

Presentation To:



- Maricopa Association of Governments
 - Standard Specifications & Details Committee
 - Sewer & Pipe Workgroup Meeting 4/19/11

Speaker:

Charlie Moses
Product Development Manager
Jensen Precast



Summary

- Why consider Precast MH Base adoption as a case?
- Engineering & Design Basis
 - Precast ASTM C 478 v. C.I.P
- Differential Settlement Concerns (C.I.P. & Precast)
- References & Suggested Updates
 - Details
 - Specifications

Precast MH Base Background

- Used exclusively in Sacramento County
- Accepted and used extensively throughout the 50 states.
- Arizona: First approval granted in January 2011 by Pima County Regional Wastewater Reclamation District (PCRWRD).

Sacramento County

- Diametrically Opposite Standard from Maricopa County:
 - Excludes the use of cast-in-place manhole bases.
- Reasons:
 - #1 Reason cited is Higher Level of Quality Control.
 - Laser-cut steel forms vs. field ply-wood, provide exact pipe penetrations, channeling & consistent mass-production of shells & finishes.
 - Extra Inspection required to assure construction was completed correctly.

CORP: Charles Moses

From: Davis. Melenie (SDA) [davisme@sacsewer.com]
Sent: Tuesday, August 24, 2010 8:19 AM
To: CORP: Charles Moses
Cc: Carlson. Roy (SDA); Espinoza. Robert (SDA); CORP: Eric Jensen
Subject: RE: Question Regarding Precast Concrete Manhole Bases

Our main reason was your number 1..and the extra inspection that would be required to assure that they were constructed correctly. We didn't really use the other items in our discussions for requiring precast bases

From: CMoses@jensenprecast.com [mailto:CMoses@jensenprecast.com]
Sent: Tuesday, August 24, 2010 8:13 AM
To: Davis. Melenie (SDA)
Cc: Carlson. Roy (SDA); Espinoza. Robert (SDA); EJensen@jensenprecast.com
Subject: RE: Question Regarding Precast Concrete Manhole Bases

Dear Melenie,

So would it be accurate to cite in my research, that Sacramento County requires precast manhole bases for original reasons I've cited below?

Thanks again,
Charles

From: CMoses@jensenprecast.com [mailto:CMoses@jensenprecast.com]
Sent: Wed 8/18/2010 8:39 AM
To: Pedretti. Steve (MSA)
Subject: Question Regarding Precast Concrete Manhole Bases

Dear Steven,

I work for Jensen Precast, you may know us well in the Sacramento region. I am working with the company's Arizona divisions to improve local manhole specifications, and most jurisdictions, allow pour-in-place manhole bases ONLY, a complete departure from what Sacramento County

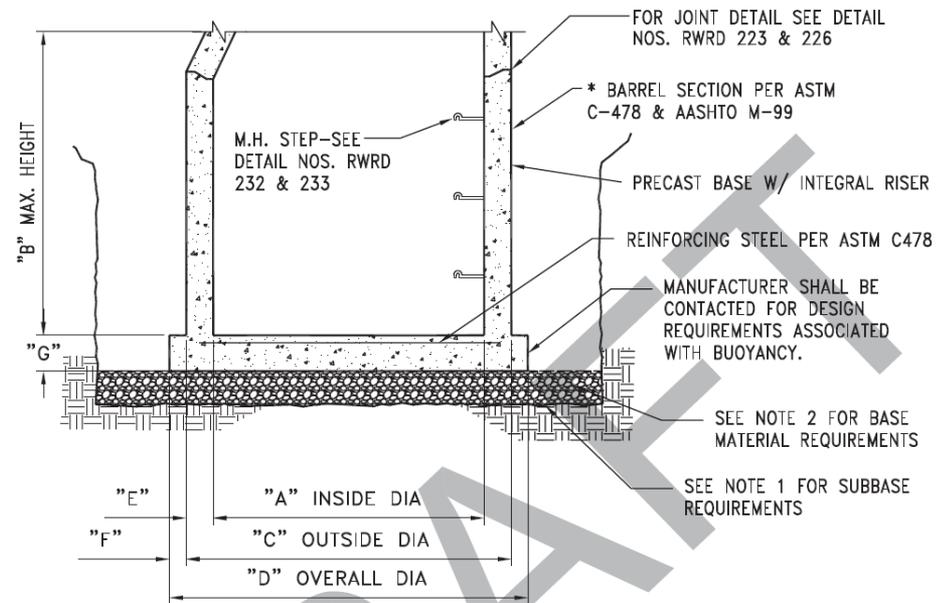
1. A very high-level of quality control with precast concrete manhole bases – laser cut steel forms give you exact pipe penetrations, channeling, and very consistent product quality vs poor QC with field-poured bases (Contractor usually pours concrete down the excavation, in some cases w/o proper compaction, and in some cases carves out channels using a shovel). We have documented these construction methods with photographs.
Greater risk of infiltration/exfiltration at pipe inverts, keyway between pour-in-place base & precast barrel sections & joints. (Again, we have documented this, and are citing a case study where disallowing & replacing field-poured bases/manholes for one Southern California power utility, significantly lowered peak demand).
3. Greater risk of failed vacuum tests, shortened lifecycle for manhole if the issues cited in my second point were to occur, due to inconsistencies in manhole base construction.
4. Cost. It is proven that the average price for a 48" sewer manhole base from any precaster is around \$350-450, the pour-in-place version can range from \$600-\$1250 in some cases!

