15.9	54	1.1	20.3	1.0	25.3	1.0	34.5	1.0	51.8	1.0	67.2
19.6	60	1.1	18.3	1.0	22.7	1.0	31.1	1.0	46.6	1.0	60.5
23.8	66	1.2	16.6	1.1	20.7	1.0	28.2	1.0	42.4	1.0	55.0
28.3	72			1.1	18.9	1.0	25.9	1.0	38.8	1.0	50.4
33.2	78			1.2	17.5	1.0	23.9	1.0	35.8	1.0	46.5
38.5	84					1.0	22.2	1.0	33.3	1.0	43.2
44.2	90					1.1	20.7	1.0	31.1	1.0	40.3
50.3	96					1.1	19.4	1.0	29.1	1.0	37.8
56.7	102							1.1	27.4	1.1	35.6
63.6	108							1.1	25.9	1.1	33.6
70.9	114									1.2	31.8
78.5	120									1.3	30.2

NOTE:
1. ~~The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.~~

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998
06
STANDARD DRAWING NO. ~~E 715-PHCL-05~~

DETAILS PLACED IN THIS FORMAT 11-15-99

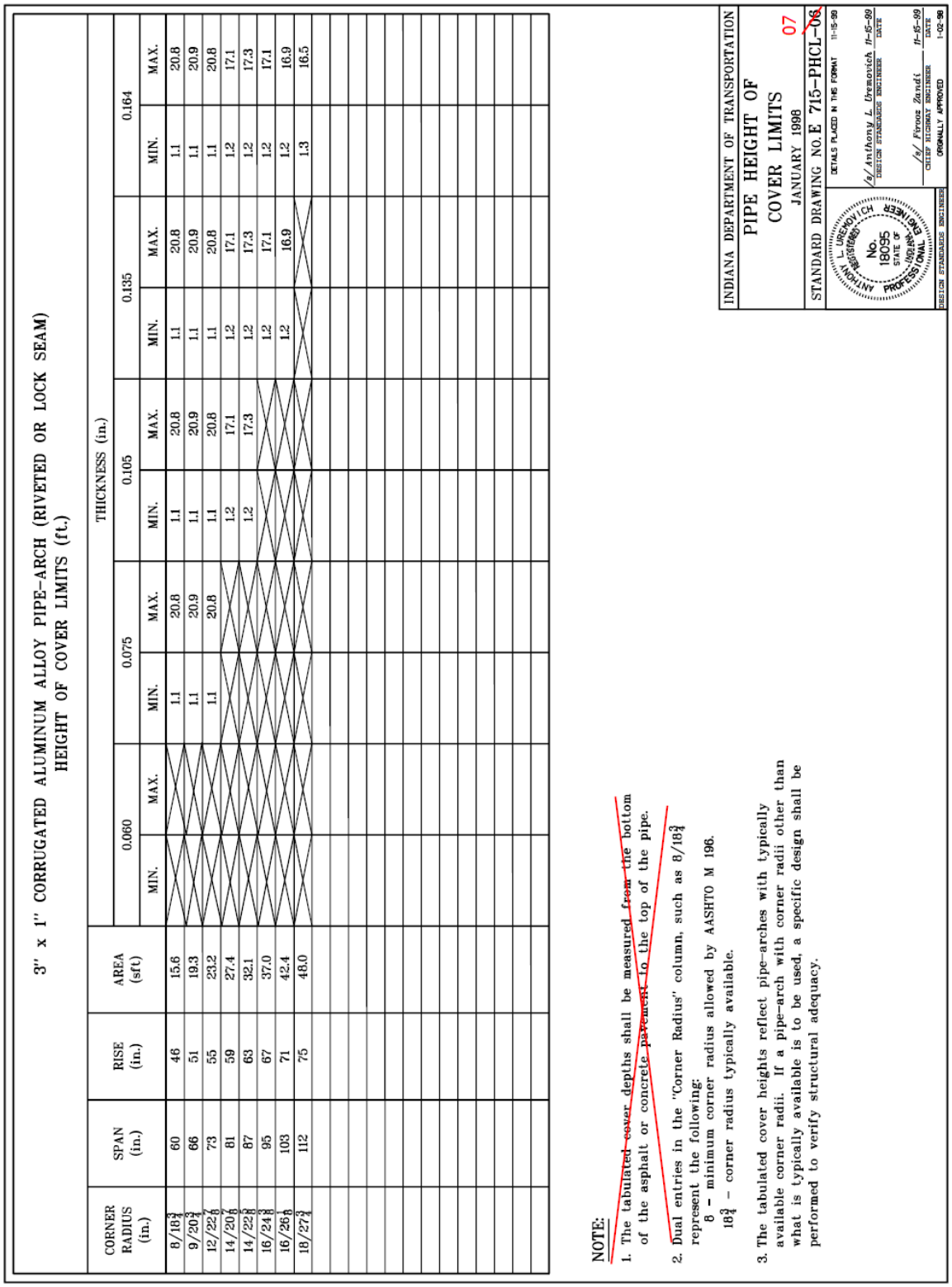
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER
ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-06 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



3" x 1" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.060		0.075		0.105		0.135		0.164	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8/18¾	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9/20¾	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12/22⅞	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14/20⅝	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1
14/22⅝	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3
16/24⅜	95	67	37.0							1.2	17.1	1.2	17.1
16/26⅛	103	71	42.4							1.2	16.9	1.2	16.9
18/27¾	112	75	48.0									1.3	16.5

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.
2. Dual entries in the "Corner Radius" column, such as 8/18¾ represent the following:
   8 – minimum corner radius allowed by AASHTO M 196.
   18¾ – corner radius typically available.
3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998 07
STANDARD DRAWING NO. E 715-PHCL-06

ANTHONY L. UREMOVICH REGISTERED PROFESSIONAL ENGINEER No. 18095 STATE OF INDIANA

DETAILS PLACED IN THIS FORMAT 11-15-99

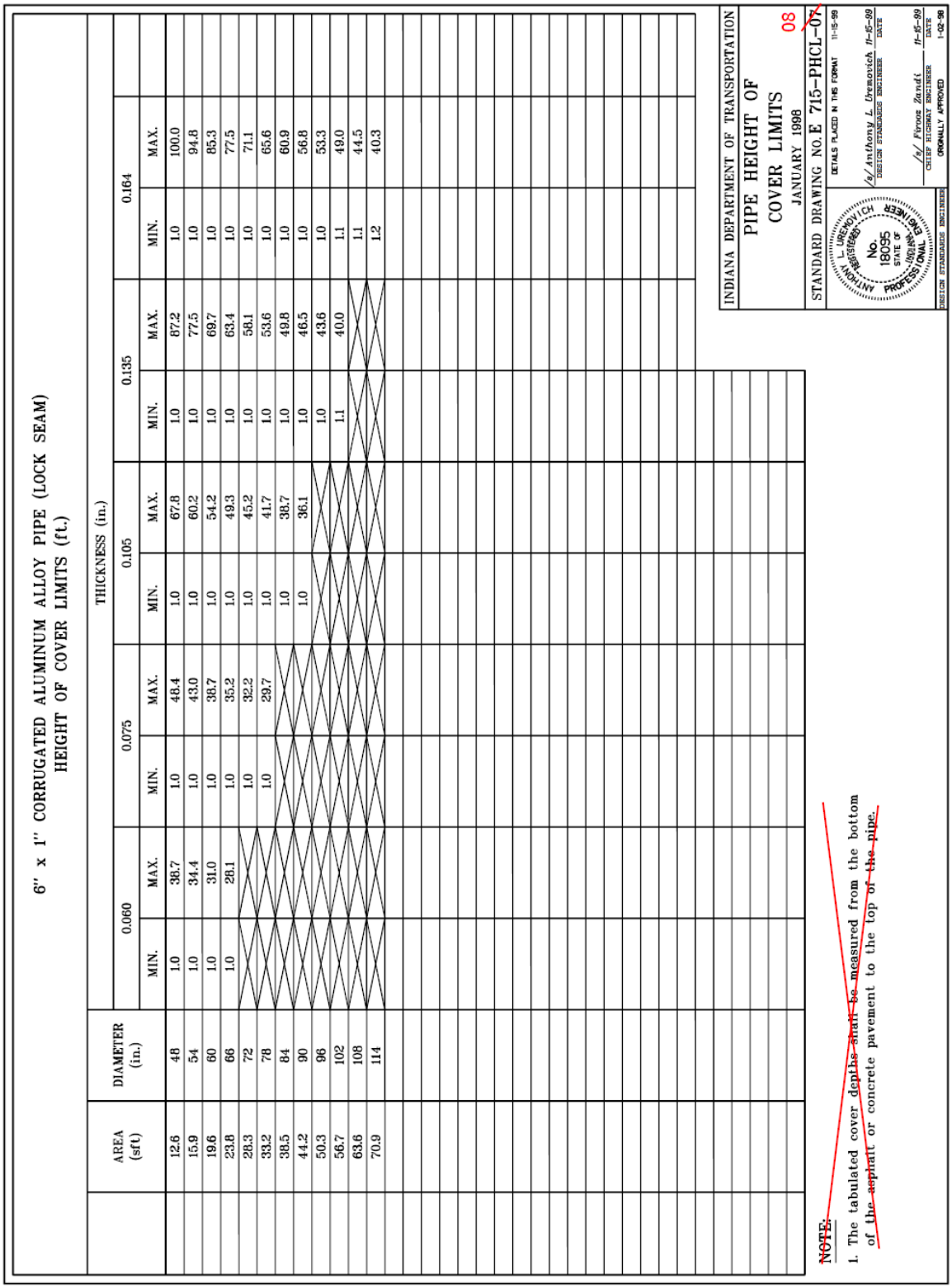
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER | ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-07 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



6" x 1" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
12.6	48	1.0	38.7	1.0	48.4	1.0	67.8	1.0	87.2	1.0	100.0
15.9	54	1.0	34.4	1.0	43.0	1.0	60.2	1.0	77.5	1.0	94.8
19.6	60	1.0	31.0	1.0	38.7	1.0	54.2	1.0	69.7	1.0	85.3
23.8	66	1.0	28.1	1.0	35.2	1.0	49.3	1.0	63.4	1.0	77.5
28.3	72			1.0	32.2	1.0	45.2	1.0	58.1	1.0	71.1
33.2	78			1.0	29.7	1.0	41.7	1.0	53.6	1.0	65.6
38.5	84					1.0	38.7	1.0	49.8	1.0	60.9
44.2	90					1.0	36.1	1.0	46.5	1.0	56.8
50.3	96							1.0	43.6	1.0	53.3
56.7	102							1.1	40.0	1.1	49.0
63.6	108									1.1	44.5
70.9	114									1.2	40.3

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998
08
STANDARD DRAWING NO. E 715-PHCL-07

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

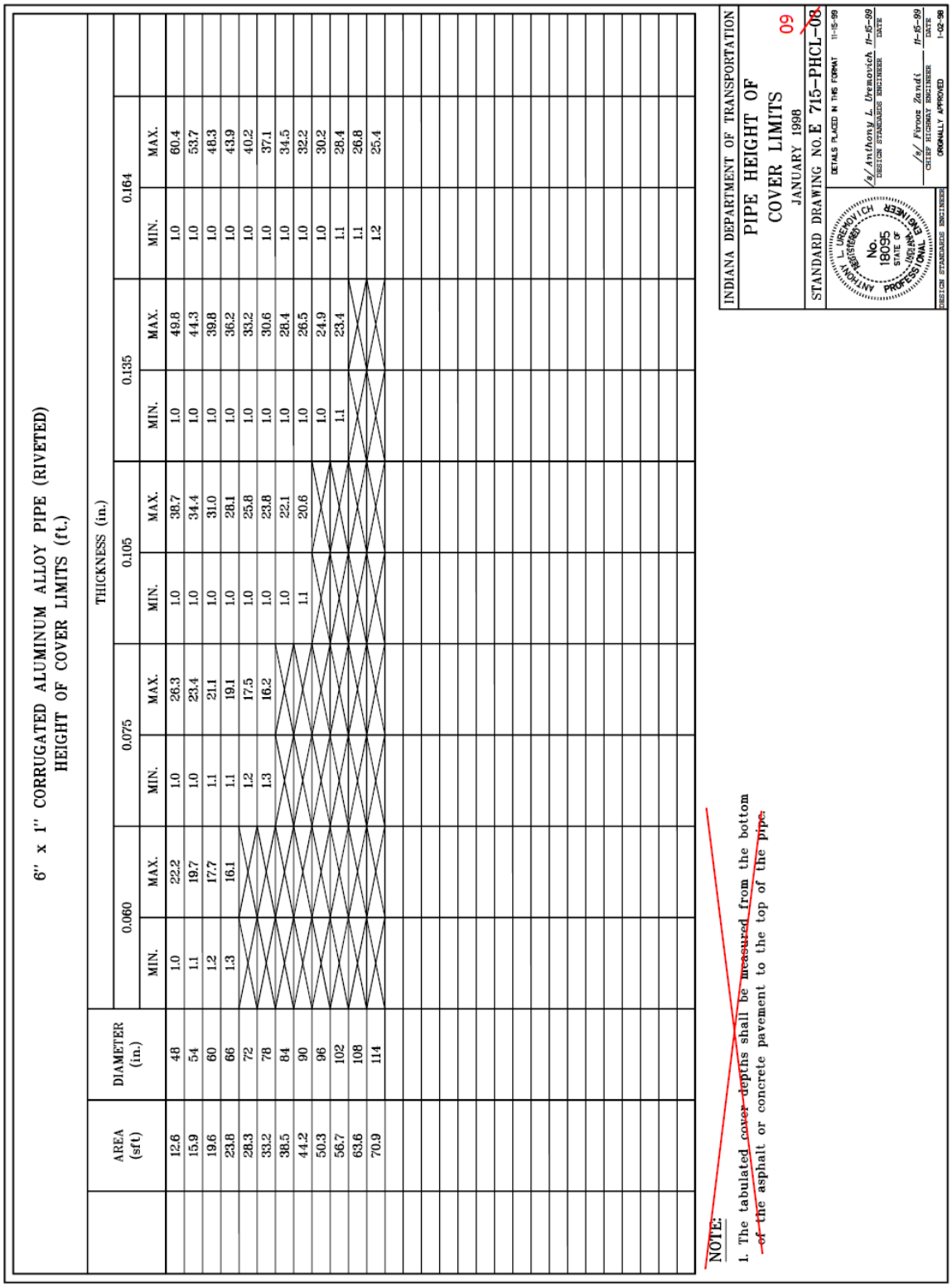
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER
ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-08 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



6" x 1" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
12.6	48	1.0	22.2	1.0	26.3	1.0	38.7	1.0	49.8	1.0	60.4
15.9	54	1.1	19.7	1.0	23.4	1.0	34.4	1.0	44.3	1.0	53.7
19.6	60	1.2	17.7	1.1	21.1	1.0	31.0	1.0	39.8	1.0	48.3
23.8	66	1.3	16.1	1.1	19.1	1.0	28.1	1.0	36.2	1.0	43.9
28.3	72			1.2	17.5	1.0	25.8	1.0	33.2	1.0	40.2
33.2	78			1.3	16.2	1.0	23.8	1.0	30.6	1.0	37.1
38.5	84					1.0	22.1	1.0	28.4	1.0	34.5
44.2	90					1.1	20.6	1.0	26.5	1.0	32.2
50.3	96							1.0	24.9	1.0	30.2
56.7	102							1.1	23.4	1.1	28.4
63.6	108									1.1	26.8
70.9	114									1.2	25.4

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
09
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-08

DETAILS PLACED IN THIS FORMAT 11-15-99

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

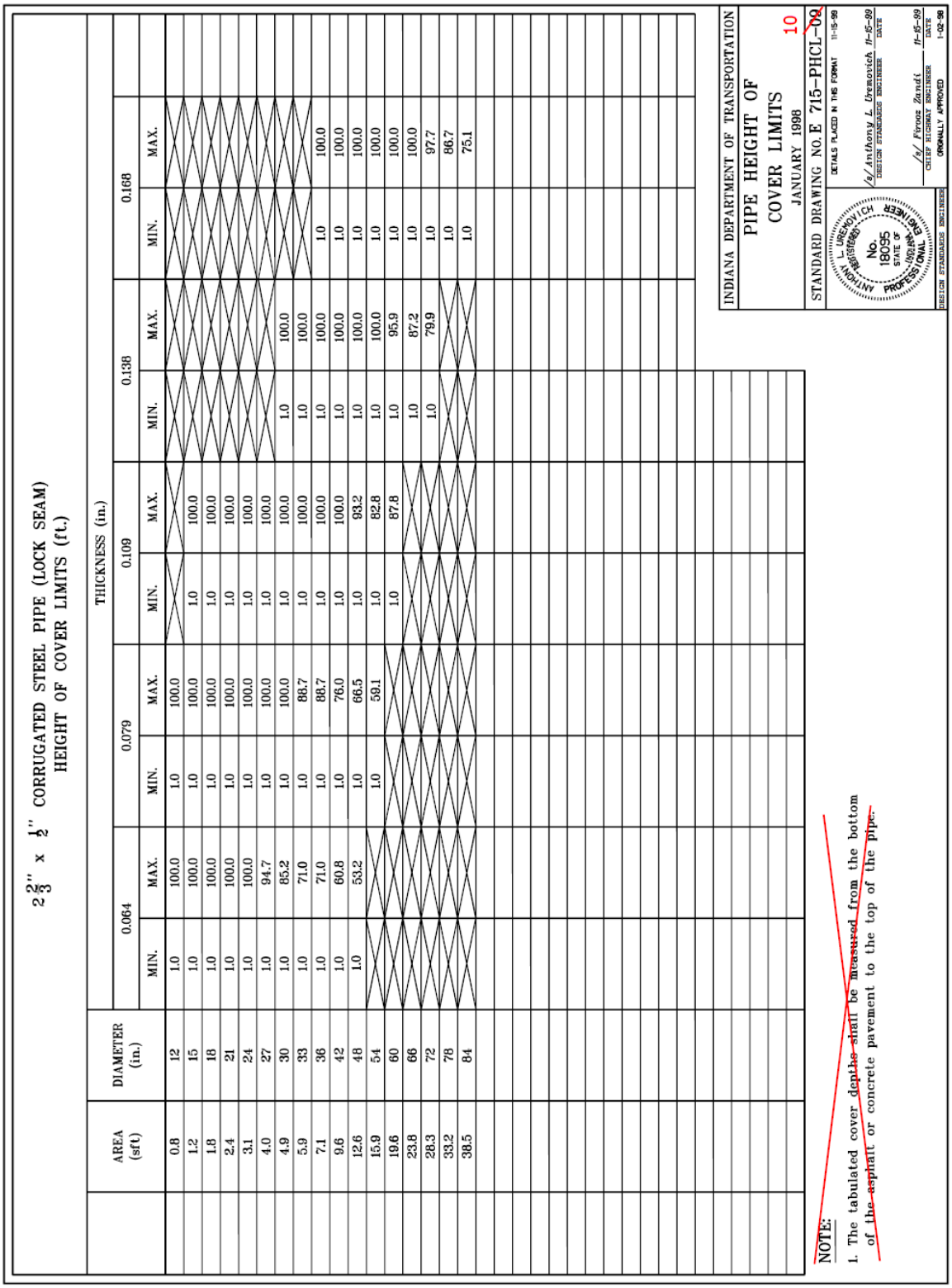
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-09 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
0.8	12	1.0	100.0	1.0	100.0						
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0				
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0				
2.4	21	1.0	100.0	1.0	100.0	1.0	100.0				
3.1	24	1.0	100.0	1.0	100.0	1.0	100.0				
4.0	27	1.0	94.7	1.0	100.0	1.0	100.0				
4.9	30	1.0	85.2	1.0	100.0	1.0	100.0	1.0	100.0	1.0	100.0
5.9	33	1.0	71.0	1.0	88.7	1.0	100.0	1.0	100.0	1.0	100.0
7.1	36	1.0	71.0	1.0	88.7	1.0	100.0	1.0	100.0	1.0	100.0
9.6	42	1.0	60.8	1.0	76.0	1.0	100.0	1.0	100.0	1.0	100.0
12.6	48	1.0	53.2	1.0	66.5	1.0	93.2	1.0	100.0	1.0	100.0
15.9	54			1.0	58.1	1.0	82.8	1.0	100.0	1.0	100.0
19.6	60					1.0	87.8	1.0	95.9	1.0	100.0
23.8	66							1.0	87.2	1.0	100.0
28.3	72							1.0	79.9	1.0	97.7
33.2	78									1.0	86.7
38.5	84									1.0	75.1

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-09 10

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

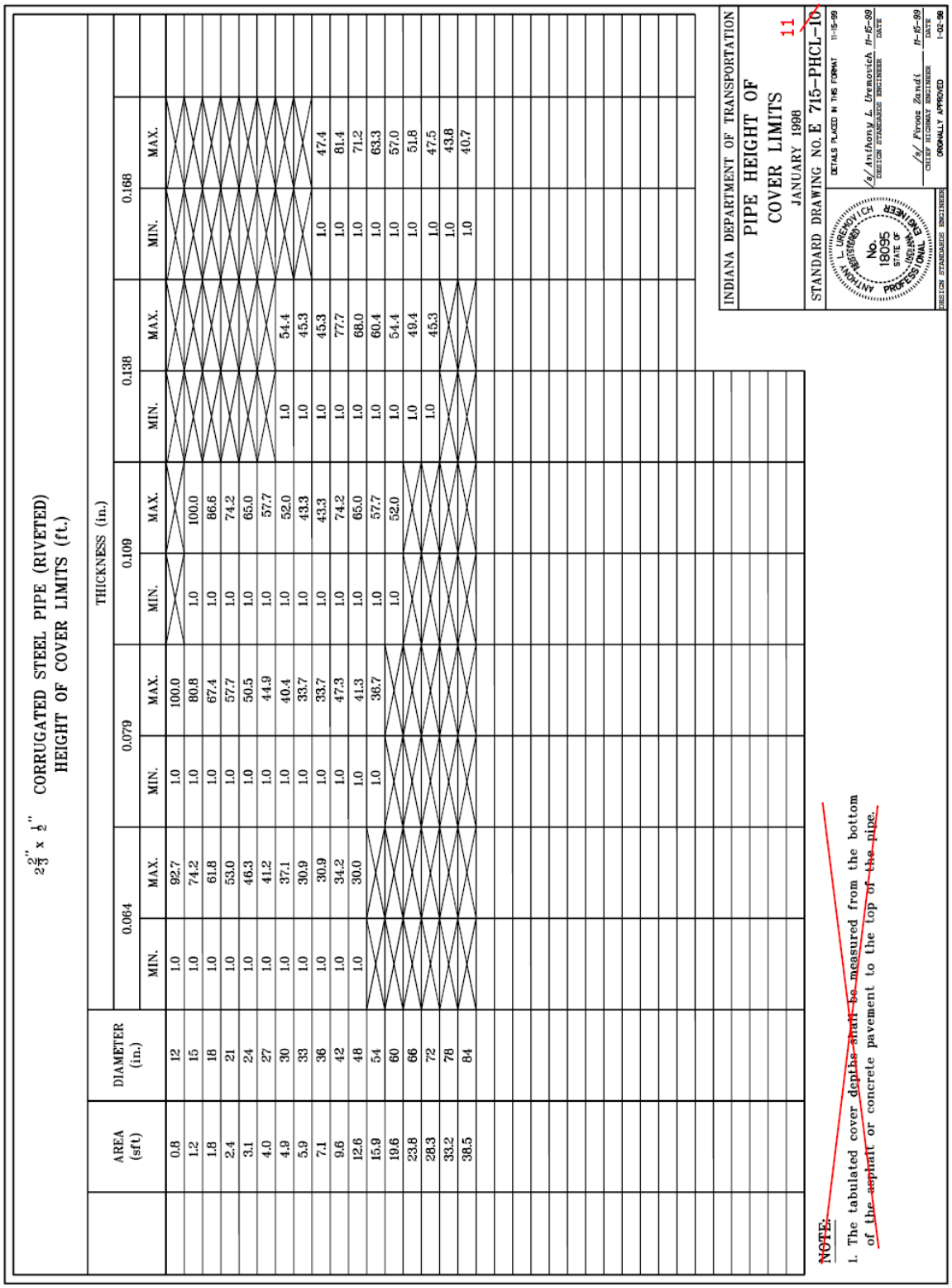
/s/ Anthony L. Uremovich 11-05-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-05-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-10 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED STEEL PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
0.8	12	1.0	92.7	1.0	100.0						
1.2	15	1.0	74.2	1.0	80.8	1.0	100.0				
1.8	18	1.0	61.8	1.0	67.4	1.0	86.6				
2.4	21	1.0	53.0	1.0	57.7	1.0	74.2				
3.1	24	1.0	46.3	1.0	50.5	1.0	65.0				
4.0	27	1.0	41.2	1.0	44.9	1.0	57.7				
4.9	30	1.0	37.1	1.0	40.4	1.0	52.0	1.0	54.4		
5.9	33	1.0	30.9	1.0	33.7	1.0	43.3	1.0	45.3		
7.1	36	1.0	30.9	1.0	33.7	1.0	43.3	1.0	45.3	1.0	47.4
9.6	42	1.0	34.2	1.0	47.3	1.0	74.2	1.0	77.7	1.0	81.4
12.6	48	1.0	30.0	1.0	41.3	1.0	65.0	1.0	68.0	1.0	71.2
15.9	54			1.0	36.7	1.0	57.7	1.0	60.4	1.0	63.3
19.6	60					1.0	52.0	1.0	54.4	1.0	57.0
23.8	66							1.0	49.4	1.0	51.8
28.3	72							1.0	45.3	1.0	47.5
33.2	78									1.0	43.8
38.5	84									1.0	40.7