DRAFT 2012 PCRWRD Engineering Standards & Specifications Section 14.B.1.1(a)

The use of pre-cast manhole bases is acceptable and shall conform to the requirements of Detail No. RWRD 200.

Bench

A bench shall be provided on each side of any manhole channel and shall be brush or broom-finished. The bench shall be sloped to provide a minimum 2% grade from the top of the base to the edge of the channel. No lateral sewer, service connection or drop manhole pipe shall discharge onto the surface of the bench. The bench



DIMENSIONS						
"A"	"B"	"C"	"D"	"E"	"F"	"G"
48"	48"	58"	62"	5"	2"	4"
60"	72"	72"	80"	6"	4"	8"
72"	72"	86"	94"	7"	4"	8"

* MINIMUM HEIGHT OF INDIVIDUAL BARREL SECTIONS USED TO MEET MINIMUM RISER HEIGHTS SHALL BE 1'-0" PER DETAIL NO. RWRD 206

NOTES:

- SUB-BASE SHALL BE UNDISTURBED SOIL, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER.
A MINIMUM 6" THICKNESS OF CRUSHED AGGREGATE BASE MATERIAL PER DETAIL NO. RWRD 104 SHALL BE PROVIDED ON TOP OF THE SUBBASE. THE BASE MATERIAL SHALL BE LEVELED WITHIN 1/4" OF THE REQUIRED GRADE PRIOR TO PLACEMENT OF THE MANHOLE BASE.
- PRECAST BASES SHALL BE FURNISHED WITH CUTOUTS OR KNOCKOUTS. KNOCKOUTS SHALL HAVE A MINIMUM WALL THICKNESS OF 2".
KNOCKOUT OR CUTOUT HOLE SIZE IS EQUAL TO PIPE O.D. PLUS MANHOLE WALL THICKNESS. MAX. HOLE SIZE IS 36", 42" FOR 5' MANHOLE MIN. DISTANCE BETWEEN HOLES IS 8".
- FLOW CHANNEL AND BENCH SHALL BE CONSTRUCTED OF NON-REINFORCED CONCRETE, CLASS 'S' PER PCRWRD STANDARD SPECIFICATIONS SECTION 14.2.3(B)(i)(1a).
- REFER TO SECTION 14.2.3(B)(i)(4) OF THE DEPARTMENT'S STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

ISSUED:	STANDARD DETAIL PRECAST CONCRETE BASE FOR 4 FT. TO 6 FT. DIA. MANHOLES		DETAIL NO.
8/92			RWRD 200
REVISED:			SHEET 1 OF 1
11/01/10			

MAG Precast MH Bases? Already Acceptable:

- **MAG 601.2.6** offers backfill & compaction requirements specifically for precast manhole bases, therefore precast manhole bases are acceptable per MAG.

- **MAG Section 601: Trench Excavation, Backfilling & Compaction**

- **Section 601.2.6:**

601.2.6 Excavation for Manholes, Valves, Inlets, Catch Basins and Other Accessories: The Contractor may excavate to place the concrete structure directly against the excavated surface, provided that the faces of the excavation are firm and unyielding and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing or if precast structures are used, the Contractor shall overexcavate to place the structure and this overexcavation shall be backfilled with the same material required for the adjoining pipe line trench and compacted per Table 601-2.

TABLE 601-2				
MINIMUM TRENCH COMPACTION DENSITIES				
Backfill Type	Location	From Surface To 2 feet Below Surface	From 2 feet Below Surface To 1 foot Above Top of Pipe	From 1 foot Above Top of Pipe to Bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2-feet of the above.	100% for granular 95% for non-granular	90%	90%
II	On any utility easement street, road or alley right-of-way outside limits of (I).	85%	85%	90%
III	Around any structures or exposed utilities.	95% in all cases		

Reasons This Issue Should Be Considered as a Case

(Inside & Outside Right-of-Way):

1. Adopting precast AND keeping cast-in-place Manhole base standards invites competition & keeps costs low for C.I.P. & Private developers following MAG standards.
 1. Currently, contractors have monopoly on the only approved method.
2. Keep consistent with 601.2.6 excavation & backfill requirements.
3. C.I.P. & Precast Manhole bases can be considered two different products:
 1. Varying levels of quality control
 2. No reinforcing vs. reinforcing per ASTM C478
 3. No reference standard for Cast-in-Place Manhole Bases.
4. Precast Raises the quality standard for base construction.
5. Precast bases have qualified manufacturer's engineering data, ASTM C478, Cast-in-Place bases has none.

Advantages of Precast Manhole Bases

- Consistent product quality using steel forms & automated batching equipment.
- Higher percent of manhole stacks with precast bases pass vacuum tests.
- Can use ASTM C 923 Resilient Flexible pipe gasket.
 - Test requires 7 degrees of Omni-deflection while maintaining 30' (13 psi) of hydrostatic pressure , no leakage.
- Dry-cast concrete “zero-slump” option, more economical, uses less water.
- Third-Party Plant Audits.
- Engineering-backed product to verify structural design & loading & performance.
- Avg. 28 day strength is 5,500 PSI.
- More economical as inside diameter increases.
- Monolithic lining inserts for tooling, to protect against sewer gasses.
 - See lining & coating matrix.



Differences in Design Criteria for C.I.P. & Precast Manhole Bases

– Precast

- Precast referenced in ASTM C 478
- Precast has structural & anti-flotation calculations to back up base designs.
- **ASTM C 478.15.3.1 Uses ACI 318 for bases of design**
- Uses ASTM C923 Resilient Flexible Pipe Connector for differential settlement.

• Cast-In-Place

- No engineering or uniform Ref. Standard for cast-in-place bases.
- Designed according to MAG Section 505 CONCRETE.
- No reinforcing requirements spelled out for precast manhole bases in specs or details.
- Problems curing in variable out-door weather conditions (How do you ensure you're getting proper placement of concrete?)
- Problems with consolidation of concrete. W/No compaction standards, even vibrating is difficult.
- Problems working around existing utilities if excavation reveals sloppy, chunk of concrete that's hard to remove.



Precast MH Base Design Criteria

- BASIS OF DESIGN ACI 318
- 4000 PSI CONCRETE COMPRESIVE STRENGTH
- 6" MIMIMUM SLAB THICKNESS
- REINFORCING STEEL CONFORMING TO ASTM
- MINIMUM SLAB STEEL AREA $.012 \text{ IN.}^2 / \text{ LINEAR FT}$
- MINIMUM WALL STEEL AREA $.0025 \text{ X DIA.} / \text{ VERT FOOT}$
- JENSEN PRECAST RECOMMENDS ALL PRECAST BASES ALSO
 - DESIGNED TO ASTM C890 A-16 (H20) WHEEL LOAD UPTO 25'
OF BURY

Differential Settlement:

- One member settling at a different rate than another.



False:

- “Precast concrete manhole bases are susceptible to differential settlement” ...

True:

- Cast-in-Place AND precast manhole bases are at EQUAL RISK for differential settlement.
- Why would precast base take a more stringent requirement, and settle more than a pour-in-place base?
- What is the difference between C.I.P. & precast bases when it comes to soil bearing pressure?