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-10 11

DETAILS PLACED IN THIS FORMAT 11-15-99

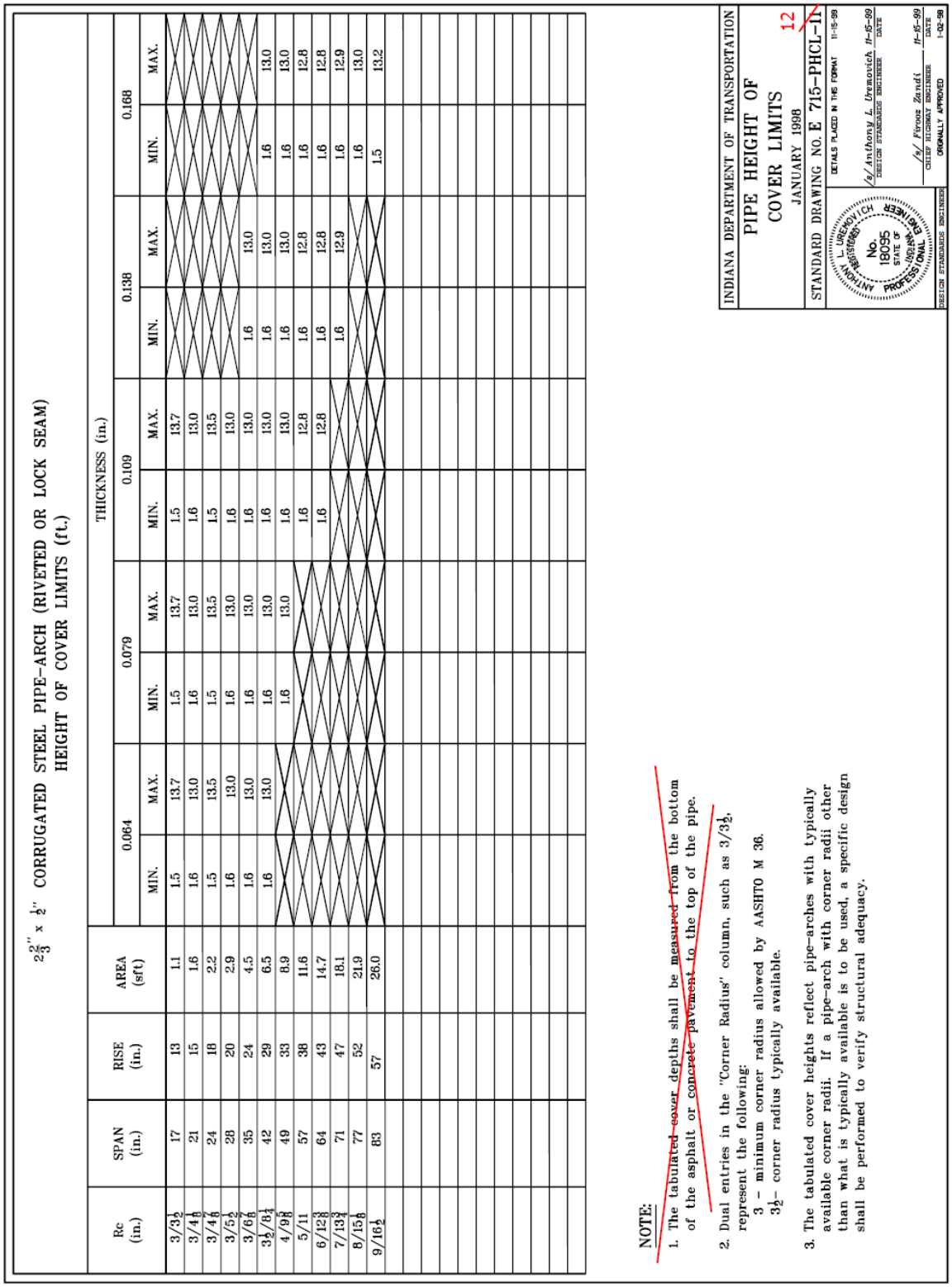
/s/ Anthony L. Uhrovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER
ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-11 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
3/3½	17	13	1.1	1.5	13.7	1.5	13.7	1.5	13.7				
3/4⅙	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0				
3/4⅚	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5				
3/5½	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0				
3/6⅙	35	24	4.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0		
3½/8¼	42	29	6.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
4/9⅝	49	33	8.9			1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
5/11	57	38	11.6					1.6	12.8	1.6	12.8	1.6	12.8
6/12⅜	64	43	14.7					1.6	12.8	1.6	12.8	1.6	12.8
7/13⅞	71	47	18.1							1.6	12.9	1.6	12.9
8/15⅛	77	52	21.9									1.6	13.0
9/16½	83	57	26.0									1.5	13.2

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.
2. Dual entries in the "Corner Radius" column, such as 3/3½, represent the following:
   3 – minimum corner radius allowed by AASHTO M 36.
   3½– corner radius typically available.
3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS 12
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-11

ANTHONY L. URGOVICH REGISTERED PROFESSIONAL ENGINEER No. 18095 STATE OF INDIANA

DETAILS PLACED IN THIS FORMAT 11-15-99

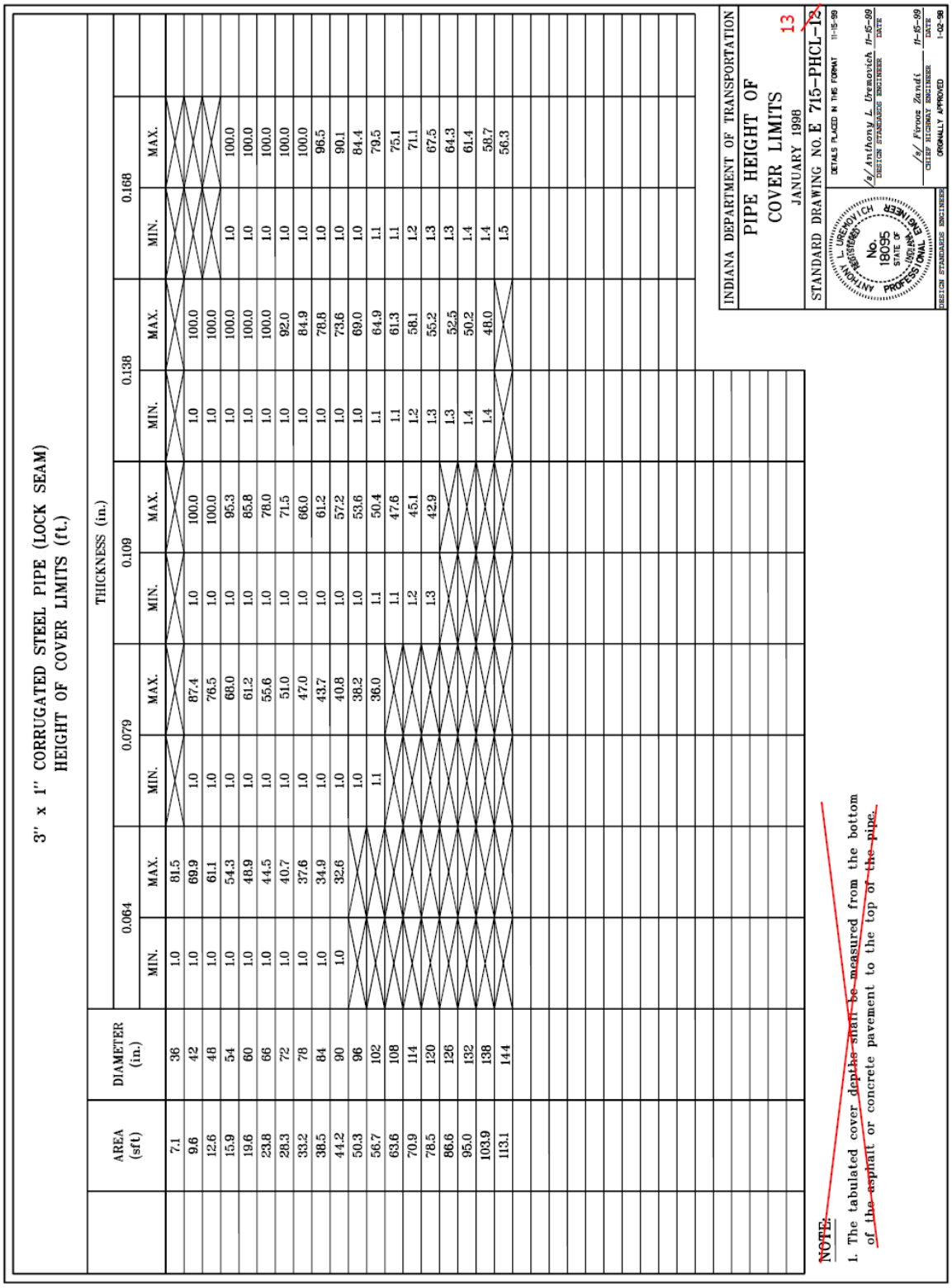
/s/ Anthony L. Urgovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 1-02-98

DESIGN STANDARDS ENGINEER

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-12 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



3'' x 1'' CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
7.1	36	1.0	81.5	1.0	87.4	1.0	100.0	1.0	100.0	1.0	100.0
9.6	42	1.0	69.9	1.0	78.5	1.0	100.0	1.0	100.0	1.0	100.0
12.6	48	1.0	61.1	1.0	68.0	1.0	95.3	1.0	100.0	1.0	100.0
15.9	54	1.0	54.3	1.0	61.2	1.0	85.8	1.0	100.0	1.0	100.0
19.6	60	1.0	48.9	1.0	55.6	1.0	78.0	1.0	100.0	1.0	100.0
23.8	66	1.0	44.5	1.0	51.0	1.0	71.5	1.0	92.0	1.0	100.0
28.3	72	1.0	40.7	1.0	47.0	1.0	66.0	1.0	84.9	1.0	100.0
33.2	78	1.0	37.6	1.0	43.7	1.0	61.2	1.0	78.8	1.0	96.5
38.5	84	1.0	34.9	1.0	40.8	1.0	57.2	1.0	73.6	1.0	90.1
44.2	90	1.0	32.6	1.0	38.2	1.0	53.6	1.0	69.0	1.0	84.4
50.3	96			1.1	36.0	1.1	50.4	1.1	64.9	1.1	79.5
56.7	102					1.1	47.6	1.1	61.3	1.1	75.1
63.6	108					1.2	45.1	1.2	58.1	1.2	71.1
70.9	114					1.3	42.9	1.3	55.2	1.3	67.5
78.5	120							1.3	52.5	1.3	64.3
86.6	126							1.4	50.2	1.4	61.4
95.0	132							1.4	48.0	1.4	58.7
103.9	138									1.5	56.3
113.1	144										

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-12 13

ANTHONY L. URESKOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

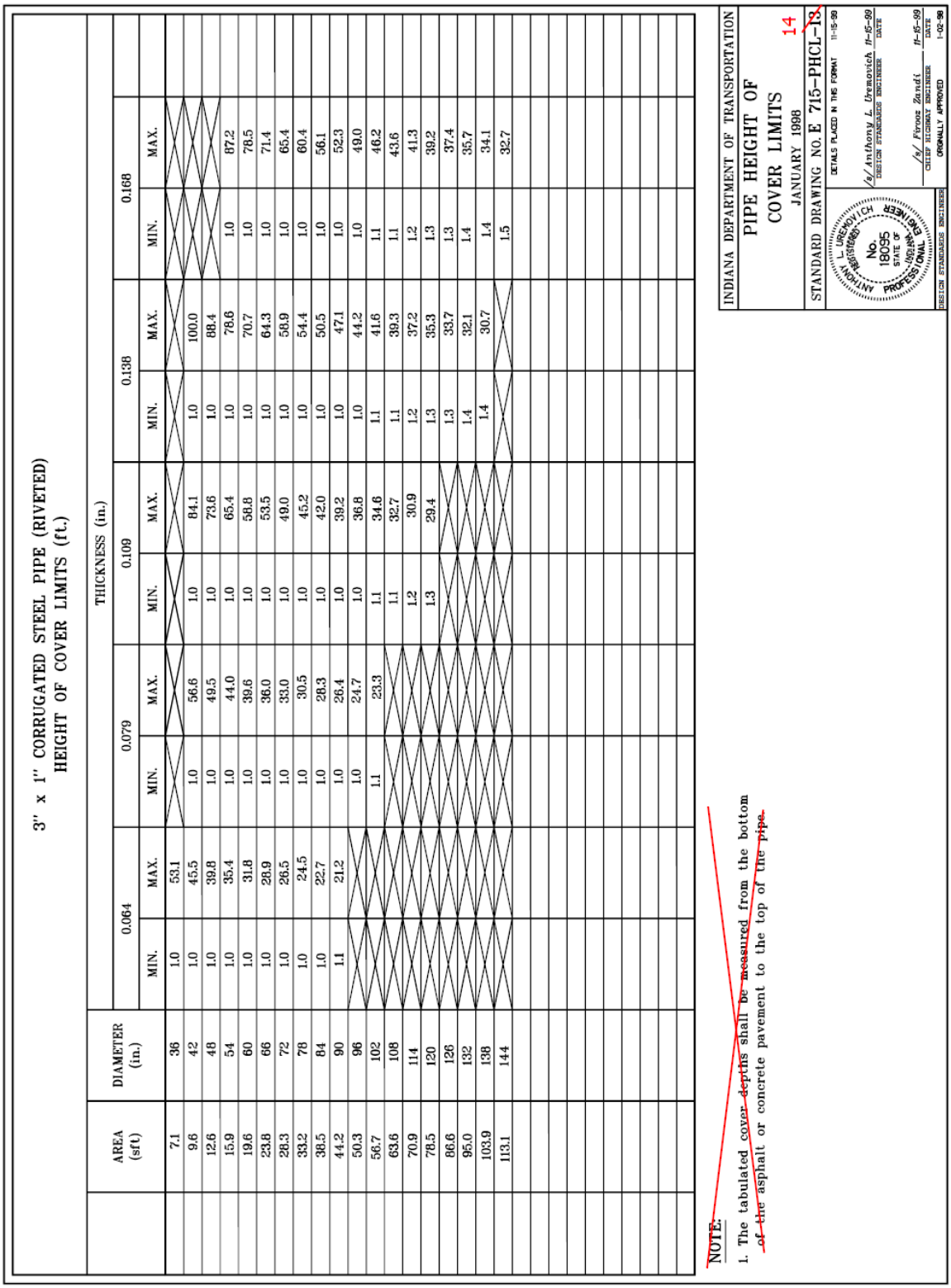
/s/ Anthony L. Ureskovich 11-05-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zarafi 11-05-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER
ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-13 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



3" x 1" CORRUGATED STEEL PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
7.1	36	1.0	53.1								
9.6	42	1.0	45.5	1.0	56.6	1.0	84.1	1.0	100.0		
12.6	48	1.0	39.8	1.0	49.5	1.0	73.6	1.0	88.4		
15.9	54	1.0	35.4	1.0	44.0	1.0	65.4	1.0	78.6	1.0	87.2
19.6	60	1.0	31.8	1.0	39.6	1.0	58.8	1.0	70.7	1.0	78.5
23.8	66	1.0	28.9	1.0	36.0	1.0	53.5	1.0	64.3	1.0	71.4
28.3	72	1.0	26.5	1.0	33.0	1.0	49.0	1.0	58.9	1.0	65.4
33.2	78	1.0	24.5	1.0	30.5	1.0	45.2	1.0	54.4	1.0	60.4
38.5	84	1.0	22.7	1.0	28.3	1.0	42.0	1.0	50.5	1.0	56.1
44.2	90	1.1	21.2	1.0	26.4	1.0	39.2	1.0	47.1	1.0	52.3
50.3	96			1.0	24.7	1.0	36.8	1.0	44.2	1.0	49.0
56.7	102			1.1	23.3	1.1	34.6	1.1	41.6	1.1	46.2
63.6	108					1.1	32.7	1.1	39.3	1.1	43.6
70.9	114					1.2	30.9	1.2	37.2	1.2	41.3
78.5	120					1.3	29.4	1.3	35.3	1.3	39.2
86.6	126							1.3	33.7	1.3	37.4
95.0	132							1.4	32.1	1.4	35.7
103.9	138							1.4	30.7	1.4	34.1
113.1	144									1.5	32.7

NOTE:

1. The tabulated ~~cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.~~

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS 14
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-13

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uhrovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

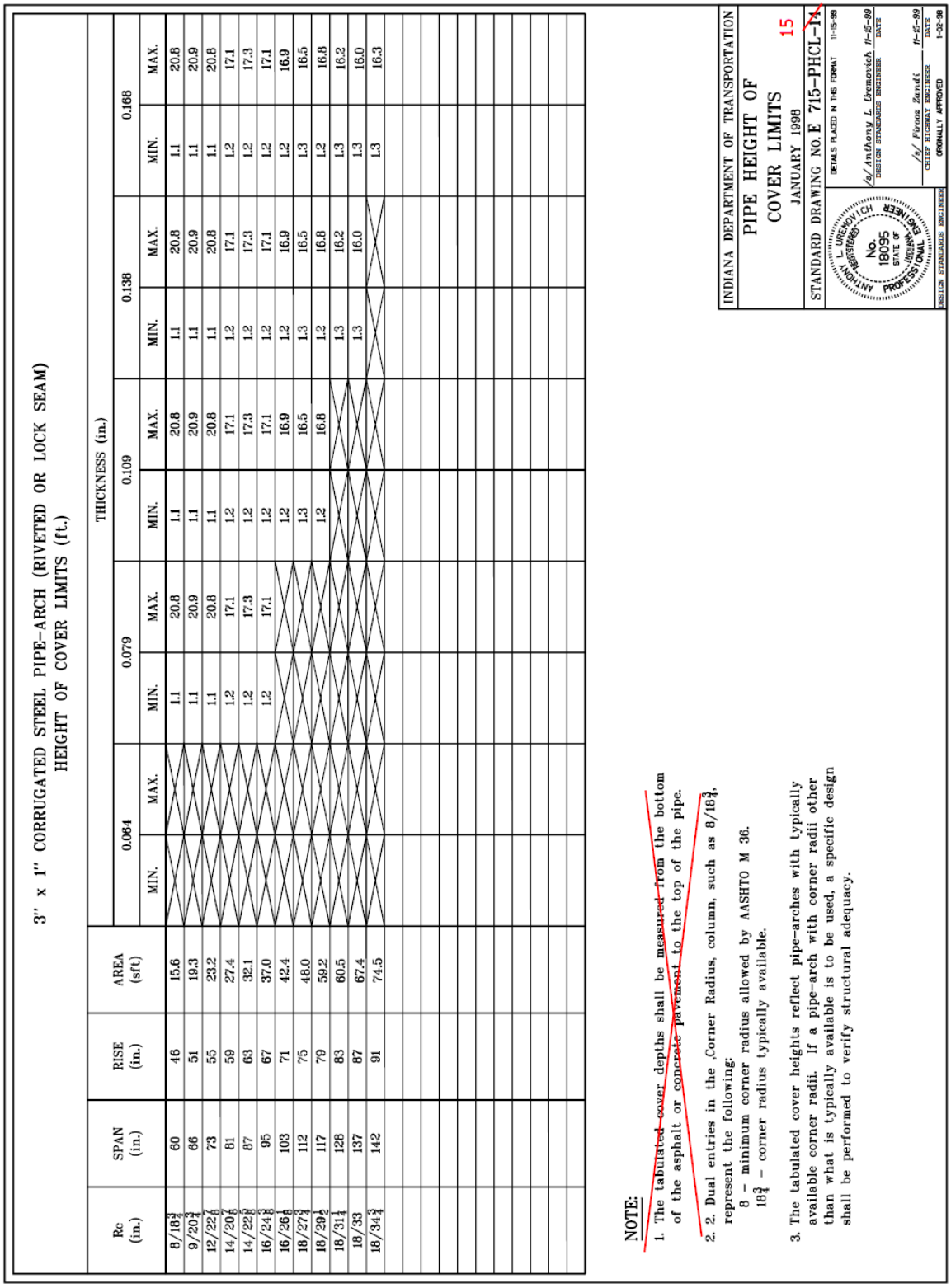
/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER ORIGINALLY APPROVED 1-02-98

ANTHONY L. UHROVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-14 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



3" x 1" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
8/18$\frac{3}{4}$	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9/20$\frac{3}{4}$	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12/22$\frac{7}{8}$	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14/20$\frac{7}{8}$	81	59	27.4			1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
14/22$\frac{3}{8}$	87	63	32.1			1.2	17.3	1.2	17.3	1.2	17.3	1.2	17.3
16/24$\frac{1}{8}$	95	67	37.0			1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
16/26$\frac{3}{8}$	103	71	42.4					1.2	16.9	1.2	16.9	1.2	16.9
18/27$\frac{3}{8}$	112	75	48.0					1.3	16.5	1.3	16.5	1.3	16.5
18/29$\frac{1}{2}$	117	79	59.2					1.2	16.8	1.2	16.8	1.2	16.8
18/31$\frac{1}{4}$	128	83	60.5							1.3	16.2	1.3	16.2
18/33	137	87	67.4							1.3	16.0	1.3	16.0
18/34$\frac{3}{4}$	142	91	74.5							1.2		1.3	16.3

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.
2. 2. Dual entries in the ,Corner Radius, column, such as 8/18$\frac{3}{4}$, represent the following:
   8 - minimum corner radius allowed by AASHTO M 36.
   18$\frac{3}{4}$ - corner radius typically available.
3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998 15
STANDARD DRAWING NO. E 715-PHCL-14

DETAILS PLACED IN THIS FORMAT 11-15-99

ANTHONY L. URKOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

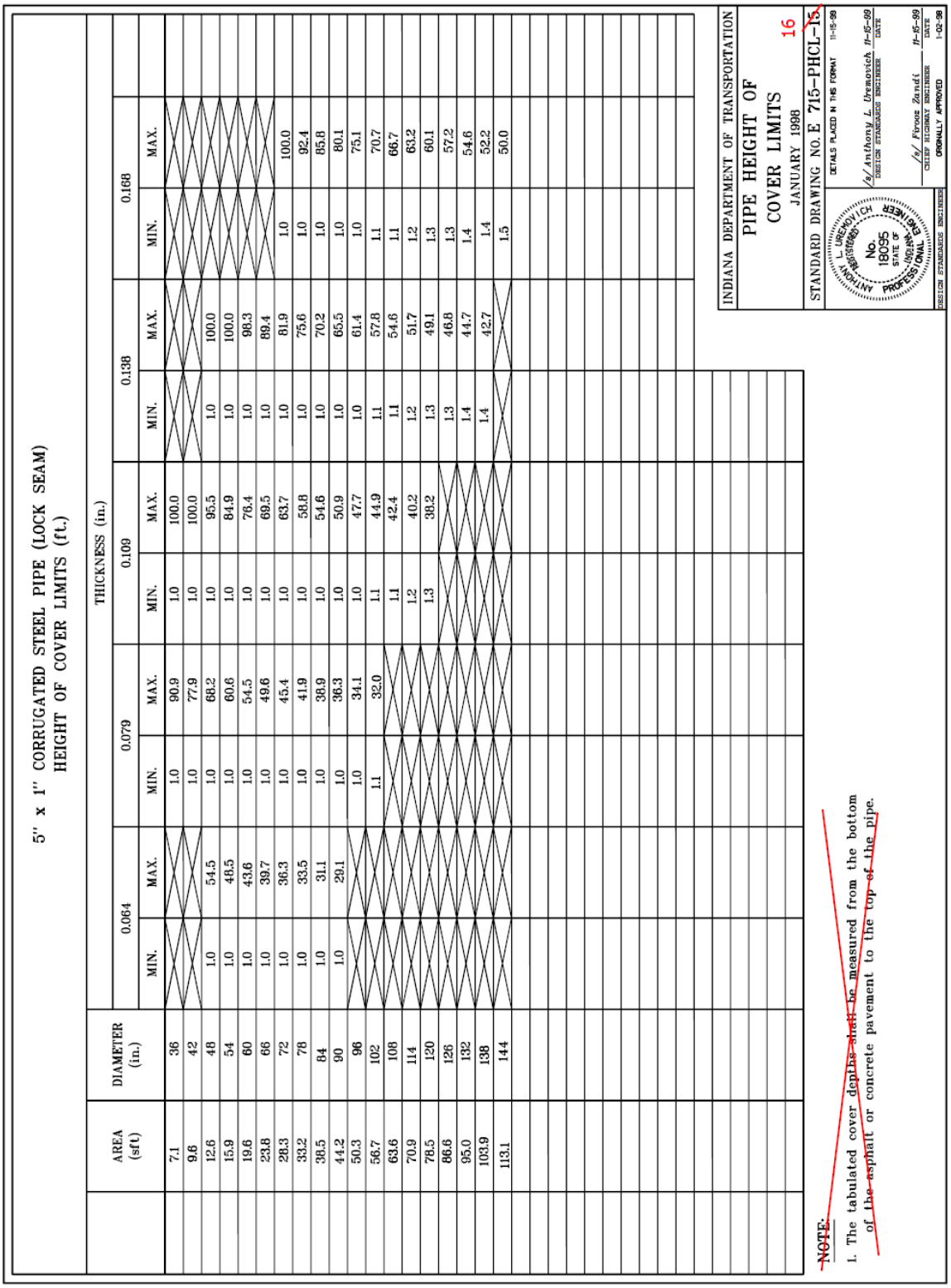
/s/ Anthony L. Urkovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-15 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



5" x 1" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
7.1	36			1.0	90.9	1.0	100.0				
9.6	42			1.0	77.9	1.0	100.0				
12.6	48	1.0	54.5	1.0	68.2	1.0	95.5	1.0	100.0		
15.9	54	1.0	48.5	1.0	60.6	1.0	84.9	1.0	100.0		
19.6	60	1.0	43.6	1.0	54.5	1.0	76.4	1.0	98.3		
23.8	66	1.0	39.7	1.0	49.6	1.0	69.5	1.0	89.4	1.0	100.0
28.3	72	1.0	36.3	1.0	45.4	1.0	63.7	1.0	81.9	1.0	92.4
33.2	78	1.0	33.5	1.0	41.9	1.0	58.8	1.0	75.6	1.0	85.8
38.5	84	1.0	31.1	1.0	38.9	1.0	54.6	1.0	70.2	1.0	80.1
44.2	90	1.0	29.1	1.0	36.3	1.0	50.9	1.0	65.5	1.0	75.1
50.3	96			1.0	34.1	1.0	47.7	1.0	61.4	1.0	70.7
56.7	102			1.1	32.0	1.1	44.9	1.1	57.8	1.1	66.7
63.6	108					1.1	42.4	1.1	54.6	1.1	63.2
70.9	114					1.2	40.2	1.2	51.7	1.2	60.1
78.5	120					1.3	38.2	1.3	49.1	1.3	57.2
86.6	126							1.3	46.8	1.3	54.6
95.0	132							1.4	44.7	1.4	52.2
103.9	138							1.4	42.7	1.4	50.0
113.1	144									1.5	50.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-15