Differential Settlement

- Traditionally, pipe soil doesn't get compacted properly underneath, so this settles much faster than Base.
- Differential Settlement occurs regardless of cast-in-place OR precast construction:
 - If you are using standard Sch. 40 PVC or HDPE Pipe, and it is not backfilled properly, it has been proven that this pipe settles quicker than concrete structure itself.

MAG 601.2.6:

- Clearly, cast-in-place & precast concrete placing have different preparation & backfill requirements.
- **601.1.2.6:** Allows placement of cast-in-place concrete directly against excavated surface, provided that the faces of the excavation are “firm” and “unyielding”.
 - How can someone quantify this requirement?
 - How is this requirement a better assurance against differential settlement OR structural cracking & failure of C.I.P. concrete base?

Safeguard Against Differential Settlement

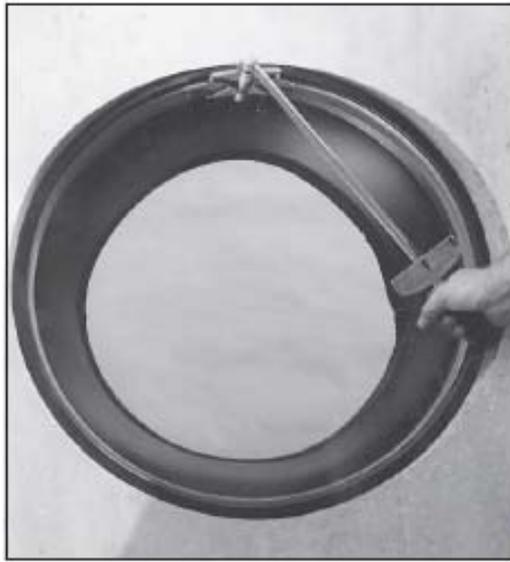
- Precast Bases Can use ASTM C 923 Resilient Flexible pipe gasket.
 - Test requires 7 degrees of Omni-deflection while maintaining 30' of hydrostatic pressure, no leakage.



KOR-N-SEAL I - WEDGE KORBAND CONNECTOR ASSEMBLY



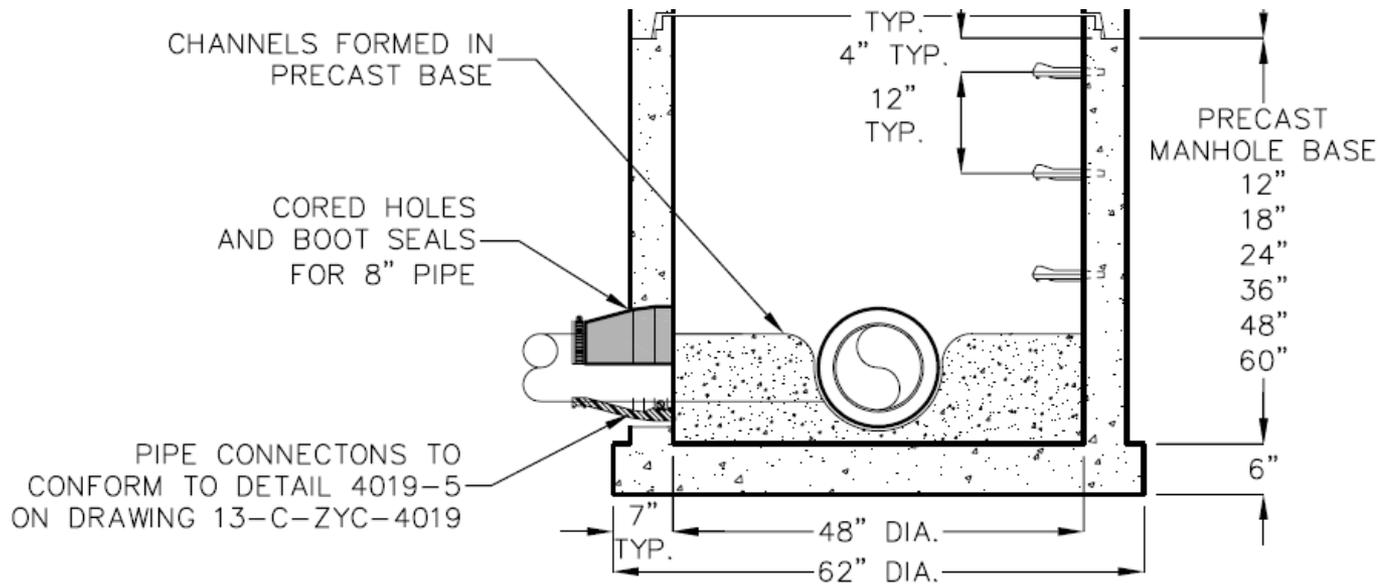
Install Kor-N-Seal I - Wedge Korband
with Socket Wrench & Torque Limiter