16

ANTHONY L. JEREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

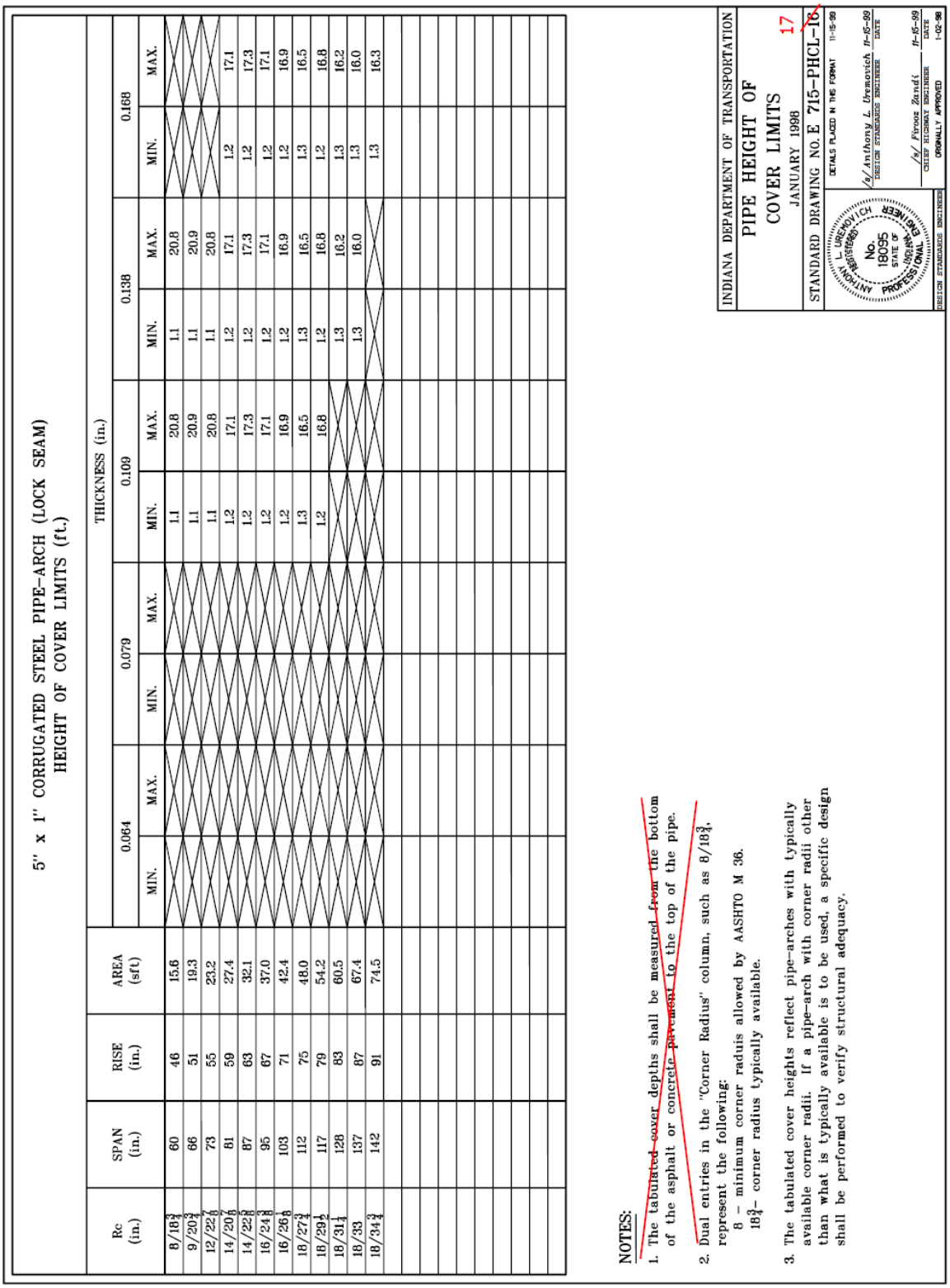
/s/ Anthony L. Jeremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firouz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER
ORGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-16 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



5" x 1" CORRUGATED STEEL PIPE-ARCH (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
8/18 3/4	60	46	15.6					1.1	20.8	1.1	20.8		
9/20 3/4	66	51	19.3					1.1	20.9	1.1	20.9		
12/22 7/8	73	55	23.2					1.1	20.8	1.1	20.8		
14/20 7/8	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1
14/22 3/8	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3
16/24 3/8	95	67	37.0					1.2	17.1	1.2	17.1	1.2	17.1
16/26 1/8	103	71	42.4					1.2	16.9	1.2	16.9	1.2	16.9
18/27 3/4	112	75	48.0					1.3	16.5	1.3	16.5	1.3	16.5
18/29 1/2	117	79	54.2					1.2	16.8	1.2	16.8	1.2	16.8
18/31 1/4	128	83	60.5							1.3	16.2	1.3	16.2
18/33	137	87	67.4							1.3	16.0	1.3	16.0
18/34 3/8	142	91	74.5									1.3	16.3

NOTES:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.
2. Dual entries in the "Corner Radius" column, such as 8/18 3/4, represent the following:
   8 – minimum corner raduis allowed by AASHTO M 36.
   18 3/4 – corner radius typically available.
3. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-16

17

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

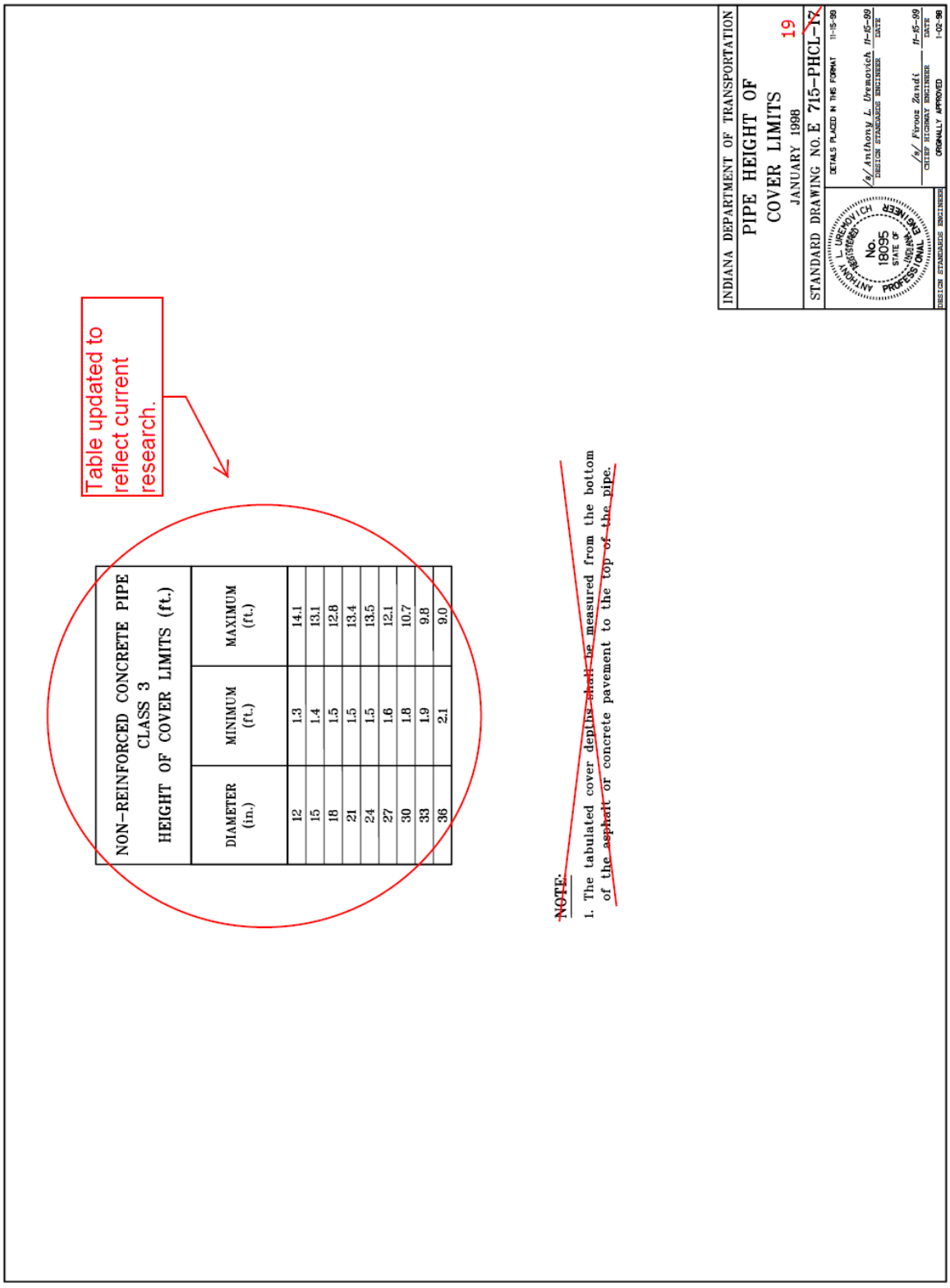
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-17 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
JANUARY 1998 19
STANDARD DRAWING NO. E 715-PHCL-17
DETAILS PLACED IN THIS FORMAT 11-15-99
/s/ Anthony L. Uhrovich 11-15-99
DESIGN STANDARDS ENGINEER DATE
/s/ Firoos Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE
ORIGINALLY APPROVED 1-02-98
DESIGN STANDARDS ENGINEER

Table updated to reflect current research.

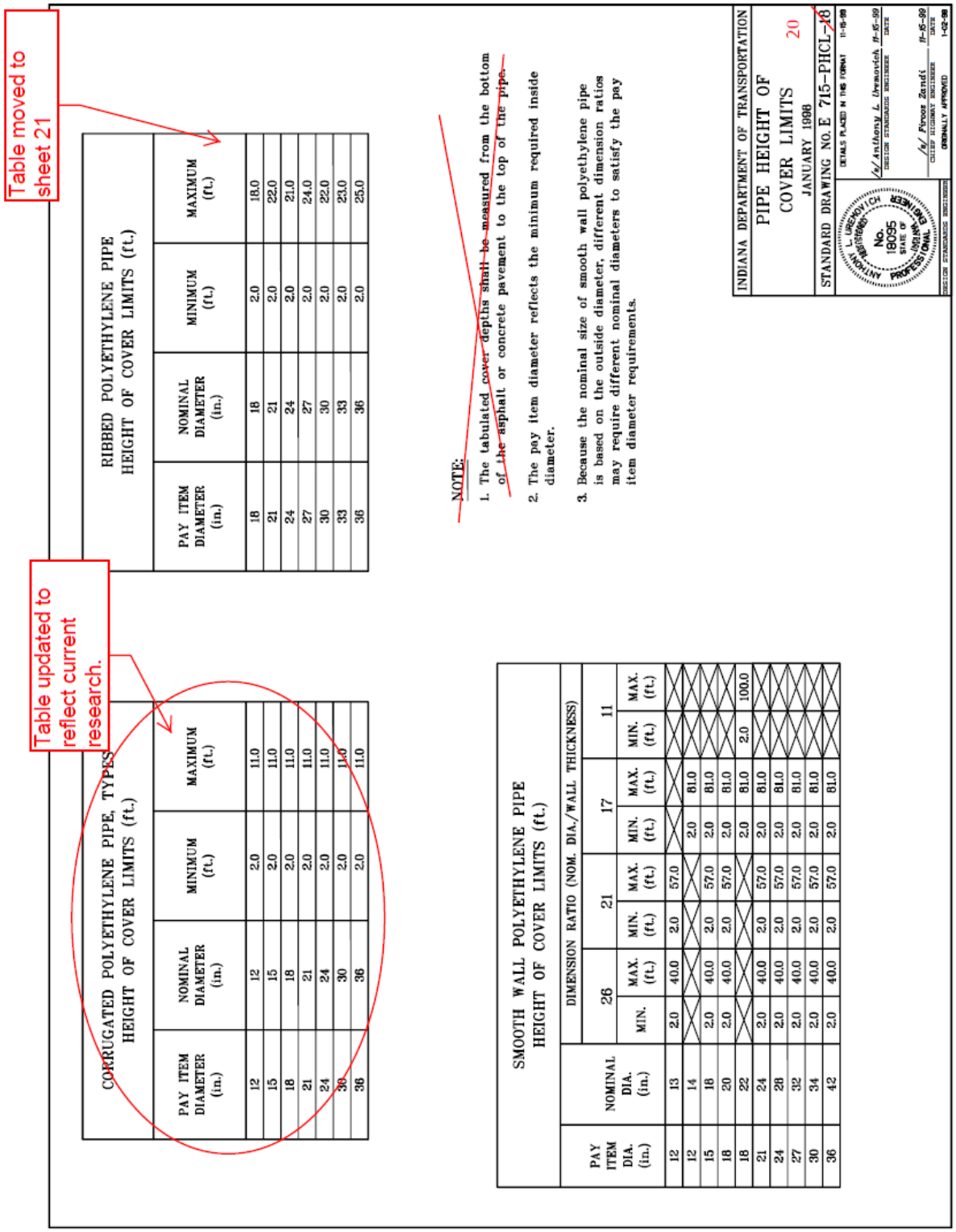
NON-REINFORCED CONCRETE PIPE
CLASS 3
HEIGHT OF COVER LIMITS (ft.)

DIAMETER (in.)	MINIMUM (ft.)	MAXIMUM (ft.)
12	1.3	14.1
15	1.4	13.1
18	1.5	12.8
21	1.5	13.4
24	1.5	13.5
27	1.6	12.1
30	1.8	10.7
33	1.9	9.8
36	2.1	9.0

NOTE:
1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

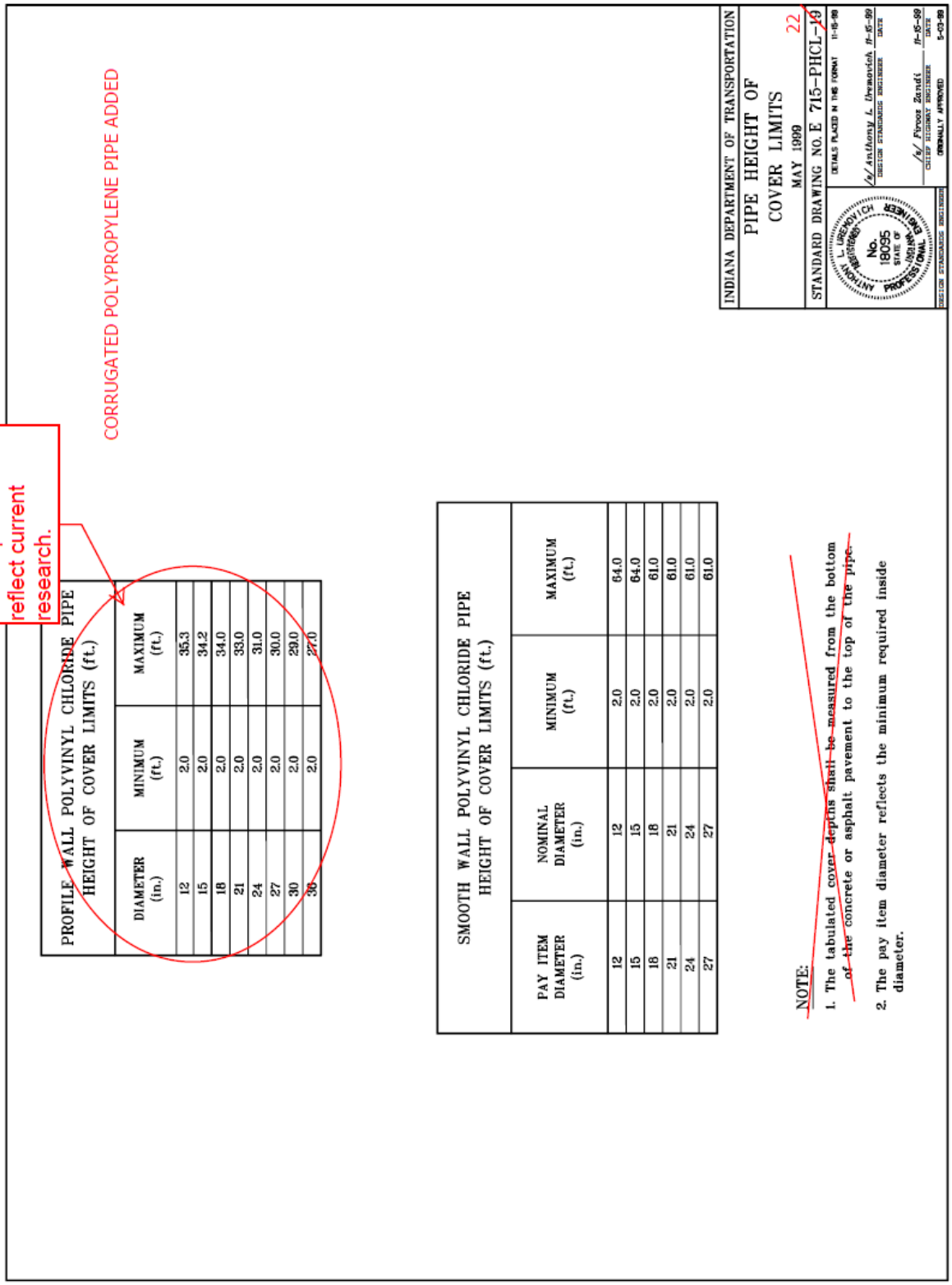
REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-18 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



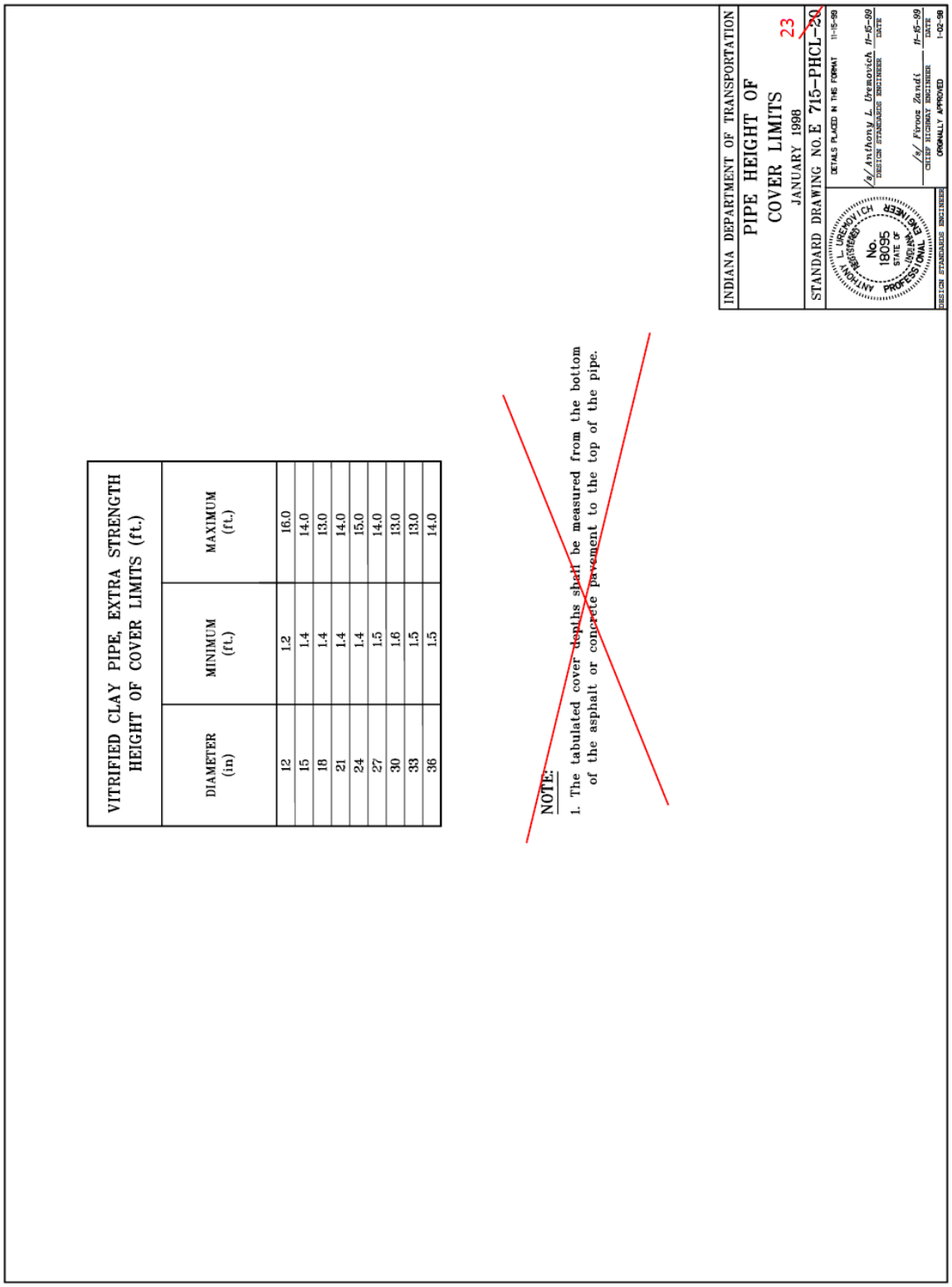
REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-19 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-20 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
23
JANUARY 1998
STANDARD DRAWING NO. E 715-PHCL-20
DETAILS PLACED IN THIS FORMAT 11-15-99
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE
/s/ Firoz Zaidi 11-15-99
CHIEF ENGINEER DATE
ORIGINALLY APPROVED 1-02-98
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF PROFESSIONAL ENGINEER
DESIGN STANDARDS ENGINEER

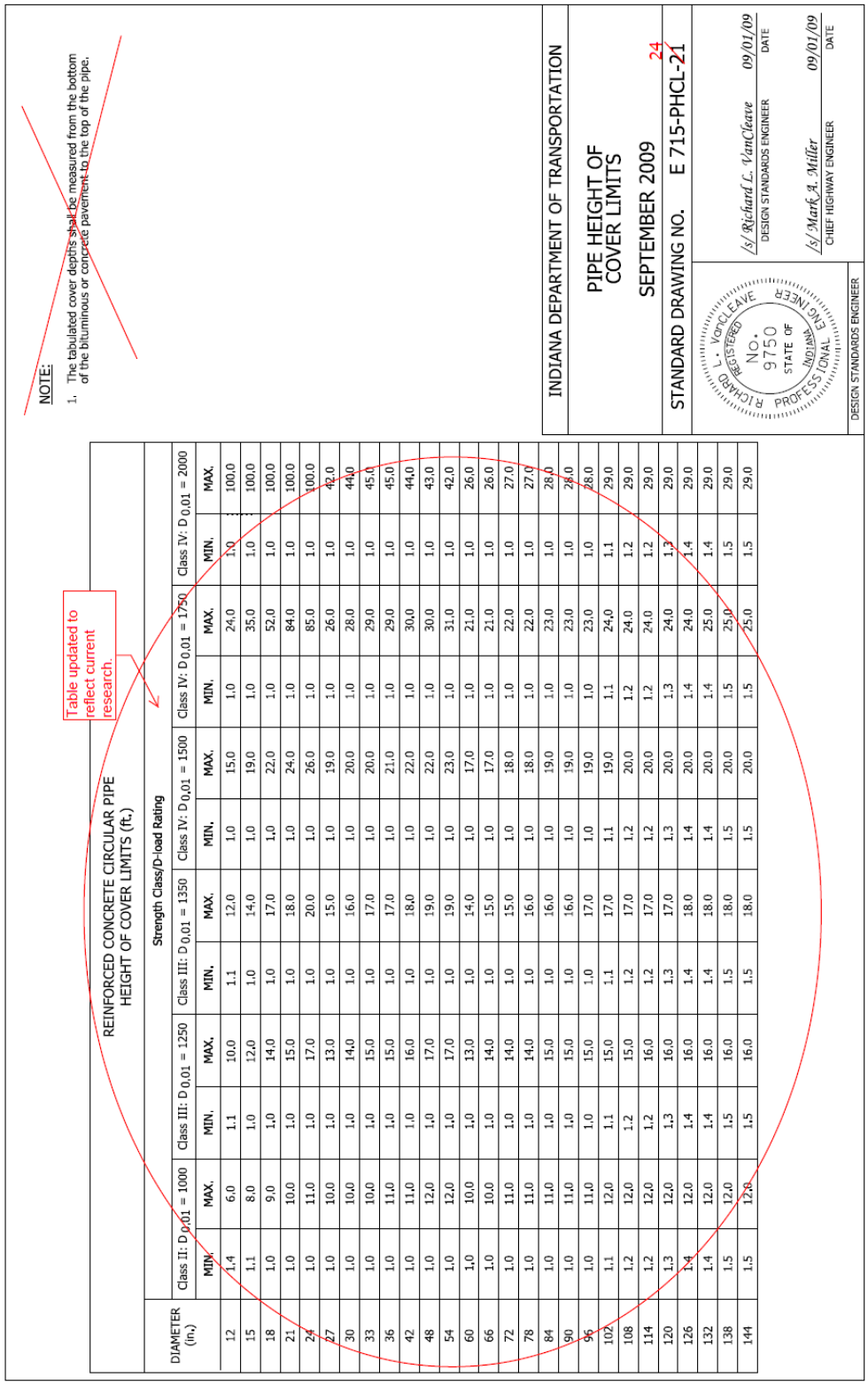
VITRIFIED CLAY PIPE, EXTRA STRENGTH
HEIGHT OF COVER LIMITS (ft.)

DIAMETER (in)	MINIMUM (ft.)	MAXIMUM (ft.)
12	1.2	16.0
15	1.4	14.0
18	1.4	13.0
21	1.4	14.0
24	1.4	15.0
27	1.5	14.0
30	1.6	13.0
33	1.5	13.0
36	1.5	14.0

NOTE:
1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-21 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)



NOTE:

1. The tabulated cover depths shall be measured from the bottom of the bituminous or concrete pavement to the top of the pipe.

Table updated to reflect current research.

REINFORCED CONCRETE CIRCULAR PIPE
HEIGHT OF COVER LIMITS (ft.)

DIAMETER (in.)	Strength Class/D-load Rating											
	Class II: $D_{0.01}$ = 1000		Class III: $D_{0.01}$ = 1250		Class III: $D_{0.01}$ = 1350		Class IV: $D_{0.01}$ = 1500		Class IV: $D_{0.01}$ = 1750		Class IV: $D_{0.01}$ = 2000	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	1.4	6.0	1.1	10.0	1.1	12.0	1.0	15.0	1.0	24.0	1.0	100.0
15	1.1	8.0	1.0	12.0	1.0	14.0	1.0	19.0	1.0	35.0	1.0	100.0
18	1.0	9.0	1.0	14.0	1.0	17.0	1.0	22.0	1.0	52.0	1.0	100.0
21	1.0	10.0	1.0	15.0	1.0	18.0	1.0	24.0	1.0	84.0	1.0	100.0
24	1.0	11.0	1.0	17.0	1.0	20.0	1.0	26.0	1.0	85.0	1.0	100.0
27	1.0	10.0	1.0	13.0	1.0	15.0	1.0	19.0	1.0	26.0	1.0	42.0
30	1.0	10.0	1.0	14.0	1.0	16.0	1.0	20.0	1.0	28.0	1.0	44.0
33	1.0	10.0	1.0	15.0	1.0	17.0	1.0	20.0	1.0	29.0	1.0	45.0
36	1.0	11.0	1.0	15.0	1.0	17.0	1.0	21.0	1.0	29.0	1.0	45.0
42	1.0	11.0	1.0	16.0	1.0	18.0	1.0	22.0	1.0	30.0	1.0	44.0
48	1.0	12.0	1.0	17.0	1.0	19.0	1.0	22.0	1.0	30.0	1.0	43.0
54	1.0	12.0	1.0	17.0	1.0	19.0	1.0	23.0	1.0	31.0	1.0	42.0
60	1.0	10.0	1.0	13.0	1.0	14.0	1.0	17.0	1.0	21.0	1.0	26.0
66	1.0	10.0	1.0	14.0	1.0	15.0	1.0	17.0	1.0	21.0	1.0	26.0
72	1.0	11.0	1.0	14.0	1.0	15.0	1.0	18.0	1.0	22.0	1.0	27.0
78	1.0	11.0	1.0	14.0	1.0	16.0	1.0	18.0	1.0	22.0	1.0	27.0
84	1.0	11.0	1.0	15.0	1.0	16.0	1.0	19.0	1.0	23.0	1.0	28.0
90	1.0	11.0	1.0	15.0	1.0	16.0	1.0	19.0	1.0	23.0	1.0	28.0
96	1.0	11.0	1.0	15.0	1.0	17.0	1.0	19.0	1.0	23.0	1.0	28.0
102	1.1	12.0	1.1	15.0	1.1	17.0	1.1	19.0	1.1	24.0	1.1	29.0
108	1.2	12.0	1.2	15.0	1.2	17.0	1.2	20.0	1.2	24.0	1.2	29.0
114	1.2	12.0	1.2	16.0	1.2	17.0	1.2	20.0	1.2	24.0	1.2	29.0
120	1.3	12.0	1.3	16.0	1.3	17.0	1.3	20.0	1.3	24.0	1.3	29.0
126	1.4	12.0	1.4	16.0	1.4	18.0	1.4	20.0	1.4	24.0	1.4	29.0
132	1.4	12.0	1.4	16.0	1.4	18.0	1.4	20.0	1.4	25.0	1.4	29.0
138	1.5	12.0	1.5	16.0	1.5	18.0	1.5	20.0	1.5	25.0	1.5	29.0
144	1.5	12.0	1.5	16.0	1.5	18.0	1.5	20.0	1.5	25.0	1.5	29.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2009 24

STANDARD DRAWING NO. E 715-PHCL-21

RICHARD L. VANCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/09
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-22 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)

DELETED, COMBINED WITH SHEET 21

REINFORCED CONCRETE CIRCULAR PIPE
HEIGHT OF COVER LIMITS (ft.)

DIAMETER (In.)	Strength Class/D-load Rating											
	Class V: D 0.01 = 2250		Class V: D 0.01 = 2500		Class V: D 0.01 = 2750		Class V: D 0.01 = 3000		Class Special: D 0.01 = 3250	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
15	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
18	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
21	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
24	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
27	1.0	92.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
30	1.0	100.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
33	1.0	89.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
36	1.0	79.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
42	1.0	68.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
48	1.0	61.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
54	1.0	57.0	1.0	100.0	1.0	100.5	1.0	100.5	1.0	100.5
60	1.0	30.0	1.0	100.0	1.0	45.0	1.0	57.0	1.0	75.0
66	1.0	31.0	1.0	100.0	1.0	46.0	1.0	57.0	1.0	74.0
72	1.0	32.0	1.0	37.0	1.0	47.0	1.0	57.0	1.0	73.0
78	1.0	32.0	1.0	39.0	1.0	47.0	1.0	57.0	1.0	72.0
84	1.0	33.0	1.0	39.0	1.0	47.0	1.0	57.0	1.0	70.0
90	1.0	33.0	1.0	40.0	1.0	47.0	1.0	57.0	1.0	69.0
96	1.0	33.0	1.0	40.0	1.0	47.0	1.0	57.0	1.0	68.0
102	1.1	34.0	1.1	40.0	1.1	47.0	1.1	57.0	1.1	67.0
108	1.2	34.0	1.2	40.0	1.2	47.0	1.2	55.0	1.2	66.0
114	1.2	34.0	1.2	40.0	1.2	47.0	1.2	55.0	1.2	65.0
120	1.3	34.0	1.3	40.0	1.3	47.0	1.3	55.0	1.3	64.0
126	1.4	34.0	1.4	40.0	1.4	47.0	1.4	54.0	1.4	63.0
132	1.4	34.0	1.4	40.0	1.4	46.0	1.4	54.0	1.4	63.0
138	1.5	34.0	1.5	40.0	1.5	46.0	1.5	54.0	1.5	62.0
144	1.5	34.0	1.5	40.0	1.5	46.0	1.5	53.0	1.5	61.0

NOTE:
1. The tabulated cover depths shall be measured from the bottom of the bituminous or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION
PIPE HEIGHT OF COVER LIMITS
SEPTEMBER 2009
STANDARD DRAWING NO. E 715- PHCL-22

REGISTERED - R. VANCLEAVE - No. 9750 - STATE OF INDIANA - PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/09
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-23 PIPE HEIGHT OF COVER LIMITS (WITH MARKUPS)

REINFORCED CONCRETE HORIZONTAL ELLIPICAL PIPE
HEIGHT OF COVER LIMITS (ft.)

SPAN (in.)	RISE (in.)	AREA (sft)	Strength Class/D-load Rating											
			Class HE-A: D0.01 = 600		Class HE-I: D0.01 = 800		Class HE-II: D 0.01 = 1000		Class HE-III: D 0.01 = 1350		Class HE-IV: D 0.01 = 2000	
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
23	14	1.8	1.3	4.0	1.0	8.0	1.0	11.0	1.0	20.0	1.0	100.0
30	19	3.3	1.1	5.0	1.0	7.0	1.0	10.0	1.0	16.0	1.0	47.0
34	22	4.1	1.0	5.0	1.0	8.0	1.0	11.0	1.0	17.0	1.0	48.0
38	24	5.1	1.0	5.0	1.0	8.0	1.0	11.0	1.0	18.0	1.0	49.0
42	27	6.3	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	50.0
45	29	7.4	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	45.0
49	32	8.8	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	45.0
53	34	10.2	1.0	6.0	1.0	9.0	1.0	12.0	1.0	20.0	1.0	44.0
60	38	12.9	1.0	5.0	1.0	8.0	1.0	10.0	1.0	15.0	1.0	26.0
68	43	16.6	1.0	6.0	1.0	8.0	1.0	10.0	1.0	15.0	1.0	27.0
76	48	20.5	1.0	6.0	1.0	8.0	1.0	11.0	1.0	16.0	1.0	28.0
83	53	24.8	1.0	6.0	1.0	9.0	1.0	11.0	1.0	16.0	1.0	29.0
91	58	29.5	1.0	6.0	1.0	9.0	1.0	12.0	1.0	17.0	1.0	29.0
98	63	34.6	1.1	6.0	1.1	9.0	1.1	12.0	1.1	17.0	1.1	29.0
106	68	40.1	1.2	6.0	1.2	9.0	1.2	12.0	1.2	17.0	1.2	30.0
113	72	46.1	1.2	7.0	1.2	9.0	1.2	12.0	1.2	18.0	1.2	30.0
121	77	52.4	1.3	7.0	1.3	9.0	1.3	12.0	1.3	18.0	1.3	30.0
128	82	59.2	1.4	7.0	1.4	10.0	1.4	13.0	1.4	18.0	1.4	30.0
136	87	66.4	1.5	7.0	1.5	10.0	1.5	13.0	1.5	18.0	1.5	31.0
143	92	74.0	1.5	7.0	1.5	10.0	1.5	13.0	1.5	18.0	1.5	31.0
151	97	82.0	1.6	7.0	1.6	10.0	1.6	13.0	1.6	19.0	1.6	31.0
166	106	99.2	1.7	7.0	1.8	10.0	1.8	13.0	1.8	19.0	1.8	31.0
180	116	118.6	1.8	7.0	1.9	10.0	1.9	13.0	1.9	19.0	1.9	31.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

25

STANDARD DRAWING NO. E 715-PHCL-~~23~~

DETAILS PLACED IN THE FORMAT 11-15-99

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

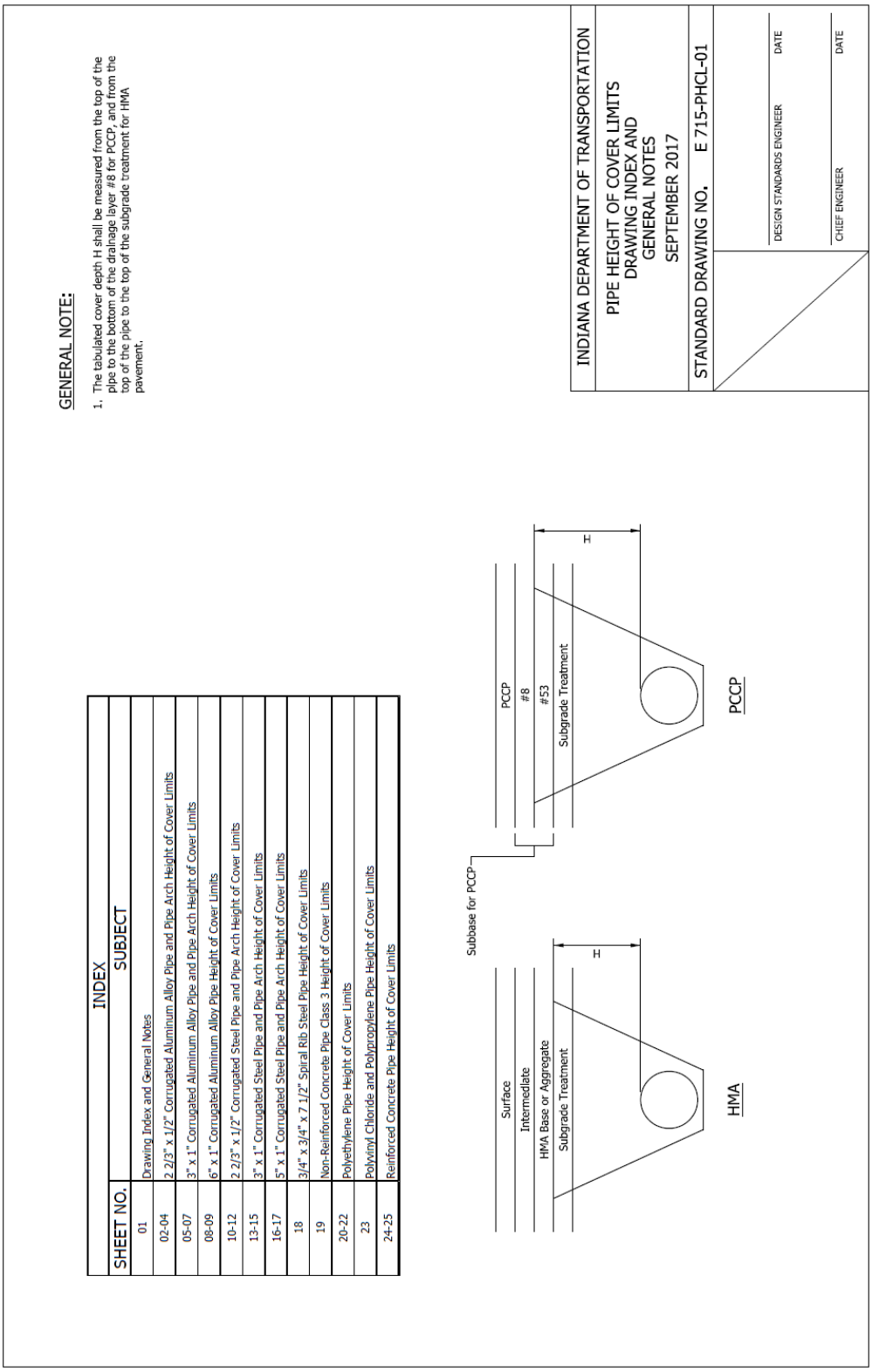
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firoz Zaidi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER ORIGINALLY APPROVED 1-02-98

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-01 PIPE HEIGHT OF COVER LIMITS DRAWING INDEX AND GENERAL NOTES (DRAFT)



INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS
DRAWING INDEX AND
GENERAL NOTES
SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-01

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

GENERAL NOTE:

1. The tabulated cover depth H shall be measured from the top of the pipe to the bottom of the drainage layer #8 for PCCP, and from the top of the pipe to the top of the subgrade treatment for HMA pavement.

INDEX

SHEET NO.	SUBJECT
01	Drawing Index and General Notes
02-04	2 2/3" x 1/2" Corrugated Aluminum Alloy Pipe and Pipe Arch Height of Cover Limits
05-07	3" x 1" Corrugated Aluminum Alloy Pipe and Pipe Arch Height of Cover Limits
08-09	6" x 1" Corrugated Aluminum Alloy Pipe Height of Cover Limits
10-12	2 2/3" x 1/2" Corrugated Steel Pipe and Pipe Arch Height of Cover Limits
13-15	3" x 1" Corrugated Steel Pipe and Pipe Arch Height of Cover Limits
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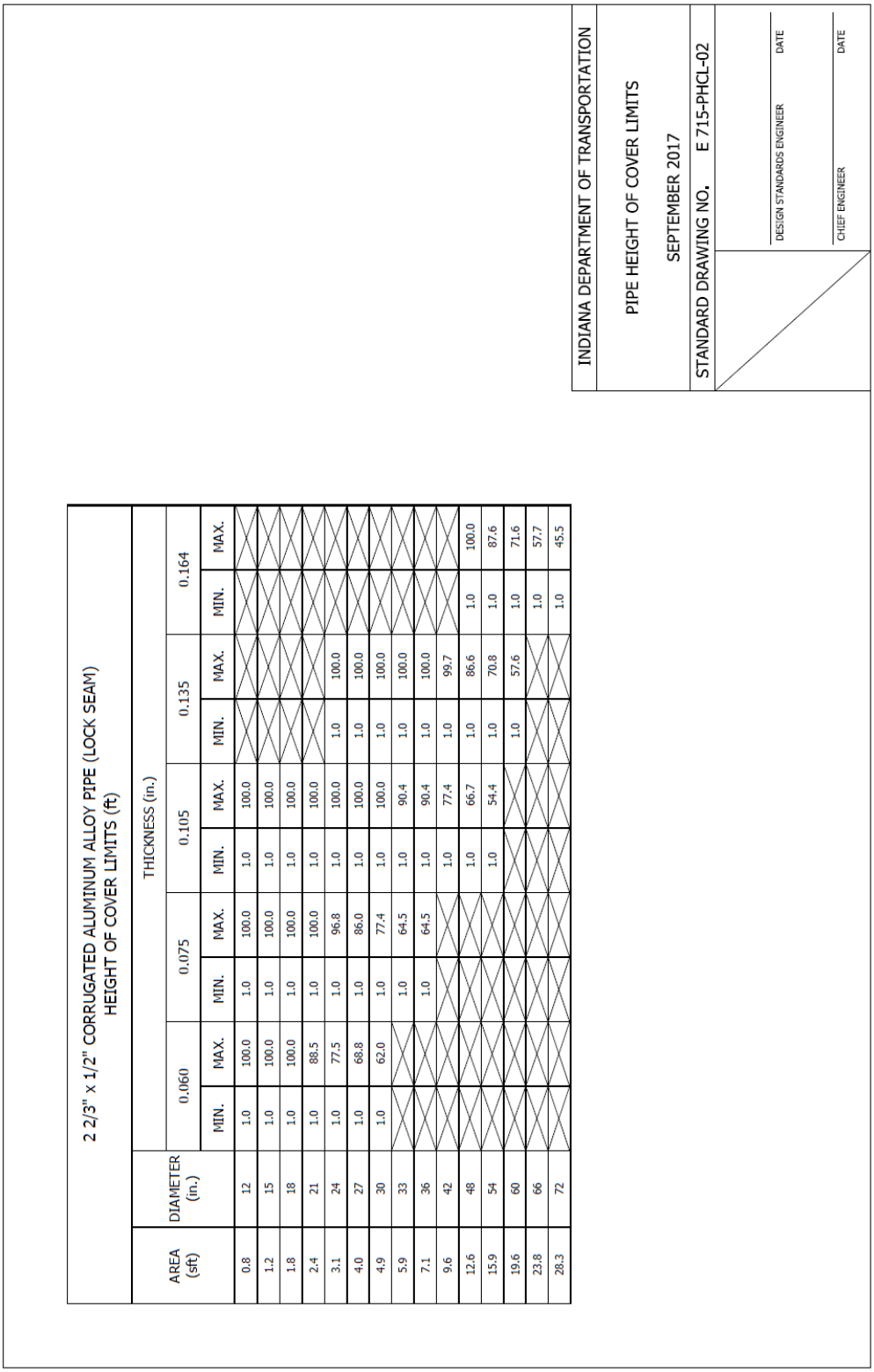
18	3/4" x 3/4" x 7 1/2" Spiral Rib Steel Pipe Height of Cover Limits
19	Non-Reinforced Concrete Pipe Class 3 Height of Cover Limits
20-22	Polyethylene Pipe Height of Cover Limits
23	Polyvinyl Chloride and Polypropylene Pipe Height of Cover Limits
24-25	Reinforced Concrete Pipe Height of Cover Limits

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-02 PIPE HEIGHT OF COVER LIMITS (DRAFT)



2 2/3" x 1/2" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
0.8	12	1.0	100.0	1.0	100.0	1.0	100.0				
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0				
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0				
2.4	21	1.0	88.5	1.0	100.0	1.0	100.0				
3.1	24	1.0	77.5	1.0	96.8	1.0	100.0	1.0	100.0		
4.0	27	1.0	68.8	1.0	86.0	1.0	100.0	1.0	100.0		
4.9	30	1.0	62.0	1.0	77.4	1.0	100.0	1.0	100.0		
5.9	33			1.0	64.5	1.0	90.4	1.0	100.0		
7.1	36			1.0	64.5	1.0	90.4	1.0	100.0		
9.6	42					1.0	77.4	1.0	99.7		
12.6	48					1.0	66.7	1.0	86.6	1.0	100.0
15.9	54					1.0	54.4	1.0	70.8	1.0	87.6
19.6	60							1.0	57.6	1.0	71.6
23.8	66									1.0	57.7
28.3	72									1.0	45.5

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-02

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-03 PIPE HEIGHT OF COVER LIMITS (DRAFT)

2 2/3" x 1/2" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
0.8	12	1.0	50.0	1.0	50.0	1.0	86.6				
1.2	15	1.0	40.0	1.0	40.0	1.0	69.3				
1.8	18	1.0	33.3	1.0	33.3	1.0	57.7				
2.4	21	1.0	28.5	1.0	28.5	1.0	49.5				
3.1	24	1.0	25.0	1.0	25.0	1.0	43.3	1.0	45.0		
4.0	27	1.0	22.2	1.0	22.2	1.0	38.5	1.0	40.0		
4.9	30	1.1	20.0	1.1	20.0	1.0	34.6	1.0	36.0		
5.9	33			1.2	16.6	1.0	28.8	1.0	30.0		
7.1	36			1.2	16.6	1.0	28.8	1.0	30.0		
9.6	42					1.0	50.0	1.0	52.3		
12.6	48					1.0	43.7	1.0	45.8	1.0	47.2
15.9	54					1.0	38.8	1.0	40.7	1.0	41.9
19.6	60							1.0	36.6	1.0	37.7
23.8	66									1.0	34.3
28.3	72									1.0	31.4

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

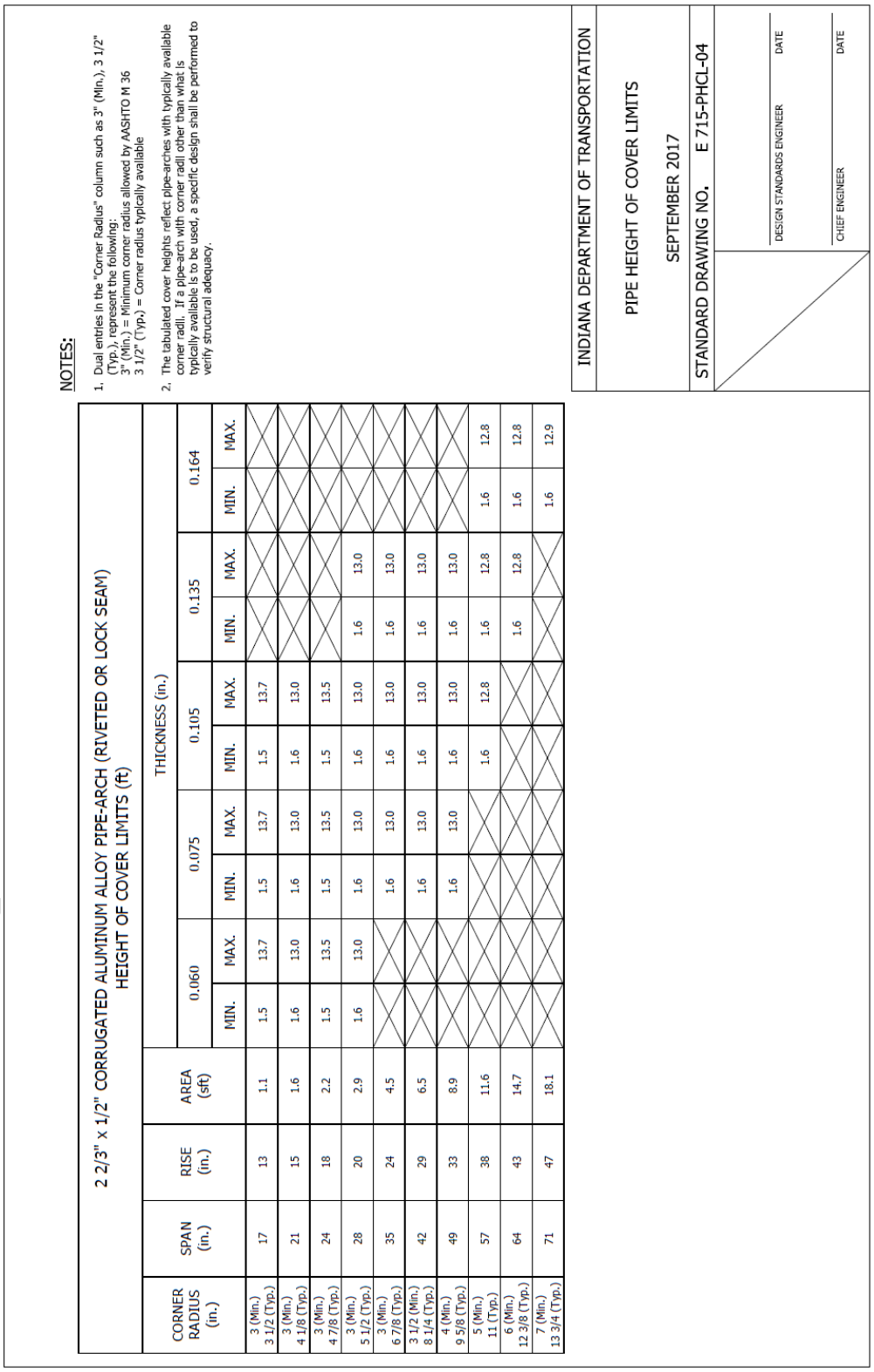
STANDARD DRAWING NO. E 715-PHCL-03

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-04 PIPE HEIGHT OF COVER LIMITS (DRAFT)



NOTES:

1. Dual entries in the "Corner Radius" column such as 3" (Min.), 3 1/2" (Typ.), represent the following:
   3" (Min.) = Minimum corner radius allowed by AASHTO M 36
   3 1/2" (Typ.) = Corner radius typically available
2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

2 2/3" x 1/2" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.060		0.075		0.105		0.135		0.164	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
3 (Min.) 3 1/2 (Typ.)	17	13	1.1	1.5	13.7	1.5	13.7	1.5	13.7				
3 (Min.) 4 1/8 (Typ.)	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0				
3 (Min.) 4 7/8 (Typ.)	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5				
3 (Min.) 5 1/2 (Typ.)	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0		
3 (Min.) 6 7/8 (Typ.)	35	24	4.5			1.6	13.0	1.6	13.0	1.6	13.0		
3 1/2 (Min.) 8 1/4 (Typ.)	42	29	6.5			1.6	13.0	1.6	13.0	1.6	13.0		
4 (Min.) 9 5/8 (Typ.)	49	33	8.9			1.6	13.0	1.6	13.0	1.6	13.0		
5 (Min.) 11 (Typ.)	57	38	11.6					1.6	12.8	1.6	12.8	1.6	12.8
6 (Min.) 12 3/8 (Typ.)	64	43	14.7							1.6	12.8	1.6	12.8
7 (Min.) 13 3/4 (Typ.)	71	47	18.1									1.6	12.9