Install Kor-N-Seal II - Wedge Korband
with Standard Torque Wrench



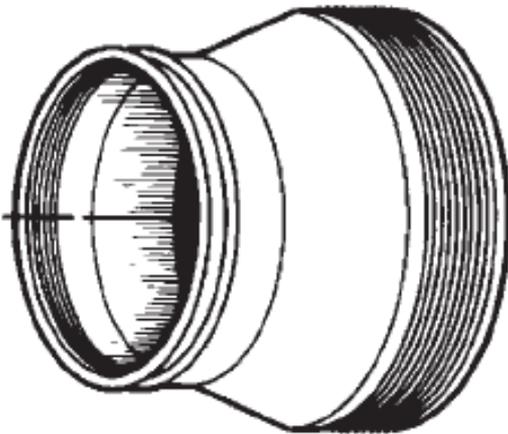
Install Pipe Clamp(s)
with T-Handle Torque Wrench



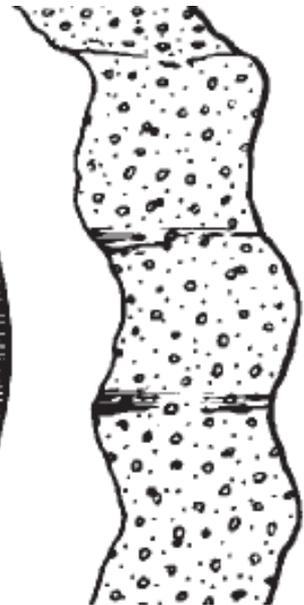
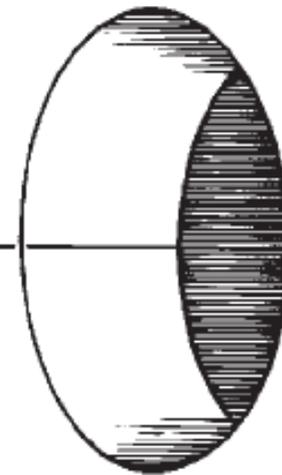
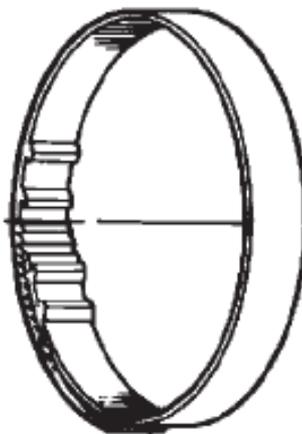
**TAKE-UP
CLAMP**