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

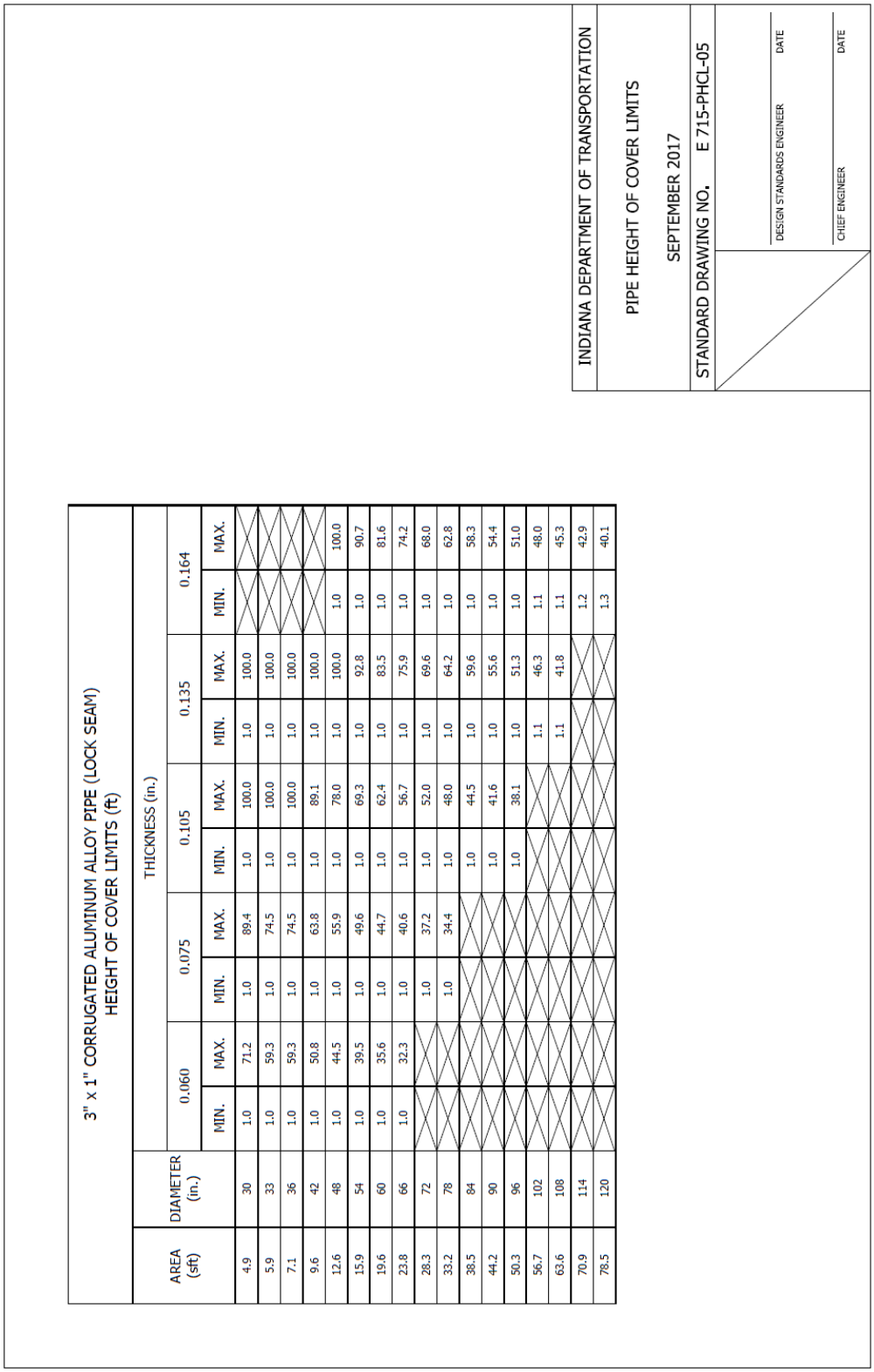
STANDARD DRAWING NO. E 715-PHCL-04

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-05 PIPE HEIGHT OF COVER LIMITS (DRAFT)



3" x 1" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
4.9	30	1.0	71.2	1.0	89.4	1.0	100.0	1.0	100.0		
5.9	33	1.0	59.3	1.0	74.5	1.0	100.0	1.0	100.0		
7.1	36	1.0	59.3	1.0	74.5	1.0	100.0	1.0	100.0		
9.6	42	1.0	50.8	1.0	63.8	1.0	89.1	1.0	100.0		
12.6	48	1.0	44.5	1.0	55.9	1.0	78.0	1.0	100.0	1.0	100.0
15.9	54	1.0	39.5	1.0	49.6	1.0	69.3	1.0	92.8	1.0	90.7
19.6	60	1.0	35.6	1.0	44.7	1.0	62.4	1.0	83.5	1.0	81.6
23.8	66	1.0	32.3	1.0	40.6	1.0	56.7	1.0	75.9	1.0	74.2
28.3	72			1.0	37.2	1.0	52.0	1.0	69.6	1.0	68.0
33.2	78			1.0	34.4	1.0	48.0	1.0	64.2	1.0	62.8
38.5	84					1.0	44.5	1.0	59.6	1.0	58.3
44.2	90					1.0	41.6	1.0	55.6	1.0	54.4
50.3	96					1.0	38.1	1.0	51.3	1.0	51.0
56.7	102							1.1	46.3	1.1	48.0
63.6	108							1.1	41.8	1.1	45.3
70.9	114									1.2	42.9
78.5	120									1.3	40.1

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

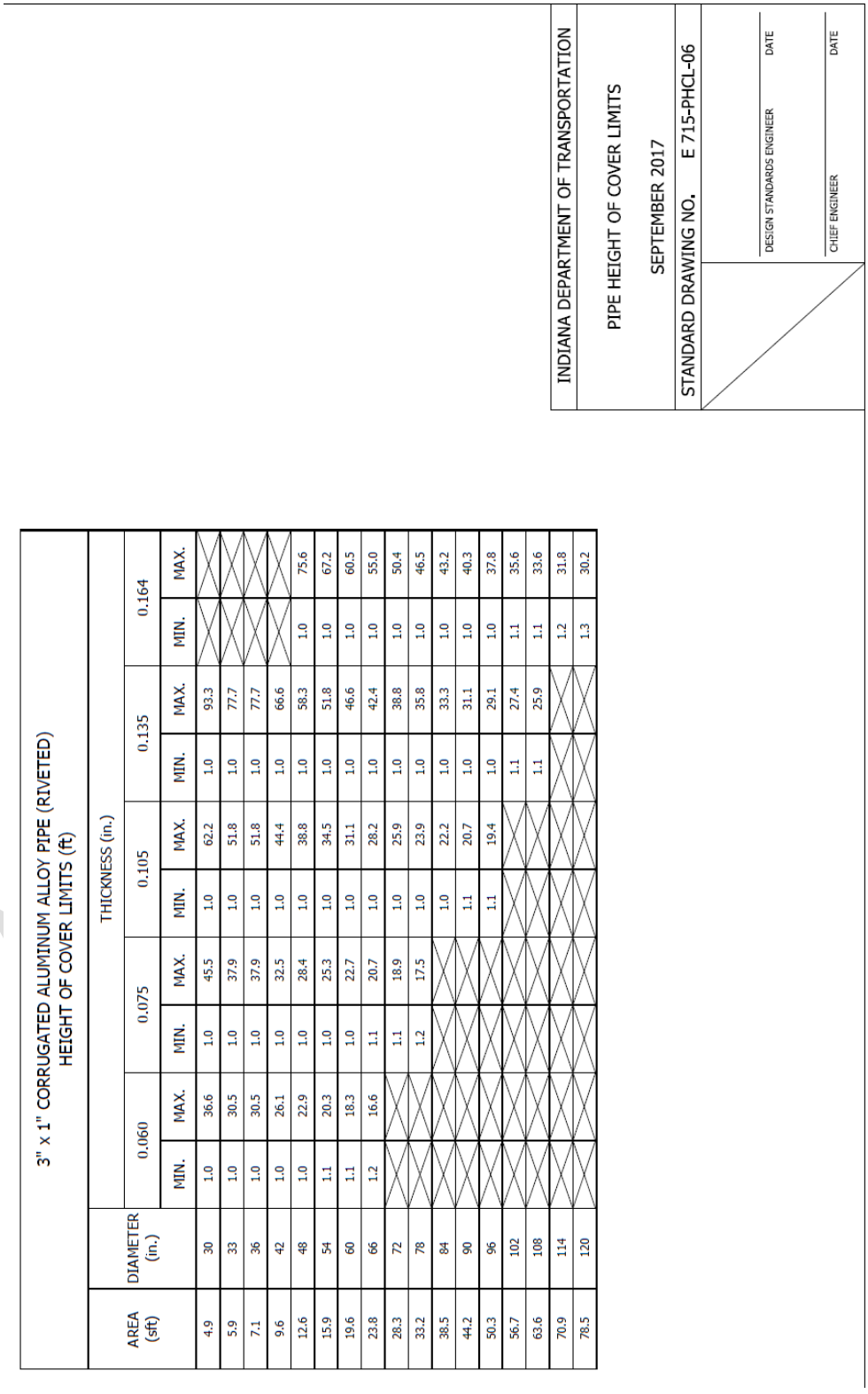
STANDARD DRAWING NO. E 715-PHCL-05

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-06 PIPE HEIGHT OF COVER LIMITS (DRAFT)



3" x 1" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
4.9	30	1.0	36.6	1.0	45.5	1.0	62.2	1.0	93.3		
5.9	33	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7		
7.1	36	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7		
9.6	42	1.0	26.1	1.0	32.5	1.0	44.4	1.0	66.6		
12.6	48	1.0	22.9	1.0	28.4	1.0	38.8	1.0	58.3	1.0	75.6
15.9	54	1.1	20.3	1.0	25.3	1.0	34.5	1.0	51.8	1.0	67.2
19.6	60	1.1	18.3	1.0	22.7	1.0	31.1	1.0	46.6	1.0	60.5
23.8	66	1.2	16.6	1.1	20.7	1.0	28.2	1.0	42.4	1.0	55.0
28.3	72			1.1	18.9	1.0	25.9	1.0	38.8	1.0	50.4
33.2	78			1.2	17.5	1.0	23.9	1.0	35.8	1.0	46.5
38.5	84					1.0	22.2	1.0	33.3	1.0	43.2
44.2	90					1.1	20.7	1.0	31.1	1.0	40.3
50.3	96					1.1	19.4	1.0	29.1	1.0	37.8
56.7	102							1.1	27.4	1.1	35.6
63.6	108							1.1	25.9	1.1	33.6
70.9	114									1.2	31.8
78.5	120									1.3	30.2

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

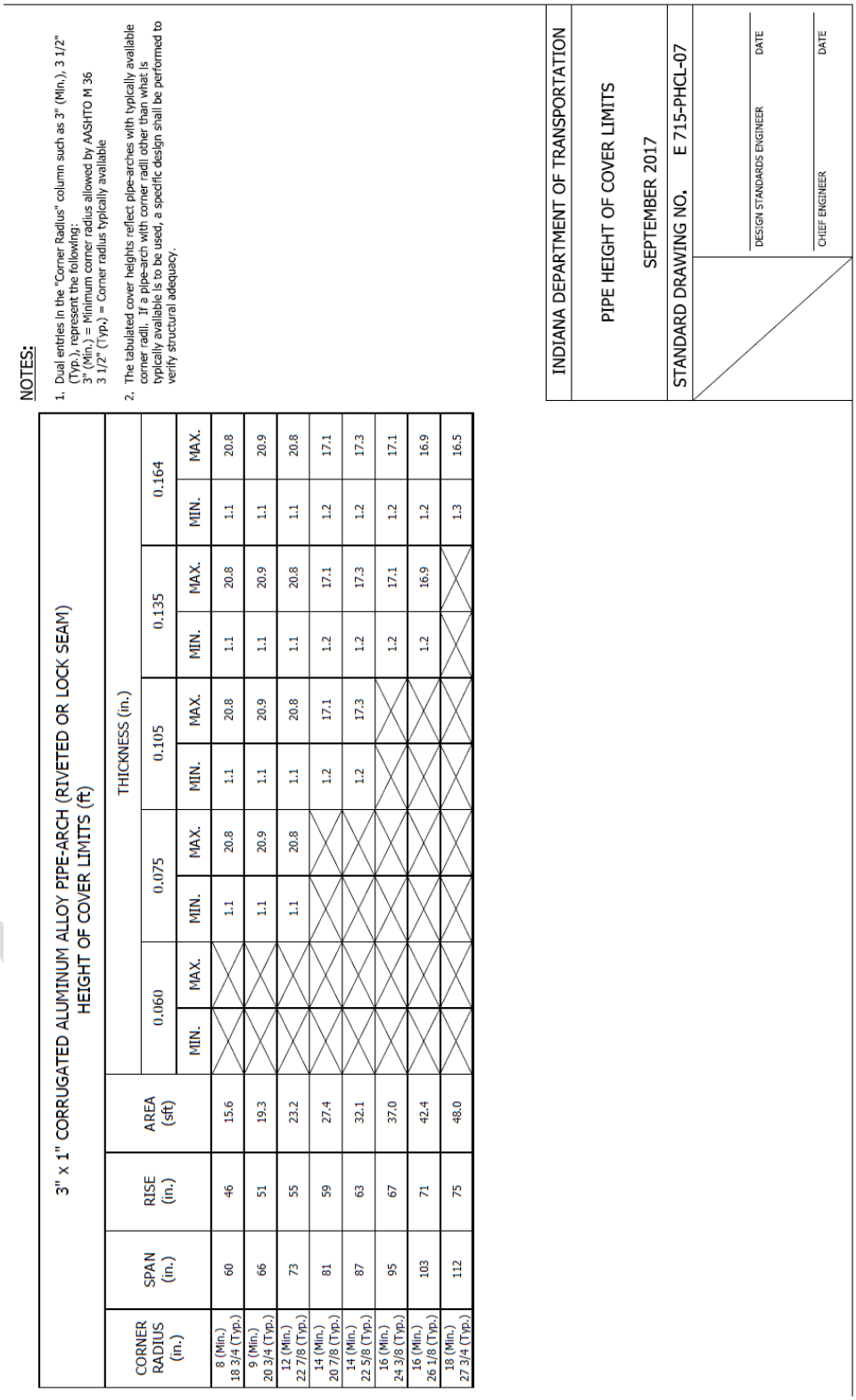
STANDARD DRAWING NO. E 715-PHCL-06

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-07 PIPE HEIGHT OF COVER LIMITS (DRAFT)



3" x 1" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.060		0.075		0.105		0.135		0.164	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8 (Min.) 18 3/4 (Typ.)	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9 (Min.) 20 3/4 (Typ.)	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12 (Min.) 22 7/8 (Typ.)	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14 (Min.) 20 7/8 (Typ.)	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1
14 (Min.) 22 5/8 (Typ.)	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3
16 (Min.) 24 3/8 (Typ.)	95	67	37.0							1.2	17.1	1.2	17.1
16 (Min.) 26 1/8 (Typ.)	103	71	42.4							1.2	16.9	1.2	16.9
18 (Min.) 27 3/4 (Typ.)	112	75	48.0									1.3	16.5

NOTES:

1. Dual entries in the "Corner Radius" column such as 3" (Min.), 3 1/2" (Typ.), represent the following:
   3" (Min.) = Minimum corner radius allowed by AASHTO M 36
   3 1/2" (Typ.) = Corner radius typically available
2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

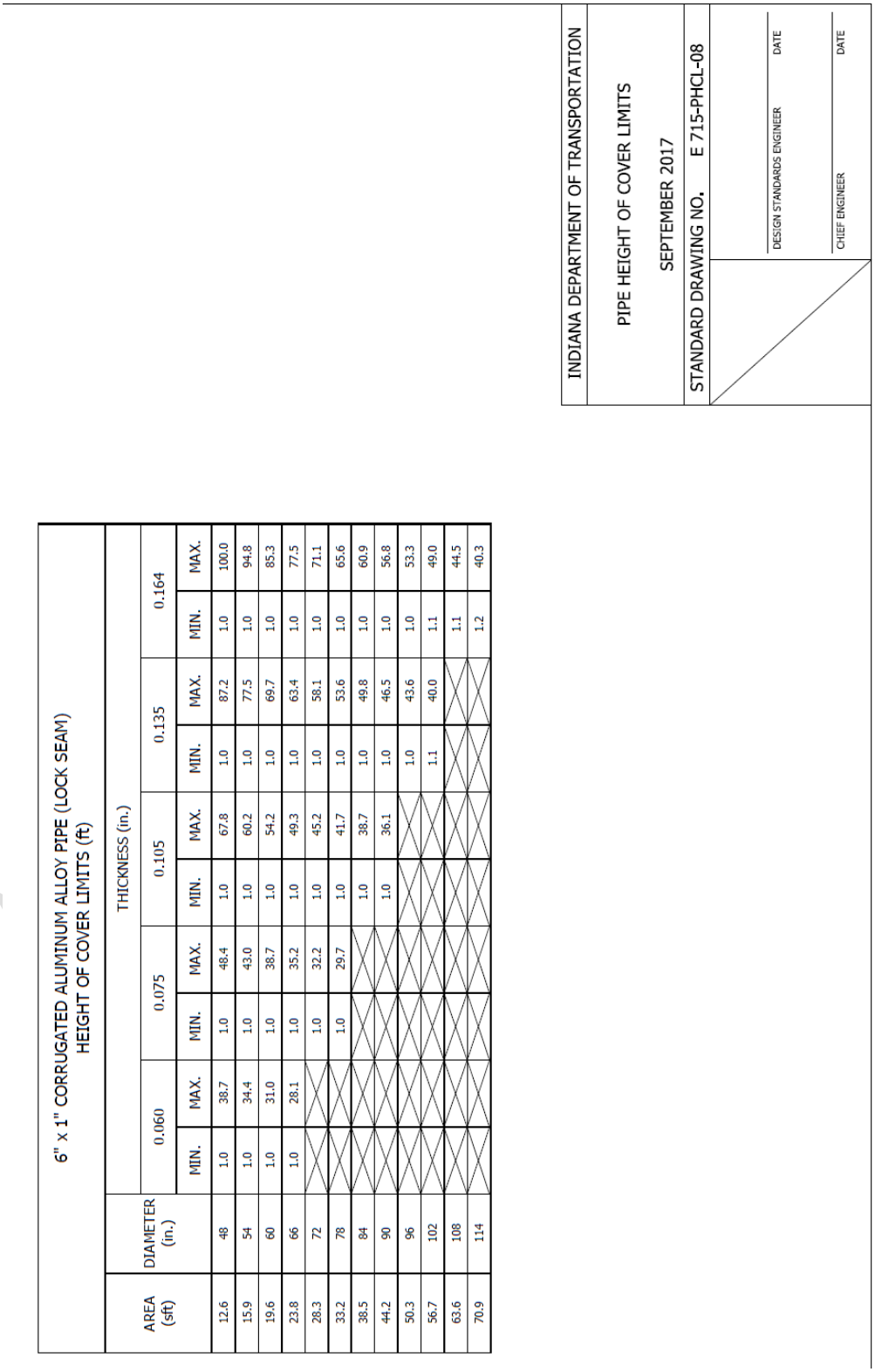
STANDARD DRAWING NO. E 715-PHCL-07

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-08 PIPE HEIGHT OF COVER LIMITS (DRAFT)



INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-08

DESIGN STANDARDS ENGINEER DATE

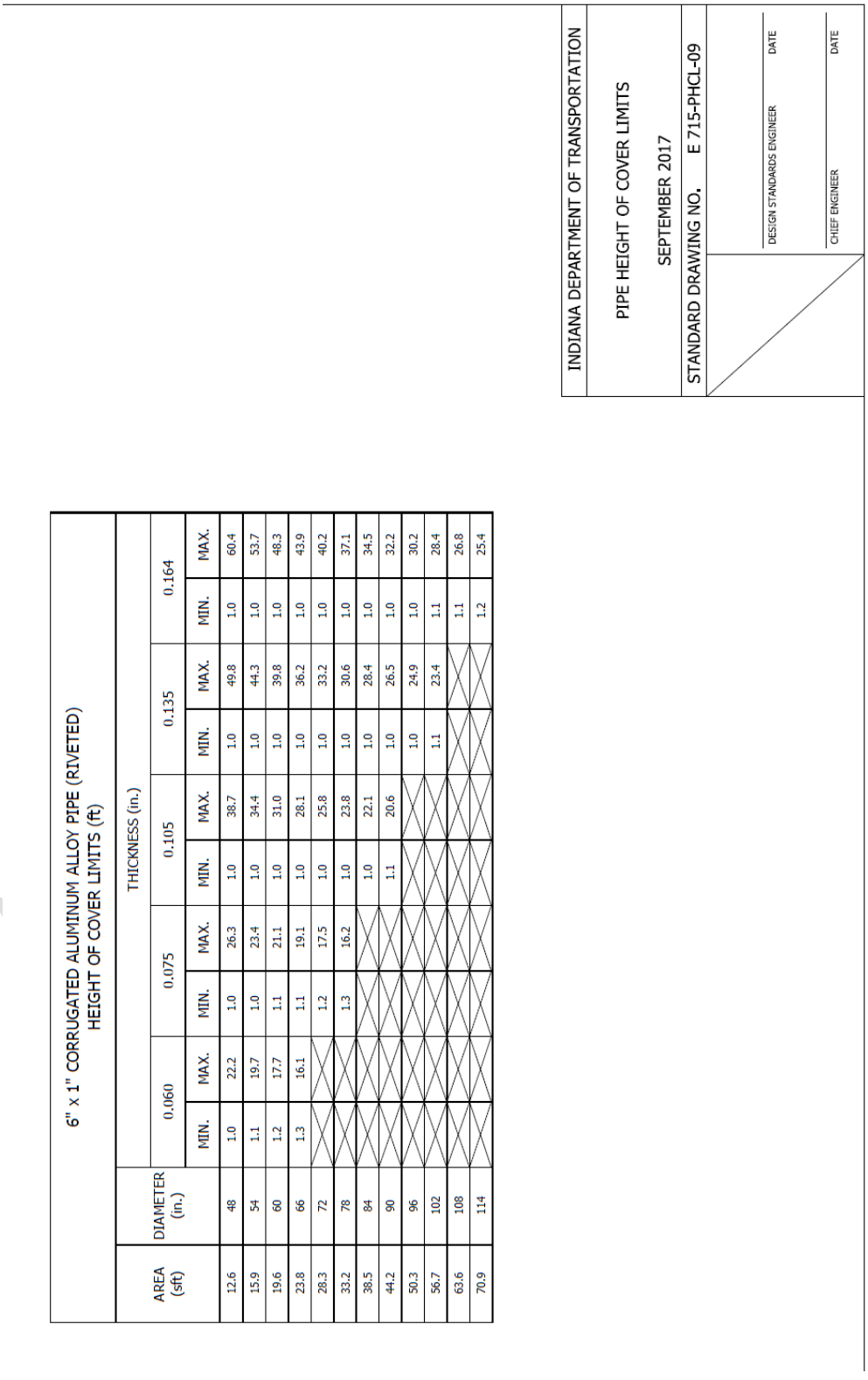
CHIEF ENGINEER DATE

6" x 1" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12.6	48	1.0	38.7	1.0	48.4	1.0	67.8	1.0	87.2	1.0	100.0
15.9	54	1.0	34.4	1.0	43.0	1.0	60.2	1.0	77.5	1.0	94.8
19.6	60	1.0	31.0	1.0	38.7	1.0	54.2	1.0	69.7	1.0	85.3
23.8	66	1.0	28.1	1.0	35.2	1.0	49.3	1.0	63.4	1.0	77.5
28.3	72			1.0	32.2	1.0	45.2	1.0	58.1	1.0	71.1
33.2	78			1.0	29.7	1.0	41.7	1.0	53.6	1.0	65.6
38.5	84					1.0	38.7	1.0	49.8	1.0	60.9
44.2	90					1.0	36.1	1.0	46.5	1.0	56.8
50.3	96							1.0	43.6	1.0	53.3
56.7	102							1.1	40.0	1.1	49.0
63.6	108									1.1	44.5
70.9	114									1.2	40.3

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-09 PIPE HEIGHT OF COVER LIMITS (DRAFT)



6" x 1" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.060 MIN.	0.060 MAX.	0.075 MIN.	0.075 MAX.	0.105 MIN.	0.105 MAX.	0.135 MIN.	0.135 MAX.	0.164 MIN.	0.164 MAX.
12.6	48	1.0	22.2	1.0	26.3	1.0	38.7	1.0	49.8	1.0	60.4
15.9	54	1.1	19.7	1.0	23.4	1.0	34.4	1.0	44.3	1.0	53.7
19.6	60	1.2	17.7	1.1	21.1	1.0	31.0	1.0	39.8	1.0	48.3
23.8	66	1.3	16.1	1.1	19.1	1.0	28.1	1.0	36.2	1.0	43.9
28.3	72			1.2	17.5	1.0	25.8	1.0	33.2	1.0	40.2
33.2	78			1.3	16.2	1.0	23.8	1.0	30.6	1.0	37.1
38.5	84					1.0	22.1	1.0	28.4	1.0	34.5
44.2	90					1.1	20.6	1.0	26.5	1.0	32.2
50.3	96							1.0	24.9	1.0	30.2
56.7	102							1.1	23.4	1.1	28.4
63.6	108									1.1	26.8
70.9	114									1.2	25.4

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-09

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-10 PIPE HEIGHT OF COVER LIMITS (DRAFT)

2 2/3" x 1/2" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
0.8	12	1.0	100.0	1.0	100.0						
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0				
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0				
2.4	21	1.0	100.0	1.0	100.0	1.0	100.0				
3.1	24	1.0	100.0	1.0	100.0	1.0	100.0				
4.0	27	1.0	94.7	1.0	100.0	1.0	100.0				
4.9	30	1.0	85.2	1.0	100.0	1.0	100.0	1.0	100.0		
5.9	33	1.0	71.0	1.0	88.7	1.0	100.0	1.0	100.0		
7.1	36	1.0	71.0	1.0	88.7	1.0	100.0	1.0	100.0	1.0	100.0
9.6	42	1.0	60.8	1.0	76.0	1.0	100.0	1.0	100.0	1.0	100.0
12.6	48	1.0	53.2	1.0	66.5	1.0	93.2	1.0	100.0	1.0	100.0
15.9	54			1.0	59.1	1.0	82.8	1.0	100.0	1.0	100.0
19.6	60					1.0	87.8	1.0	95.9	1.0	100.0
23.8	66							1.0	87.2	1.0	100.0
28.3	72							1.0	79.9	1.0	97.0
33.2	78									1.0	86.7
38.5	84									1.0	75.1

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-10

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-11 PIPE HEIGHT OF COVER LIMITS (DRAFT)

2 2/3" x 1/2" CORRUGATED STEEL PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
0.8	12	1.0	92.7	1.0	100.0						
1.2	15	1.0	74.2	1.0	80.8	1.0	100.0				
1.8	18	1.0	61.8	1.0	67.4	1.0	86.6				
2.4	21	1.0	53.0	1.0	57.7	1.0	74.2				
3.1	24	1.0	46.3	1.0	50.5	1.0	65.0				
4.0	27	1.0	41.2	1.0	44.9	1.0	57.7				
4.9	30	1.0	37.1	1.0	40.4	1.0	52.0	1.0	54.4		
5.9	33	1.0	30.9	1.0	33.7	1.0	43.3	1.0	45.3		
7.1	36	1.0	30.9	1.0	33.7	1.0	43.3	1.0	45.3	1.0	47.4
9.6	42	1.0	34.2	1.0	47.3	1.0	74.2	1.0	77.7	1.0	81.4
12.6	48	1.0	30.0	1.0	41.3	1.0	65.0	1.0	68.0	1.0	71.2
15.9	54			1.0	36.7	1.0	57.7	1.0	60.4	1.0	63.3
19.6	60					1.0	52.0	1.0	54.4	1.0	57.0
23.8	66							1.0	49.4	1.0	51.8
28.3	72							1.0	45.3	1.0	47.5
33.2	78									1.0	43.8
38.5	84									1.0	40.7

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

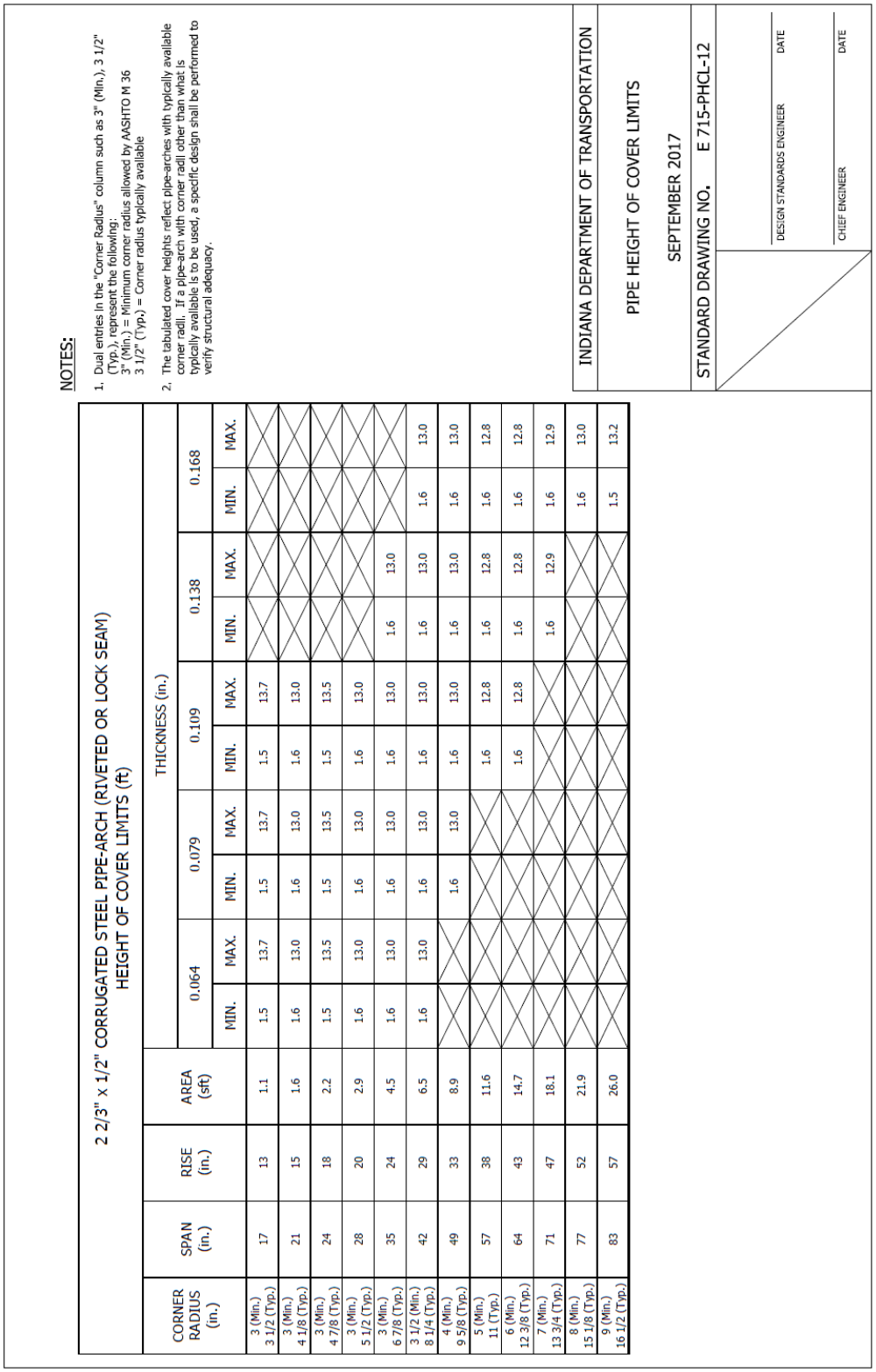
STANDARD DRAWING NO. E 715-PHCL-11

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-12 PIPE HEIGHT OF COVER LIMITS (DRAFT)



2 2/3" x 1/2" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.064		0.079		0.109		0.138		0.168	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
3 (Min.) 3 1/2 (Typ.)	17	13	1.1	1.5	13.7	1.5	13.7	1.5	13.7				
3 (Min.) 4 1/8 (Typ.)	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0				
3 (Min.) 4 7/8 (Typ.)	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5				
3 (Min.) 5 1/2 (Typ.)	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0				
3 (Min.) 6 7/8 (Typ.)	35	24	4.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0		
3 1/2 (Min.) 8 1/4 (Typ.)	42	29	6.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
4 (Min.) 9 5/8 (Typ.)	49	33	8.9			1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
5 (Min.) 11 (Typ.)	57	38	11.6					1.6	12.8	1.6	12.8	1.6	12.8
6 (Min.) 12 3/8 (Typ.)	64	43	14.7					1.6	12.8	1.6	12.8	1.6	12.8
7 (Min.) 13 3/4 (Typ.)	71	47	18.1							1.6	12.9	1.6	12.9
8 (Min.) 15 1/8 (Typ.)	77	52	21.9									1.6	13.0
9 (Min.) 16 1/2 (Typ.)	83	57	26.0									1.5	13.2

NOTES:

1. Dual entries in the "Corner Radius" column such as 3" (Min.), 3 1/2" (Typ.), represent the following:
   3" (Min.) = Minimum corner radius allowed by AASHTO M 36
   3 1/2" (Typ.) = Corner radius typically available
2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

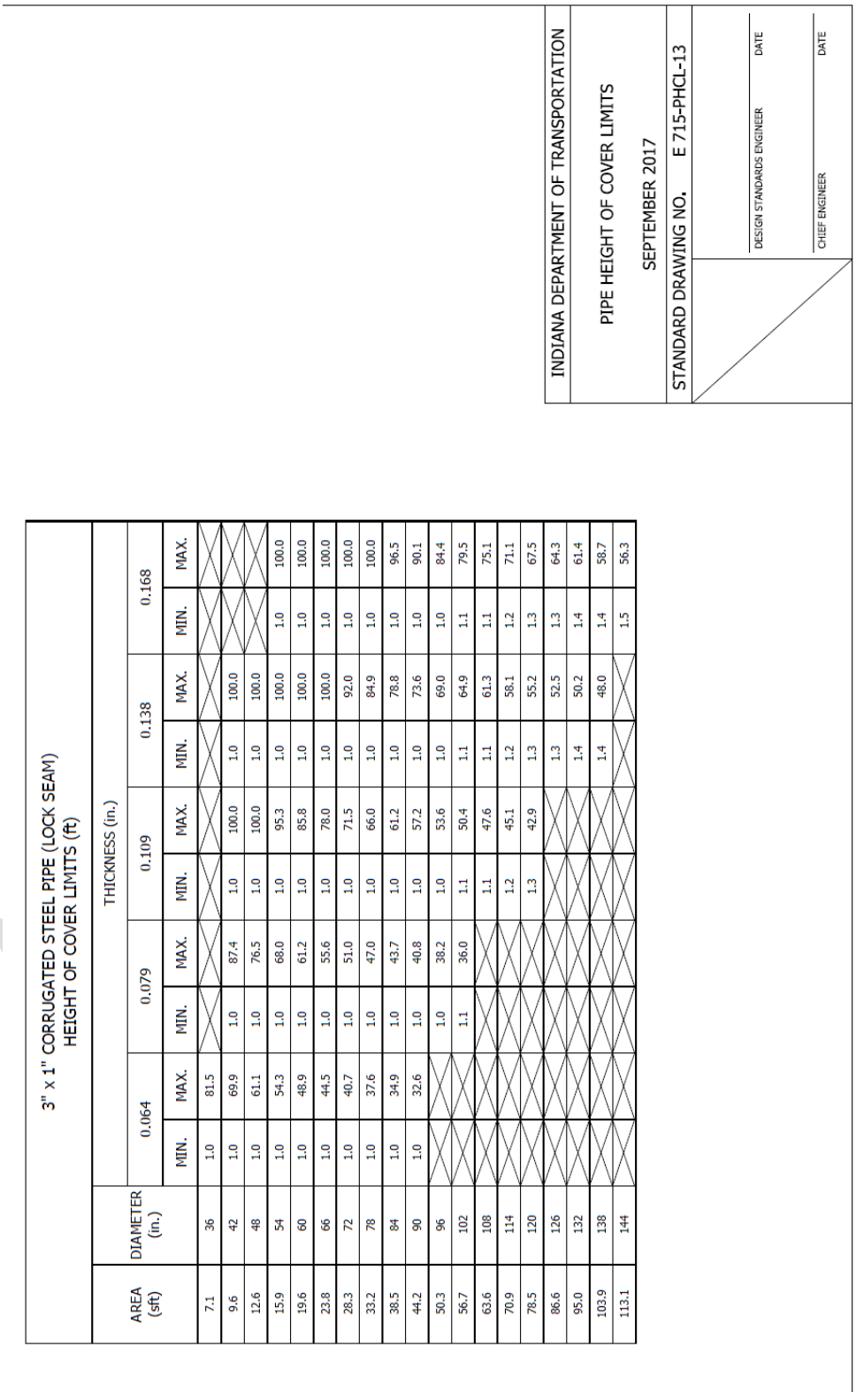
STANDARD DRAWING NO. E 715-PHCL-12

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-13 PIPE HEIGHT OF COVER LIMITS (DRAFT)



INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-13

DESIGN STANDARDS ENGINEER DATE

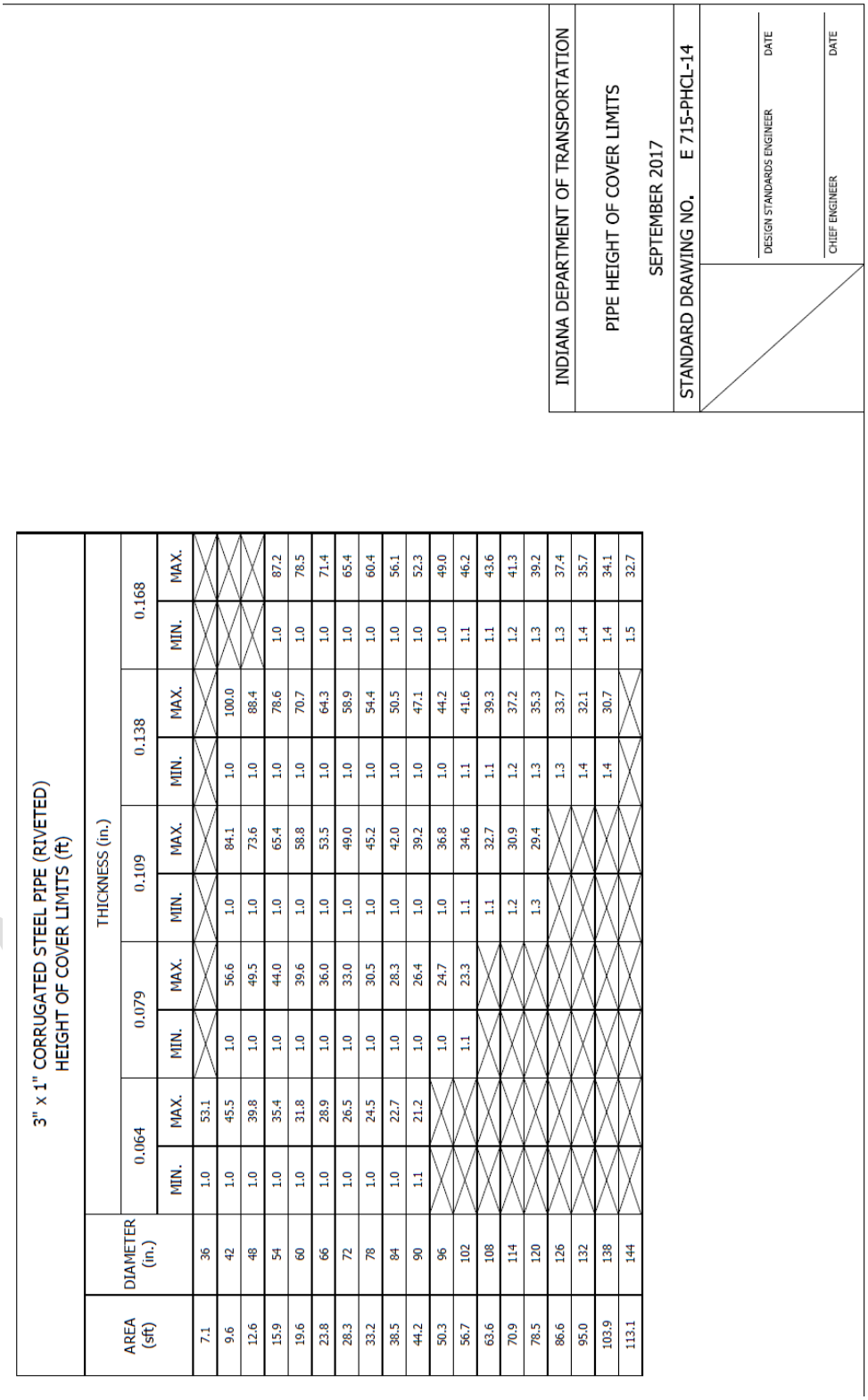
CHIEF ENGINEER DATE

3" x 1" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)											
		0.064		0.079		0.109		0.138		0.168			
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
7.1	36	1.0	81.5										
9.6	42	1.0	69.9	1.0	87.4	1.0	100.0	1.0	100.0				
12.6	48	1.0	61.1	1.0	76.5	1.0	100.0	1.0	100.0				
15.9	54	1.0	54.3	1.0	68.0	1.0	95.3	1.0	100.0	1.0	100.0		
19.6	60	1.0	48.9	1.0	61.2	1.0	85.8	1.0	100.0	1.0	100.0		
23.8	66	1.0	44.5	1.0	55.6	1.0	78.0	1.0	100.0	1.0	100.0		
28.3	72	1.0	40.7	1.0	51.0	1.0	71.5	1.0	92.0	1.0	100.0		
33.2	78	1.0	37.6	1.0	47.0	1.0	66.0	1.0	84.9	1.0	100.0		
38.5	84	1.0	34.9	1.0	43.7	1.0	61.2	1.0	78.8	1.0	96.5		
44.2	90	1.0	32.6	1.0	40.8	1.0	57.2	1.0	73.6	1.0	90.1		
50.3	96			1.0	38.2	1.0	53.6	1.0	69.0	1.0	84.4		
56.7	102			1.1	36.0	1.1	50.4	1.1	64.9	1.1	79.5		
63.6	108					1.1	47.6	1.1	61.3	1.1	75.1		
70.9	114					1.2	45.1	1.2	58.1	1.2	71.1		
78.5	120					1.3	42.9	1.3	55.2	1.3	67.5		
86.6	126							1.3	52.5	1.3	64.3		
95.0	132							1.4	50.2	1.4	61.4		
103.9	138							1.4	48.0	1.4	58.7		
113.1	144									1.5	56.3		

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-14 PIPE HEIGHT OF COVER LIMITS (DRAFT)



3" x 1" CORRUGATED STEEL PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)											
		0.064		0.079		0.109		0.138		0.168			
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
7.1	36	1.0	53.1										
9.6	42	1.0	45.5	1.0	56.6	1.0	84.1	1.0	100.0				
12.6	48	1.0	39.8	1.0	49.5	1.0	73.6	1.0	88.4				
15.9	54	1.0	35.4	1.0	44.0	1.0	65.4	1.0	78.6	1.0	87.2		
19.6	60	1.0	31.8	1.0	39.6	1.0	58.8	1.0	70.7	1.0	78.5		
23.8	66	1.0	28.9	1.0	36.0	1.0	53.5	1.0	64.3	1.0	71.4		
28.3	72	1.0	26.5	1.0	33.0	1.0	49.0	1.0	58.9	1.0	65.4		
33.2	78	1.0	24.5	1.0	30.5	1.0	45.2	1.0	54.4	1.0	60.4		
38.5	84	1.0	22.7	1.0	28.3	1.0	42.0	1.0	50.5	1.0	56.1		
44.2	90	1.1	21.2	1.0	26.4	1.0	39.2	1.0	47.1	1.0	52.3		
50.3	96			1.0	24.7	1.0	36.8	1.0	44.2	1.0	49.0		
56.7	102			1.1	23.3	1.1	34.6	1.1	41.6	1.1	46.2		
63.6	108					1.1	32.7	1.1	39.3	1.1	43.6		
70.9	114					1.2	30.9	1.2	37.2	1.2	41.3		
78.5	120					1.3	29.4	1.3	35.3	1.3	39.2		
86.6	126							1.3	33.7	1.3	37.4		
95.0	132							1.4	32.1	1.4	35.7		
103.9	138							1.4	30.7	1.4	34.1		
113.1	144									1.5	32.7		

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

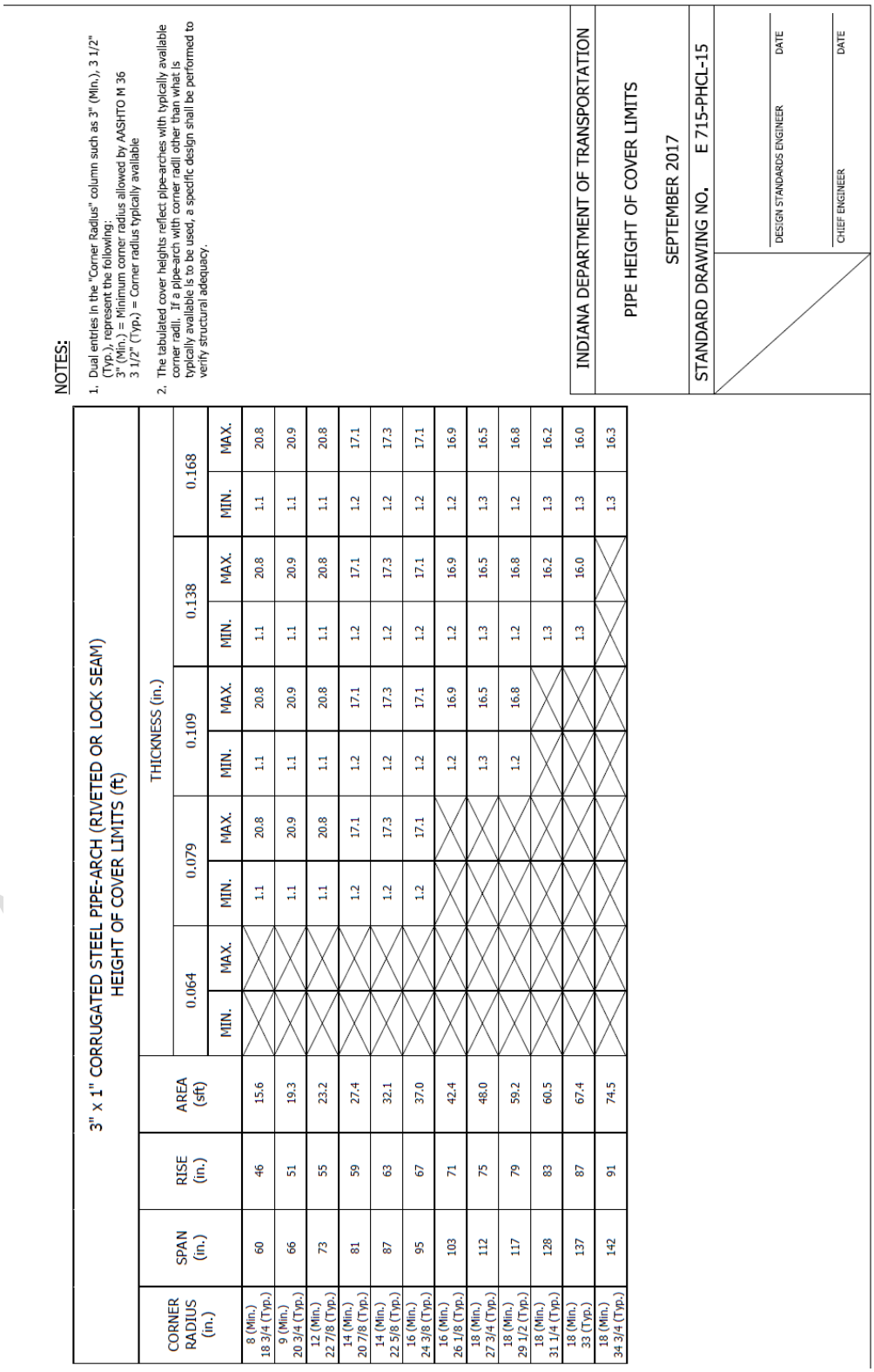
STANDARD DRAWING NO. E 715-PHCL-14

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-15 PIPE HEIGHT OF COVER LIMITS (DRAFT)



3" x 1" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.064		0.079		0.109		0.138		0.168	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8 (Min.) 18 3/4 (Typ.)	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9 (Min.) 20 3/4 (Typ.)	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12 (Min.) 22 7/8 (Typ.)	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14 (Min.) 20 7/8 (Typ.)	81	59	27.4			1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
14 (Min.) 22 5/8 (Typ.)	87	63	32.1			1.2	17.3	1.2	17.3	1.2	17.3	1.2	17.3
16 (Min.) 24 3/8 (Typ.)	95	67	37.0			1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
16 (Min.) 26 1/8 (Typ.)	103	71	42.4					1.2	16.9	1.2	16.9	1.2	16.9
18 (Min.) 27 3/4 (Typ.)	112	75	48.0					1.3	16.5	1.3	16.5	1.3	16.5
18 (Min.) 29 1/2 (Typ.)	117	79	59.2					1.2	16.8	1.2	16.8	1.2	16.8
18 (Min.) 31 1/4 (Typ.)	128	83	60.5							1.3	16.2	1.3	16.2
18 (Min.) 33 (Typ.)	137	87	67.4							1.3	16.0	1.3	16.0
18 (Min.) 34 3/4 (Typ.)	142	91	74.5									1.3	16.3

NOTES:

1. Dual entries in the "Corner Radius" column such as 3" (Min.), 3 1/2" (Typ.), represent the following:
   3" (Min.) = Minimum corner radius allowed by AASHTO M 36
   3 1/2" (Typ.) = Corner radius typically available
2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

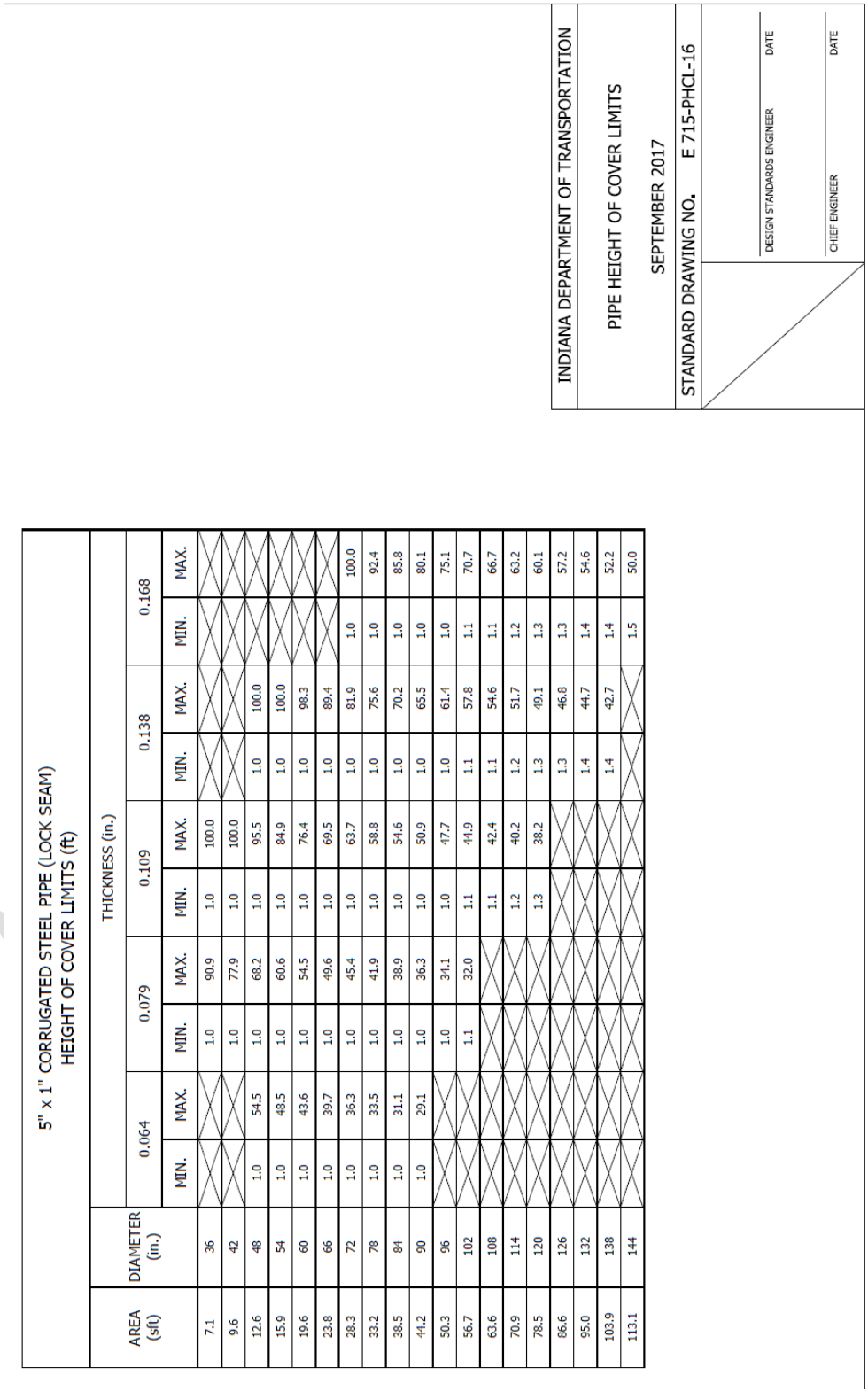
STANDARD DRAWING NO. E 715-PHCL-15

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-16 PIPE HEIGHT OF COVER LIMITS (DRAFT)



5" x 1" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.) 0.064 MIN.	0.064 MAX.	0.079 MIN.	0.079 MAX.	0.109 MIN.	0.109 MAX.	0.138 MIN.	0.138 MAX.	0.168 MIN.	0.168 MAX.
7.1	36			1.0	90.9	1.0	100.0				
9.6	42			1.0	77.9	1.0	100.0				
12.6	48	1.0	54.5	1.0	68.2	1.0	95.5	1.0	100.0		
15.9	54	1.0	48.5	1.0	60.6	1.0	84.9	1.0	100.0		
19.6	60	1.0	43.6	1.0	54.5	1.0	76.4	1.0	98.3		
23.8	66	1.0	39.7	1.0	49.6	1.0	69.5	1.0	89.4		
28.3	72	1.0	36.3	1.0	45.4	1.0	63.7	1.0	81.9	1.0	100.0
33.2	78	1.0	33.5	1.0	41.9	1.0	58.8	1.0	75.6	1.0	92.4
38.5	84	1.0	31.1	1.0	38.9	1.0	54.6	1.0	70.2	1.0	85.8
44.2	90	1.0	29.1	1.0	36.3	1.0	50.9	1.0	65.5	1.0	80.1
50.3	96			1.0	34.1	1.0	47.7	1.0	61.4	1.0	75.1
56.7	102			1.1	32.0	1.1	44.9	1.1	57.8	1.1	70.7
63.6	108					1.1	42.4	1.1	54.6	1.1	66.7
70.9	114					1.2	40.2	1.2	51.7	1.2	63.2
78.5	120					1.3	38.2	1.3	49.1	1.3	60.1
86.6	126							1.3	46.8	1.3	57.2
95.0	132							1.4	44.7	1.4	54.6
103.9	138							1.4	42.7	1.4	52.2
113.1	144									1.5	50.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