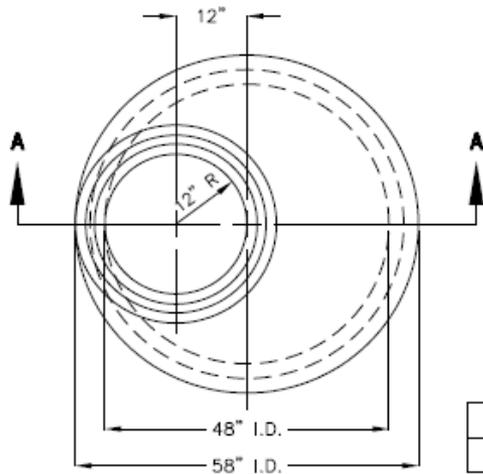


BOOT

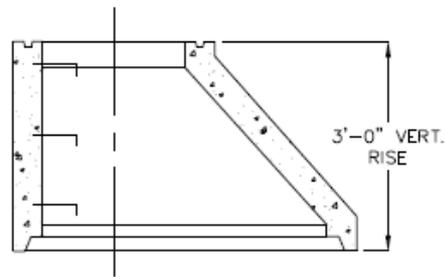


**ADJ: EXPANSION
RING**





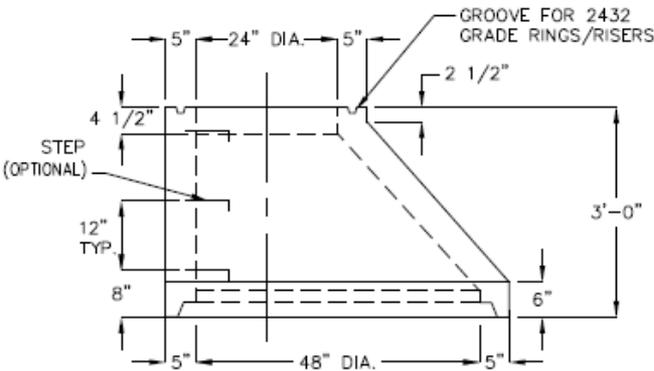
**PLAN VIEW
4858 CONE**



SECTION A-A

	APPROX. WT.
4858EC24-36 ECC CONE	2250 LBS.
4858EC24-36S ECC CONE W/STEP HOLES	2250 LBS.

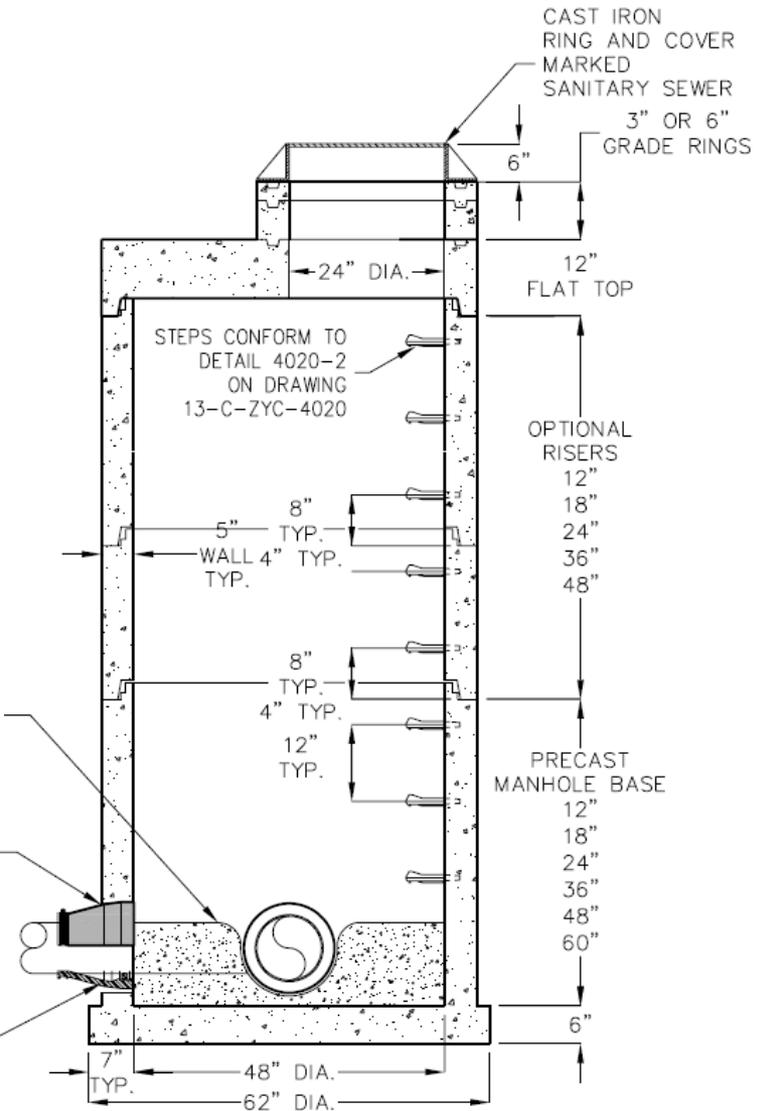
CONFORMS TO ASTM SPECS C-478
and AASHTO No. M199.



SIDE VIEW

MANHOLE COMPONENTS CONFORM TO CURRENT SPECIFICATIONS, ASTM C-478 AND AASHTO M199.

FLAT TOPS AND BASE SLABS ARE DESIGNED FOR AASHTO HS-20 WHEEL LOADING.



PIPE CONNECTORS TO CONFORM TO DETAIL 4019-5 ON DRAWING 13-C-ZYC-4019

New MAG Detail Suggestion: 420-3