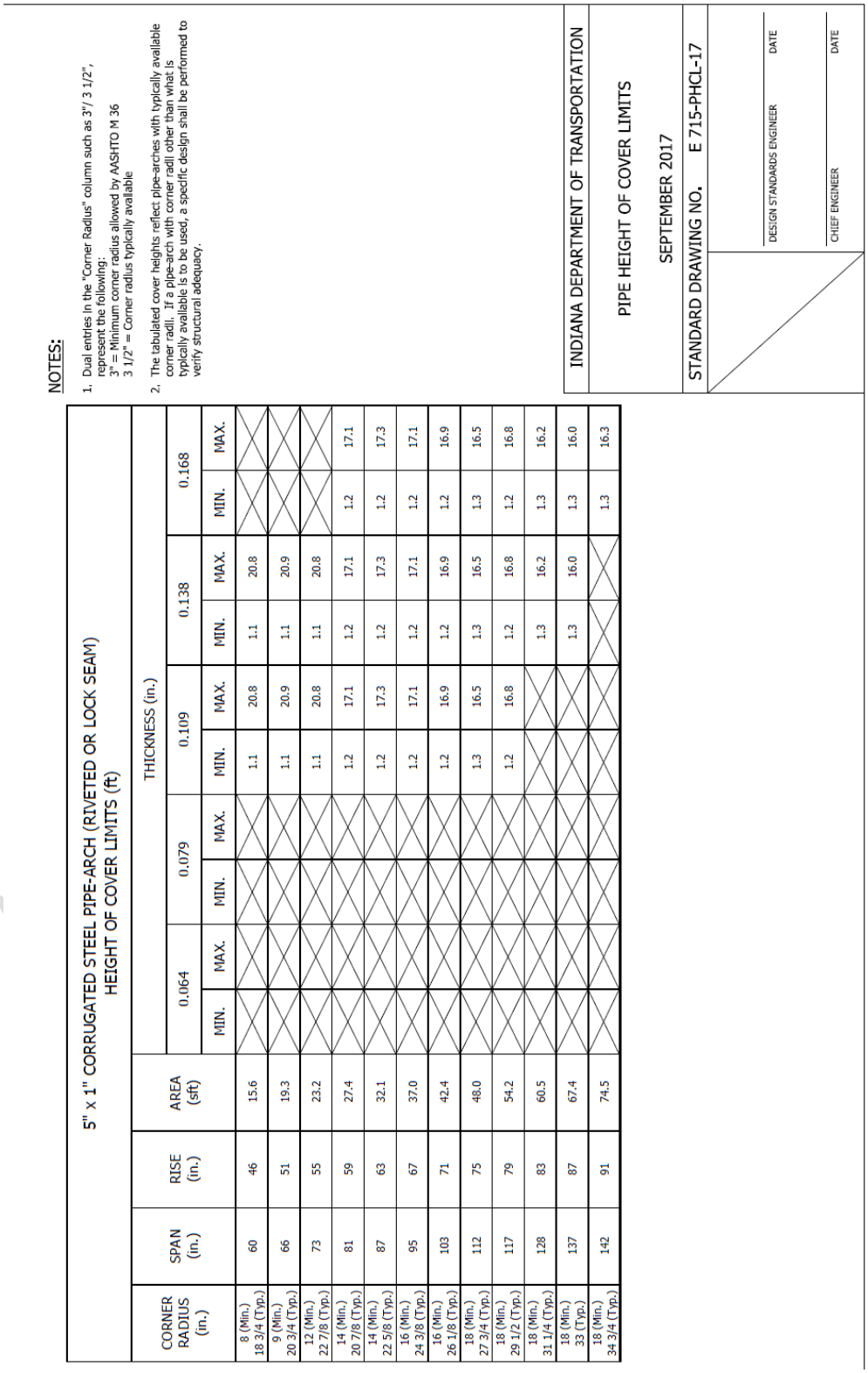
STANDARD DRAWING NO. E 715-PHCL-16

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-17 PIPE HEIGHT OF COVER LIMITS (DRAFT)



5" x 1" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)											
				0.064		0.079		0.109		0.138		0.168			
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
8 (Min.) 18 3/4 (Typ.)	60	46	15.6					1.1	20.8	1.1	20.8				
9 (Min.) 20 3/4 (Typ.)	66	51	19.3					1.1	20.9	1.1	20.9				
12 (Min.) 22 7/8 (Typ.)	73	55	23.2					1.1	20.8	1.1	20.8				
14 (Min.) 20 7/8 (Typ.)	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1		
14 (Min.) 22 5/8 (Typ.)	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3		
16 (Min.) 24 3/8 (Typ.)	95	67	37.0					1.2	17.1	1.2	17.1	1.2	17.1		
16 (Min.) 26 1/8 (Typ.)	103	71	42.4					1.2	16.9	1.2	16.9	1.2	16.9		
18 (Min.) 27 3/4 (Typ.)	112	75	48.0					1.3	16.5	1.3	16.5	1.3	16.5		
18 (Min.) 29 1/2 (Typ.)	117	79	54.2					1.2	16.8	1.2	16.8	1.2	16.8		
18 (Min.) 31 1/4 (Typ.)	128	83	60.5							1.3	16.2	1.3	16.2		
18 (Min.) 33 (Typ.)	137	87	67.4							1.3	16.0	1.3	16.0		
18 (Min.) 34 3/4 (Typ.)	142	91	74.5									1.3	16.3		

NOTES:

1. Dual entries in the "Corner Radius" column such as 3"/ 3 1/2", represent the following:
   3" = Minimum corner radius allowed by AASHTO M 36
   3 1/2" = Corner radius typically available
2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

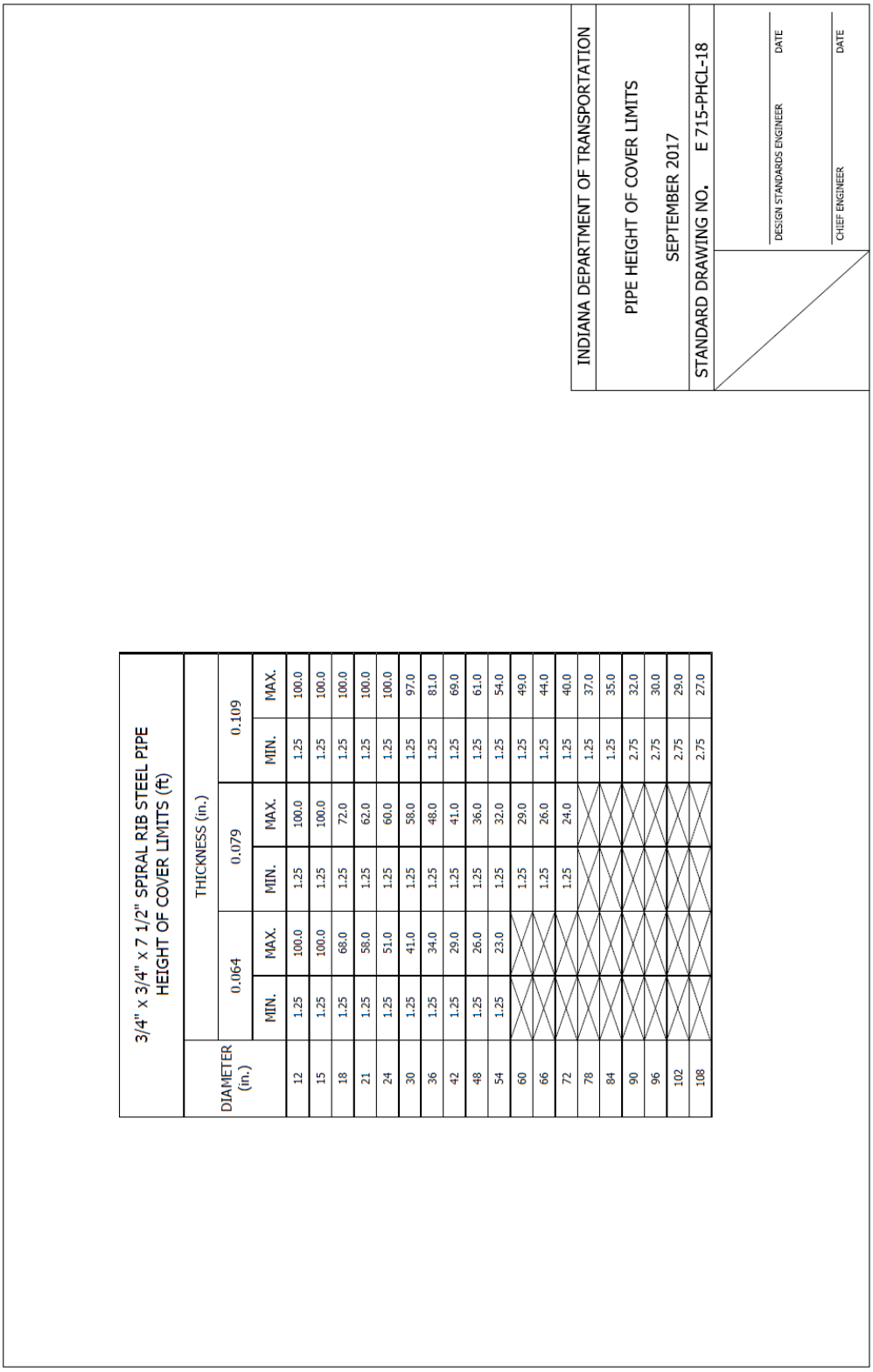
STANDARD DRAWING NO. E 715-PHCL-17

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-18 PIPE HEIGHT OF COVER LIMITS (DRAFT)



3/4" x 3/4" x 7 1/2" SPIRAL RIB STEEL PIPE
HEIGHT OF COVER LIMITS (ft)

DIAMETER (in.)	THICKNESS (in.)					
	0.064		0.079		0.109	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	1.25	100.0	1.25	100.0	1.25	100.0
15	1.25	100.0	1.25	100.0	1.25	100.0
18	1.25	68.0	1.25	72.0	1.25	100.0
21	1.25	58.0	1.25	62.0	1.25	100.0
24	1.25	51.0	1.25	60.0	1.25	100.0
30	1.25	41.0	1.25	58.0	1.25	97.0
36	1.25	34.0	1.25	48.0	1.25	81.0
42	1.25	29.0	1.25	41.0	1.25	69.0
48	1.25	26.0	1.25	36.0	1.25	61.0
54	1.25	23.0	1.25	32.0	1.25	54.0
60			1.25	29.0	1.25	49.0
66			1.25	26.0	1.25	44.0
72			1.25	24.0	1.25	40.0
78					1.25	37.0
84					1.25	35.0
90					2.75	32.0
96					2.75	30.0
102					2.75	29.0
108					2.75	27.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

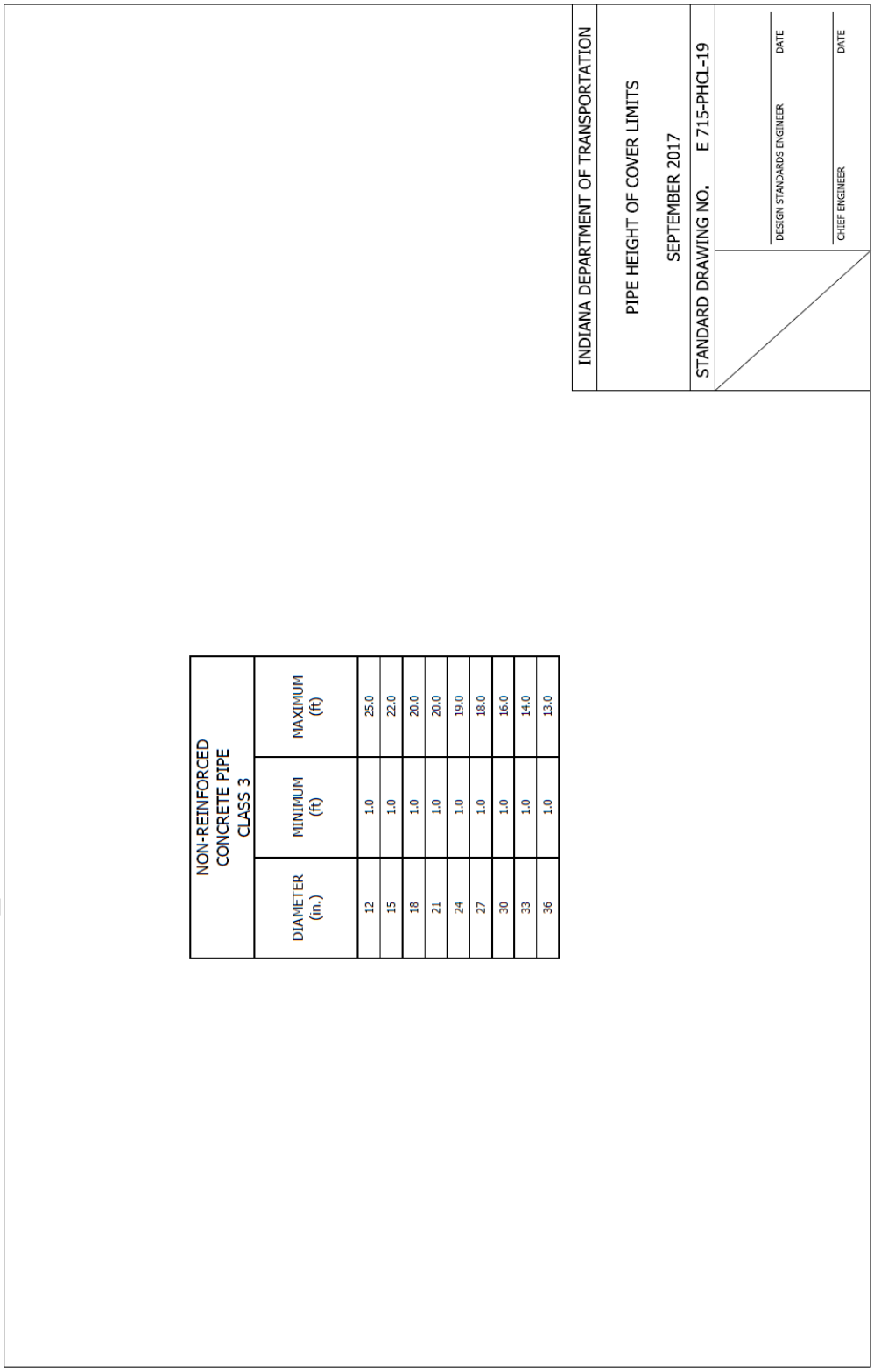
STANDARD DRAWING NO. E 715-PHCL-18

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-19 PIPE HEIGHT OF COVER LIMITS (DRAFT)



NON-REINFORCED CONCRETE PIPE CLASS 3		
DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	1.0	25.0
15	1.0	22.0
18	1.0	20.0
21	1.0	20.0
24	1.0	19.0
27	1.0	18.0
30	1.0	16.0
33	1.0	14.0
36	1.0	13.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-19

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-20 PIPE HEIGHT OF COVER LIMITS (DRAFT)

NOTES:

1. The pay item diameter reflects the minimum required inside diameter.
2. Because the nominal size of smooth wall polyethylene pipe is based on the outside diameter, different dimension ratios may require different nominal diameters to satisfy the pay item diameter requirements.

CORRUGATED POLYETHYLENE PIPE TYPE S
HEIGHT OF COVER LIMITS (ft)

PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	12	2.0	22.0
15	15	2.0	22.0
18	18	2.0	20.0
21	21	2.0	19.0
24	24	2.0	19.0
30	30	2.0	17.0
36	36	2.0	17.0
42	42	2.0	17.0
48	48	2.0	15.0

SMOOTH WALL POLYETHYLENE PIPE
HEIGHT OF COVER LIMITS (ft)

PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	DIMENSION RATIO (NOMINAL DIAMETER / WALL THICKNESS)							
		26		21		17		11	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	13	2.0	40.0	2.0	57.0				
12	14					2.0	81.0		
15	18	2.0	40.0	2.0	57.0	2.0	81.0		
18	20	2.0	40.0	2.0	57.0	2.0	81.0		
18	22					2.0	81.0	2.0	100.0
21	24	2.0	40.0	2.0	57.0	2.0	81.0		
24	28	2.0	40.0	2.0	57.0	2.0	81.0		
27	32	2.0	40.0	2.0	57.0	2.0	81.0		
30	34	2.0	40.0	2.0	57.0	2.0	81.0		
36	42	2.0	40.0	2.0	57.0	2.0	81.0		

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

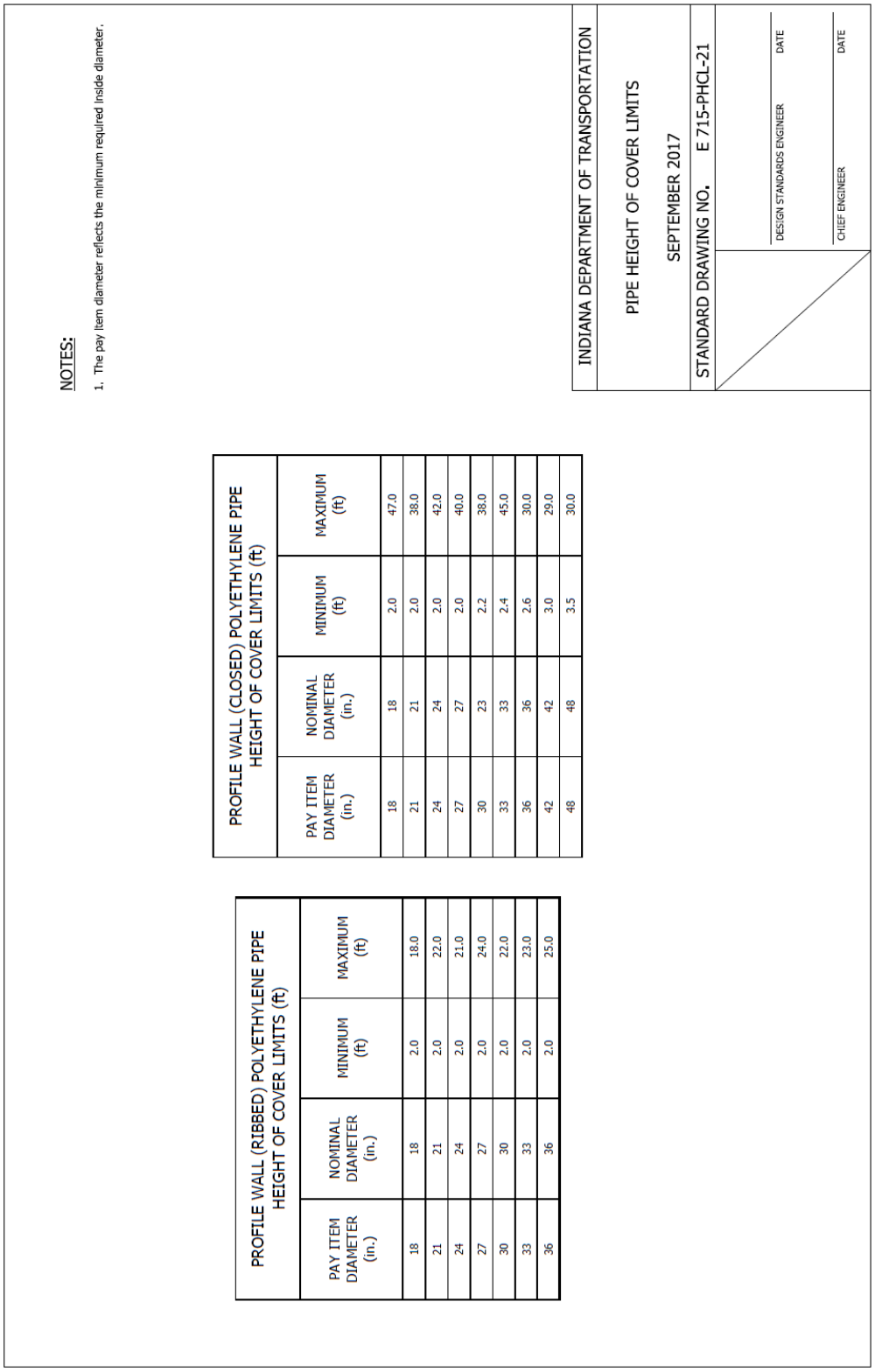
STANDARD DRAWING NO. E 715-PHCL-20

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-21 PIPE HEIGHT OF COVER LIMITS (DRAFT)



NOTES:

1. The pay item diameter reflects the minimum required inside diameter.

PROFILE WALL (RIBBED) POLYETHYLENE PIPE HEIGHT OF COVER LIMITS (ft)

PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
18	18	2.0	18.0
21	21	2.0	22.0
24	24	2.0	21.0
27	27	2.0	24.0
30	30	2.0	22.0
33	33	2.0	23.0
36	36	2.0	25.0

PROFILE WALL (CLOSED) POLYETHYLENE PIPE HEIGHT OF COVER LIMITS (ft)

PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
18	18	2.0	47.0
21	21	2.0	38.0
24	24	2.0	42.0
27	27	2.0	40.0
30	23	2.2	38.0
33	33	2.4	45.0
36	36	2.6	30.0
42	42	3.0	29.0
48	48	3.5	30.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

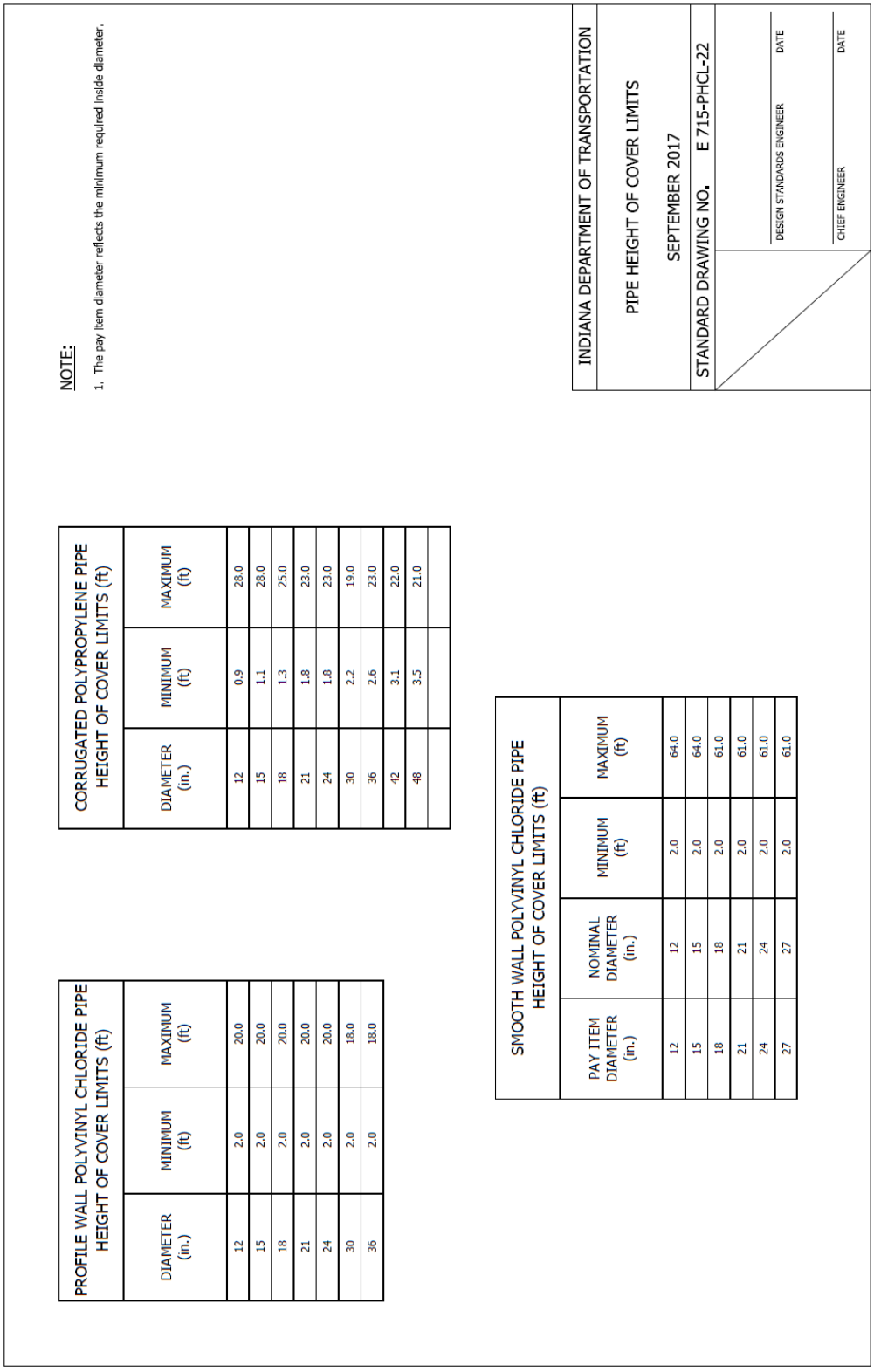
STANDARD DRAWING NO. E 715-PHCL-21

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-22 PIPE HEIGHT OF COVER LIMITS (DRAFT)



NOTE:

1. The pay item diameter reflects the minimum required inside diameter.

PROFILE WALL POLYVINYL CHLORIDE PIPE HEIGHT OF COVER LIMITS (ft)		
DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	2.0	20.0
15	2.0	20.0
18	2.0	20.0
21	2.0	20.0
24	2.0	20.0
30	2.0	18.0
36	2.0	18.0

CORRUGATED POLYPROPYLENE PIPE HEIGHT OF COVER LIMITS (ft)		
DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	0.9	28.0
15	1.1	28.0
18	1.3	25.0
21	1.8	23.0
24	1.8	23.0
30	2.2	19.0
36	2.6	23.0
42	3.1	22.0
48	3.5	21.0

SMOOTH WALL POLYVINYL CHLORIDE PIPE HEIGHT OF COVER LIMITS (ft)			
PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	12	2.0	64.0
15	15	2.0	64.0
18	18	2.0	61.0
21	21	2.0	61.0
24	24	2.0	61.0
27	27	2.0	61.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

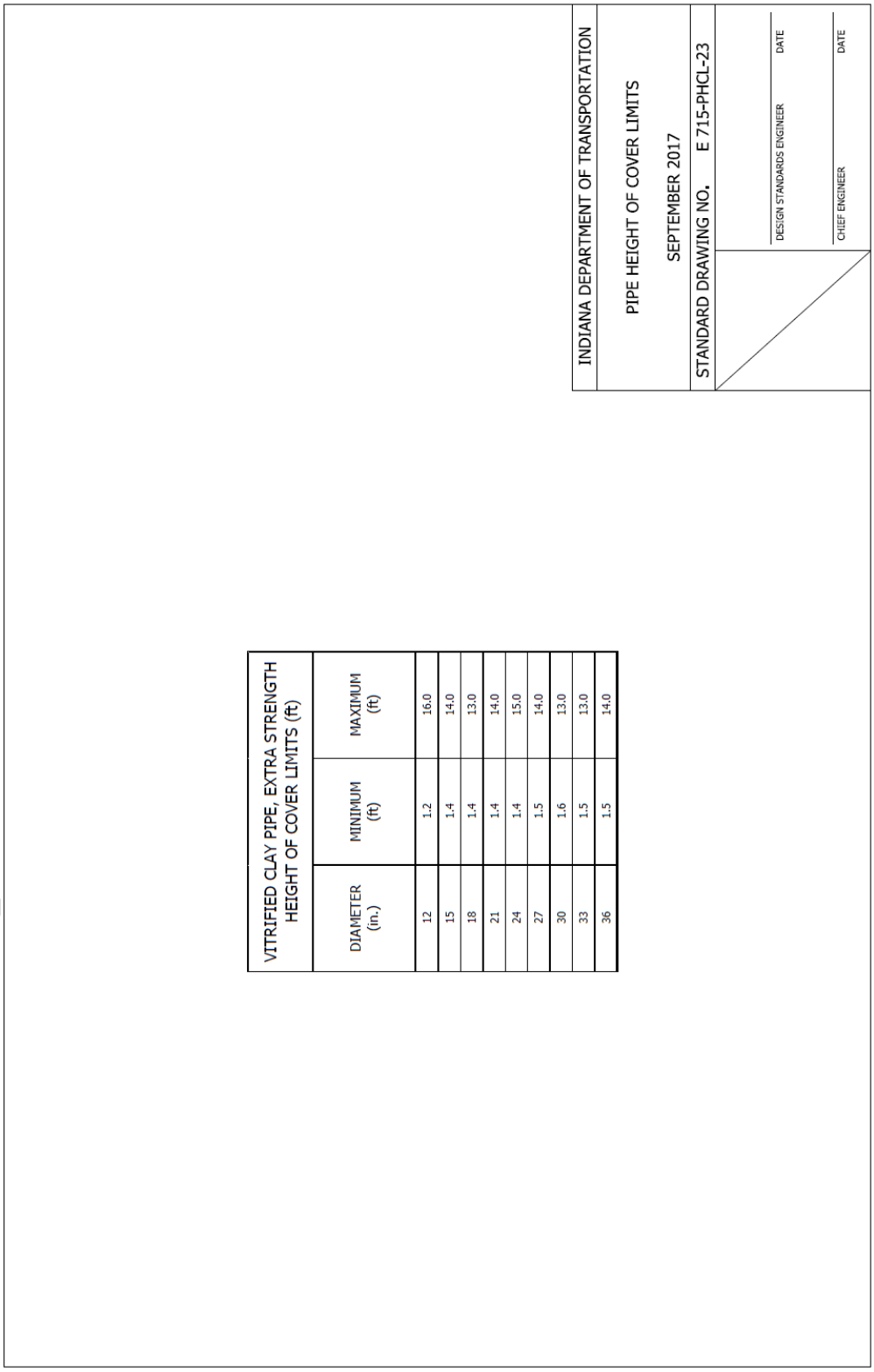
STANDARD DRAWING NO. E 715-PHCL-22

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-23 PIPE HEIGHT OF COVER LIMITS (DRAFT)



INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-23

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

VITRIFIED CLAY PIPE, EXTRA STRENGTH
HEIGHT OF COVER LIMITS (ft)

DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	1.2	16.0
15	1.4	14.0
18	1.4	13.0
21	1.4	14.0
24	1.4	15.0
27	1.5	14.0
30	1.6	13.0
33	1.5	13.0
36	1.5	14.0

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-24 PIPE HEIGHT OF COVER LIMITS (DRAFT)

REINFORCED CONCRETE CIRCULAR PIPE
HEIGHT OF COVER LIMITS (ft)

DIAMETER (in.)	STRENGTH CLASS / D-LOAD RATING									
	CLASS II: $D_{0.01}$ = 1000		CLASS III: $D_{0.01}$ = 1350		CLASS IV: $D_{0.01}$ = 2000		CLASS V: $D_{0.01}$ = 3000	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	1.0	16.0	1.0	26.0	1.0	38.0	1.0	54.0
15	1.0	16.0	1.0	26.0	1.0	38.0	1.0	54.0
18	1.0	16.0	1.0	26.0	1.0	38.0	1.0	54.0
21	1.0	16.0	1.0	26.0	1.0	38.0	1.0	54.0
24	1.0	16.0	1.0	26.0	1.0	38.0	1.0	54.0
27	1.0	16.0	1.0	26.0	1.0	38.0	1.0	54.0
30	1.0	16.0	1.0	24.0	1.0	38.0	1.0	54.0
33	1.0	16.0	1.0	24.0	1.0	38.0	1.0	54.0
36	1.0	16.0	1.0	24.0	1.0	36.0	1.0	54.0
42	1.0	16.0	1.0	24.0	1.0	36.0	1.0	54.0
48	1.0	16.0	1.0	24.0	1.0	36.0	1.0	54.0
54	1.0	16.0	1.0	24.0	1.0	36.0	1.0	54.0
60	1.0	16.0	1.0	22.0	1.0	36.0	1.0	54.0
66	1.0	16.0	1.0	22.0	1.0	34.0	1.0	54.0
72	1.0	16.0	1.0	22.0	1.0	34.0	1.0	54.0
78	1.0	16.0	1.0	22.0	1.0	34.0	1.0	52.0
84	1.0	16.0	1.0	22.0	1.0	34.0	1.0	52.0
90	1.0	14.0	1.0	22.0	1.0	34.0	1.0	52.0
96	1.0	14.0	1.0	22.0	1.0	34.0	1.0	52.0
102	1.0	14.0	1.1	19.0	1.0	31.0	1.0	52.0
108	1.0	14.0	1.2	19.0	1.0	31.0	1.0	52.0
114	1.0	14.0	1.2	19.0	1.0	31.0	1.0	49.0
120	1.0	14.0	1.3	19.0	1.0	31.0	1.0	49.0
126	1.0	14.0	1.4	19.0	1.0	31.0	1.0	49.0
132	1.0	14.0	1.4	19.0	1.0	31.0	1.0	49.0
138	1.0	11.0	1.5	19.0	1.0	31.0	1.0	49.0
144	1.0	11.0	1.5	19.0	1.0	31.0	1.0	49.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-24

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PHCL-25 PIPE HEIGHT OF COVER LIMITS (DRAFT)

REINFORCED CONCRETE HORIZONTAL ELLIPTICAL PIPE
HEIGHT OF COVER LIMITS (ft)

SPAN (in.)	RISE (in.)	AREA (sft)	STRENGTH CLASS / D-LOAD RATING									
			CLASS HE-A: $D_{0.01}$ = 600		CLASS HE-I: $D_{0.01}$ = 800		CLASS HE-II: $D_{0.01}$ = 1000		CLASS HE-III: $D_{0.01}$ = 1350		CLASS HE-IV: $D_{0.01}$ = 2000	
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
23	14	1.8	1.3	4.0	1.0	8.0	1.0	11.0	1.0	20.0	1.0	100.0
30	19	3.3	1.1	5.0	1.0	7.0	1.0	10.0	1.0	16.0	1.0	47.0
34	22	4.1	1.0	5.0	1.0	8.0	1.0	11.0	1.0	17.0	1.0	48.0
38	24	5.1	1.0	5.0	1.0	8.0	1.0	11.0	1.0	18.0	1.0	49.0
42	27	6.3	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	50.0
45	29	7.4	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	45.0
49	32	8.8	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	45.0
53	34	10.2	1.0	6.0	1.0	9.0	1.0	12.0	1.0	20.0	1.0	44.0
60	38	12.9	1.0	5.0	1.0	8.0	1.0	10.0	1.0	15.0	1.0	26.0
68	43	16.6	1.0	6.0	1.0	8.0	1.0	10.0	1.0	15.0	1.0	27.0
76	48	20.5	1.0	6.0	1.0	8.0	1.0	11.0	1.0	16.0	1.0	28.0
83	53	24.8	1.0	6.0	1.0	9.0	1.0	11.0	1.0	16.0	1.0	29.0
91	58	29.5	1.0	6.0	1.0	9.0	1.0	12.0	1.0	17.0	1.0	29.0
98	63	34.6	1.1	6.0	1.1	9.0	1.1	12.0	1.1	17.0	1.1	29.0
106	68	40.1	1.2	6.0	1.2	9.0	1.2	12.0	1.2	17.0	1.2	30.0
113	72	46.1	1.2	7.0	1.2	9.0	1.2	12.0	1.2	18.0	1.2	30.0
121	77	52.4	1.3	7.0	1.3	9.0	1.3	12.0	1.3	18.0	1.3	30.0
128	82	59.2	1.4	7.0	1.4	10.0	1.4	13.0	1.4	18.0	1.4	30.0
136	87	66.4	1.5	7.0	1.5	10.0	1.5	13.0	1.5	18.0	1.5	31.0
143	92	74.0	1.5	7.0	1.5	10.0	1.5	13.0	1.5	18.0	1.5	31.0
151	97	82.0	1.6	7.0	1.6	10.0	1.6	13.0	1.6	19.0	1.6	31.0
166	106	99.2	1.7	7.0	1.8	10.0	1.8	13.0	1.8	19.0	1.8	31.0
180	116	118.6	1.8	7.0	1.9	10.0	1.9	13.0	1.9	19.0	1.9	31.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

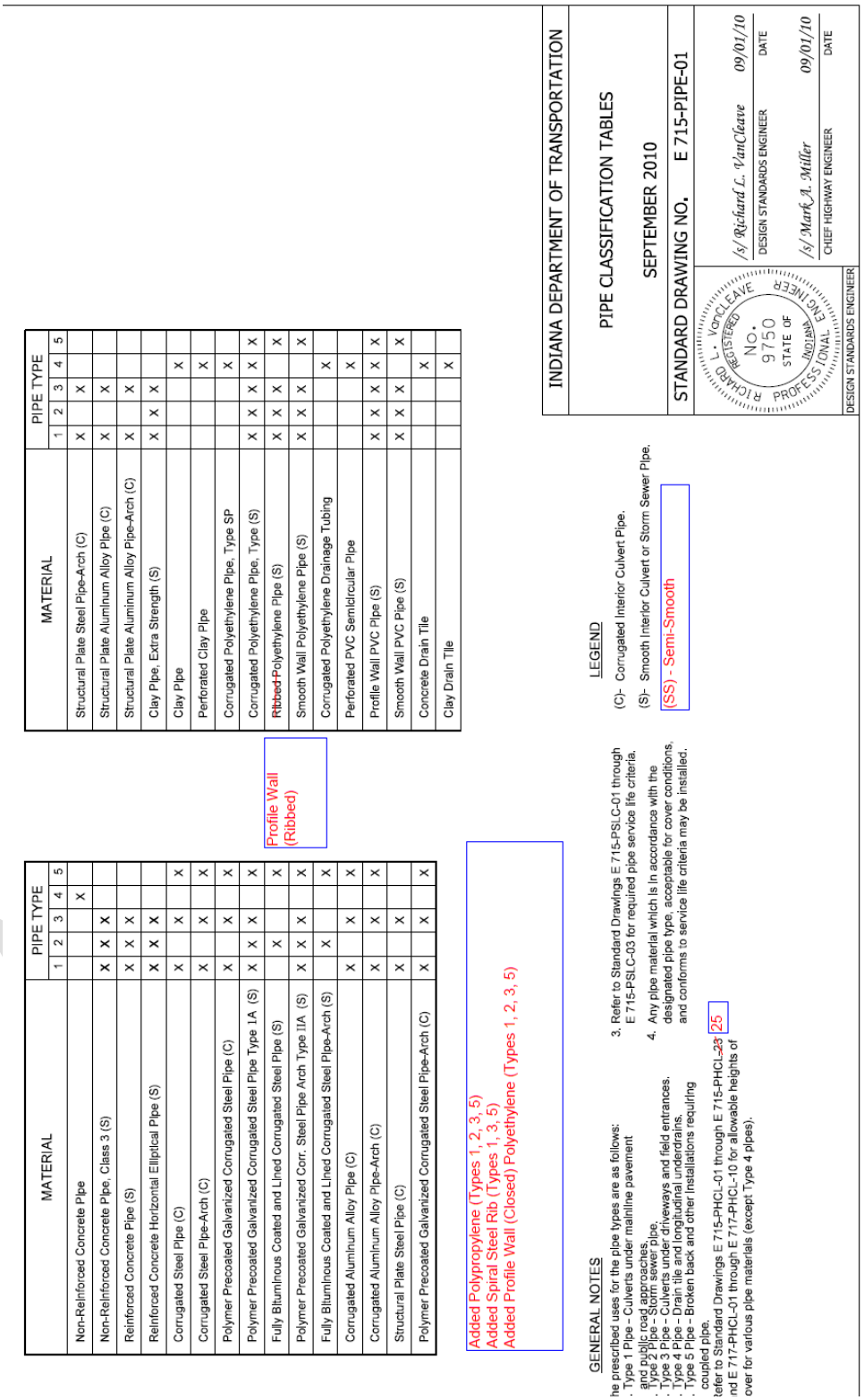
STANDARD DRAWING NO. E 715-PHCL-25

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PIPE-01 PIPE CLASSIFICATION TABLES (WITH MARKUPS)



MATERIAL	PIPE TYPE				
	1	2	3	4	5
Non-Reinforced Concrete Pipe				X	
Non-Reinforced Concrete Pipe, Class 3 (S)	X	X	X		
Reinforced Concrete Pipe (S)	X	X	X		
Reinforced Concrete Horizontal Elliptical Pipe (S)	X	X	X		
Corrugated Steel Pipe (C)	X		X		X
Corrugated Steel Pipe-Arch (C)	X		X		X
Polymer Precoated Galvanized Corrugated Steel Pipe (C)	X		X		X
Polymer Precoated Galvanized Corrugated Steel Pipe Type 1A (S)	X	X	X		X
Fully Bituminous Coated and Lined Corrugated Steel Pipe (S)		X			X
Polymer Precoated Galvanized Corr. Steel Pipe Arch Type 1IA (S)	X	X	X		X
Fully Bituminous Coated and Lined Corrugated Steel Pipe-Arch (S)		X			X
Corrugated Aluminum Alloy Pipe (C)	X		X		X
Corrugated Aluminum Alloy Pipe-Arch (C)	X		X		X
Structural Plate Steel Pipe (C)	X		X		
Polymer Precoated Galvanized Corrugated Steel Pipe-Arch (C)	X		X		X

Added Polypropylene (Types 1, 2, 3, 5)
Added Spiral Steel Rib (Types 1, 3, 5)
Added Profile Wall (Closed) Polyethylene (Types 1, 2, 3, 5)

Profile Wall (Ribbed)

MATERIAL	PIPE TYPE				
	1	2	3	4	5
Structural Plate Steel Pipe-Arch (C)	X		X		
Structural Plate Aluminum Alloy Pipe (C)	X		X		
Structural Plate Aluminum Alloy Pipe-Arch (C)	X		X		
Clay Pipe, Extra Strength (S)	X	X	X		
Clay Pipe				X	
Perforated Clay Pipe				X	
Corrugated Polyethylene Pipe, Type SP				X	
Corrugated Polyethylene Pipe, Type (S)	X	X	X	X	X
~~Ribbed~~ Polyethylene Pipe (S)	X	X	X		X
Smooth Wall Polyethylene Pipe (S)	X	X	X		X
Corrugated Polyethylene Drainage Tubing				X	
Perforated PVC Semicircular Pipe				X	
Profile Wall PVC Pipe (S)	X	X	X	X	X
Smooth Wall PVC Pipe (S)	X	X	X		X
Concrete Drain Tile				X	
Clay Drain Tile				X	

LEGEND

(C)- Corrugated Interior Culvert Pipe.
(S)- Smooth Interior Culvert or Storm Sewer Pipe.

(SS) - Semi-Smooth

GENERAL NOTES

he prescribed uses for the pipe types are as follows:
. Type 1 Pipe – Culverts under mainline pavement and public road approaches.
. Type 2 Pipe – Storm sewer pipe.
. Type 3 Pipe – Culverts under driveways and field entrances.
. Type 4 Pipe – Drain tile and longitudinal underdrains.
. Type 5 Pipe – Broken back and other installations requiring coupled pipe.

3. Refer to Standard Drawings E 715-PSLC-01 through E 715-PSLC-03 for required pipe service life criteria.
4. Any pipe material which is in accordance with the designated pipe type, acceptable for cover conditions, and conforms to service life criteria may be installed.

efer to Standard Drawings E 715-PHCL-01 through E 715-PHCL-~~23~~ 25
nd E 717-PHCL-01 through E 717-PHCL-10 for allowable heights of over for various pipe materials (except Type 4 pipes).

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE CLASSIFICATION TABLES

SEPTEMBER 2010

STANDARD DRAWING NO. E 715-PIPE-01

RICHARD L. VANCLEAVE REGISTERED NO. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

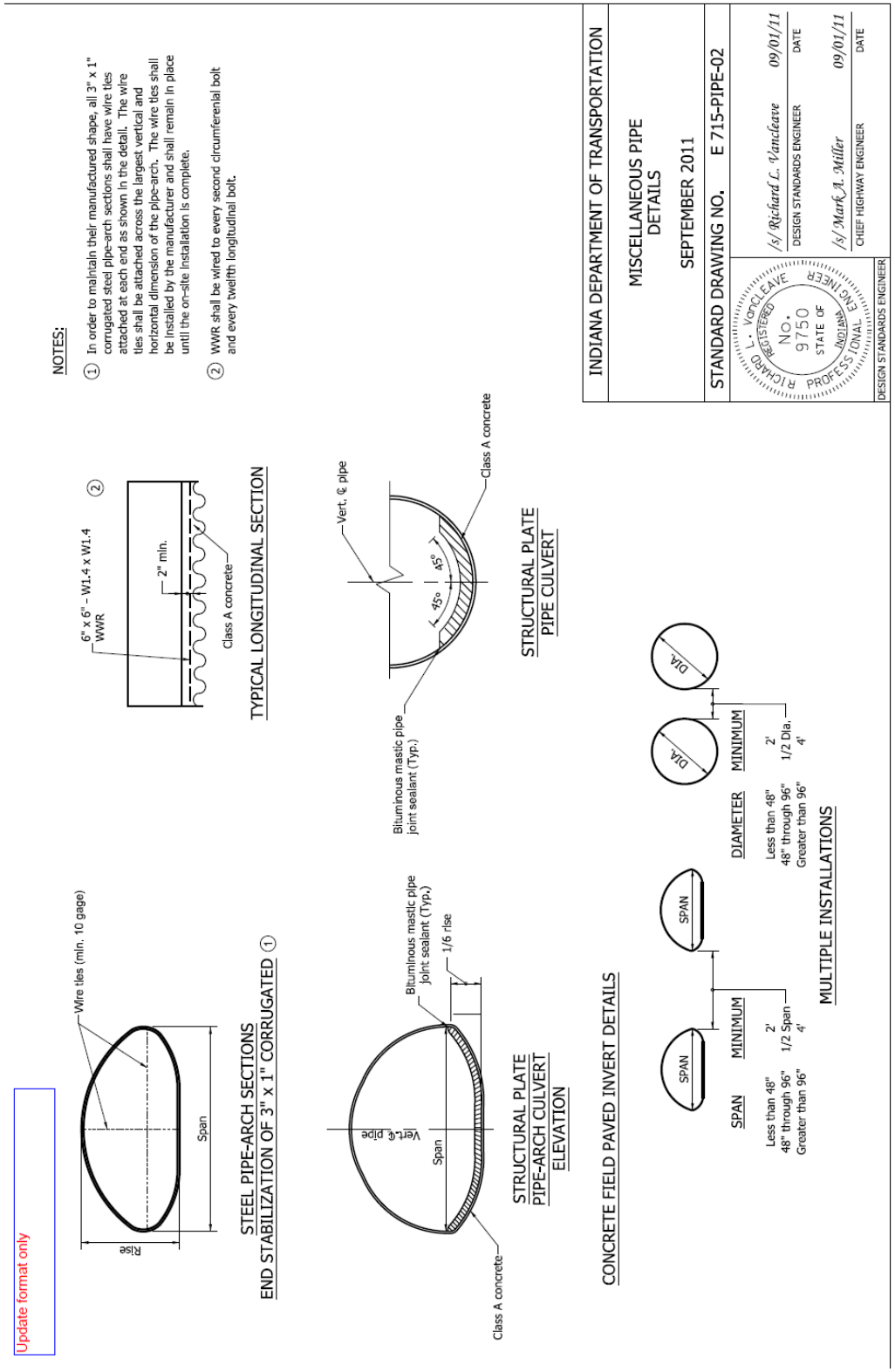
/s/ Richard L. VanCleave 09/01/10
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/10
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PIPE-02 MISCELLANEOUS PIPE DETAILS (WITH MARKUPS)



REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

715-PIPE-01 PIPE CLASSIFICATION TABLES (DRAFT)

Material	Pipe Type 1	2	3	4	5
Non-Reinforced Concrete Pipe				x	
Non-Reinforced Concrete Pipe, Class 3 (S)	x	x	x		
Reinforced Concrete Pipe (S)	x	x	x		
Reinforced Concrete Horizontal Elliptical Pipe (S)	x	x	x		
Corrugated Steel Pipe (C)	x		x		x
Corrugated Steel Pipe-Arch (C)	x		x		x
Spiral Rib Steel Pipe (SS)	x		x		x
Polymer Precoated Galvanized Corrugated Steel Pipe (C)	x		x		x
Polymer Precoated Galvanized Corrugated Steel Pipe Type 1A (S)	x	x	x		x
Fully Bituminous Coated and Lined Corrugated Steel Pipe (S)		x			x
Polymer Precoated Galvanized Corr. Steel Pipe Arch Type IIA (S)	x	x	x		x
Fully Bituminous Coated and Lined Corrugated Steel Pipe-Arch (S)		x			x
Corrugated Aluminum Alloy Pipe (C)	x		x		x
Corrugated Aluminum Alloy Pipe-Arch (C)	x		x		x
Structural Plate Steel Pipe (C)	x		x		
Polymer Precoated Galvanized Corrugated Steel Pipe-Arch (C)	x		x		x

Material	Pipe Type 1	2	3	4	5
Structural Plate Steel Pipe-Arch	x		x		
Structural Plate Aluminum Alloy Pipe (C)	x		x		
Structural Plate Aluminum Alloy Pipe-Arch (C)	x		x		
Clay Pipe, Extra Strength (S)	x	x	x		
Clay Pipe				x	
Perforated Clay Pipe				x	
Corrugated Polyethylene Pipe, Type SP				x	
Corrugated Polyethylene Pipe, Type (S)	x	x	x	x	x
Profile Wall (Ribbed) Polyethylene Pipe (S)	x	x	x		x
Profile Wall (Closed) Polyethylene Pipe (S)	x	x	x		x
Smooth Wall Polyethylene Pipe (S)	x	x	x		x
Corrugated Polyethylene Drainage Tubing				x	
Corrugated Polypropylene Pipe (C)	x	x	x		x
Perforated PVC Semicircular Pipe				x	
Profile Wall PVC Pipe (S)	x	x	x	x	x
Smooth Wall PVC Pipe (S)	x	x	x		x
Concrete Drain Tile				x	
Clay Drain Tile				x	

NOTES:

1. The prescribed uses for the pipe types are as follows.
   a. Type 1 Pipe – Culverts under mainline pavement and public road approaches.
   b. Type 2 Pipe – Storm sewer pipe.
   c. Type 3 Pipe – Culverts under driveways and field entrances.
   d. Type 4 Pipe – Drain tile and longitudinal underdrains.
   e. Type 5 Pipe – Broken back and other installations requiring coupled pipe.
2. Refer to Standard Drawings E 715-PHCL-01 through E 715-PHCL-25 and E 717-PHCL-01 through E 717-PHCL-10 for allowable heights of cover for various pipe materials except Type 4 pipes.
3. Refer to Standard Drawings E 715-PSLC-01 through E 715-PSLC-03 for required pipe service life criteria.
4. Any pipe material which is in accordance with the designated pipe type, acceptable for cover conditions, and conforms to service life criteria may be installed.

LEGEND:

(C)- Corrugated Interior Culvert Pipe.

(S)- Smooth Interior Culvert or Storm Sewer Pipe.

(SS)- Semi-Smooth Interior Culvert Pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE CLASSIFICATION TABLES

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PIPE-01

DESIGN STANDARDS ENGINEER DATE

CHIEF ENGINEER DATE

COMMENTS AND ACTION

715.02 MATERIALS
715.05 LAYING PIPE
715.07 TEE AND STUB-TEE CONNECTIONS
715.09 BACKFILLING
715.13 METHOD OF MEASUREMENT
715.14 BASIS OF PAYMENT
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.20 RIBBED POLYETHYLENE PIPE
908.02 CORRUGATED STEEL PIPE AND PIPE-ARCHES
908.08 POLYMER PRECOATED GALVANIZED CORRUGATED STEEL CULVERT PIPE AND PIPE-ARCHES
715-PSLC-01 THRU -03 PIPE SERVICE LIFE CRITERIA
715-PHCL-01 THRU -23 PIPE HEIGHT OF COVER LIMITS
715-PIPE-01 AND -02 PIPE CLASSIFICATION TABLES

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised _____ Withdrawn
Standard Specifications Sections referenced and/or affected: 715 pg 631 thru 644; 907 pg 898 and 899; 908 pg 902 and 905. Recurring Special Provision affected: NONE Standard Drawing affected: 715-PSLC-01 THRU -03 PIPE SERVICE LIFE CRITERIA 715-PHCL-01 THRU -23 PIPE HEIGHT OF COVER LIMITS 715-PIPE-01 AND -02 PIPE CLASSIFICATION TABLES Design Manual Sections affected: 203-2.02 GIFE Sections cross-references: NONE	_____ 2018 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update _____ SiteManager Update