

## **Changes to 2010 UAM References:**

Std Index 102, Temporary Erosion and Sediment Control  
Std Index 103, Turbidity Barriers  
Std Index 307, Miscellaneous Utility Details  
Std Index 600, General Information for Traffic Control Through Work Zones  
Revised as shown below.

Std Index 307, Miscellaneous Utility Details  
The UAM now references the entire standard rather than just conflict structures.  
(See Below)

Std Spec 425-6.7  
Added to prohibit concrete aprons around manhole lids.  
(See below)

Std Spec 555-4.3 through 555-4.4  
Added to clarify relation of bore (reamer) diameter to product size  
and to exclude hazardous materials from drilling mud.  
(See Below)

Std Spec 556-2  
Removed product material specifications.  
(See Below)

SAE J845:  
2010 UAM referenced the May 1997 version.  
The 2013 UAM will reference the December 2007 version.  
(See Below)

[http://standards.sae.org/j845\\_200712](http://standards.sae.org/j845_200712)

SAE J595:  
This is a new standard that replaced SAE J1318.

[http://standards.sae.org/j595\\_200811](http://standards.sae.org/j595_200811)

# DESIGN STANDARDS MODIFICATIONS

## Effective Date: January 1, 2012

Index No. 102 (Sheets 1-3 of 3), "TEMPORARY EROSION AND SEDIMENT CONTROL", are deleted and Interim Index No. 102 (Sheet 1-3 of 3), Dated 01/01/10 is substituted.

Interim Index No. 102 (Sheet 2 of 3), Dated 01/01/10, "NOTES FOR SYNTHETIC BALES OR BALE TYPE BARRIERS", Note 6 is deleted and "6. Bales to be paid for under the contract unit price for Sediment Barriers, LF. The unit price shall include the cost of filter fabric and sand bags for Type I and II Barriers. Protection around inlets to be paid for as Inlet Protection System, EA." is substituted.

Note: Interim Index No. 102 (Sheets 1-3 of 3) has been retained for use by Utility Companies only. Index No. 102 (Sheets 1-3 of 3), "TEMPORARY EROSION AND SEDIMENT CONTROL", are deleted.

Index No. 103 (Sheet 1 of 1), "TURBIDITY BARRIERS", is deleted.

Index No. 307 (Sheet 1 of 3), "MISCELLANEOUS UTILITY DETAILS", "GENERAL NOTES", Note 6, delete the last sentence of the first paragraph. Under "PAVEMENT REMOVAL AND REPLACEMENT", delete the second paragraph and substitute: "The replacement asphalt shall match the existing structural and friction courses for type and thickness in accordance with current FDOT asphalt mix specifications."

Index No. 307 (Sheet 2 of 3), "MISCELLANEOUS UTILITY DETAILS", "NOTES FOR UTILITY CONFLICT PIPE", Note 5, delete the text and replace with "If during construction or the plans design process it is determined that a potable water supply line must pass through a storm drain structure, it must be in compliance with Chapter 62-555.314 (3) F.A.C. and shown on the design or construction plans and submitted to the Florida Department of Environmental Protection (FDEP) Administrator for Drinking Water in the respective FDEP District for review and comment. This index and rule citation provide accepted methods for addressing conflicts when and where they cannot be reasonably avoided. To be submitted along with the plans shall be a justification describing inordinate cost and the impracticality of avoidance. If identified, properly justified, and accomplished in accordance with this index, approval is granted. Upon request, the Utility Agency Owner (UAO) must provide support data on the cost of relocation or adjustment to the FDOT for submittal to the FDEP. See the following web site for District FDEP Drinking Water Contacts: [www.dep.state.fl.us/water/drinkingwater/index.htm](http://www.dep.state.fl.us/water/drinkingwater/index.htm) and click on "Organization" on the menu to the right."

Index No. 600 (Sheet 1 of 13), "GENERAL INFORMATION FOR TRAFFIC CONTROL THROUGH WORK ZONES", "ABBREVIATIONS", change description of "TMA" to read: "Truck/Trailer Mounted Attenuator".

Index No. 600 (Sheet 1 of 13), "GENERAL INFORMATION FOR TRAFFIC CONTROL THROUGH WORK ZONES", ABBREVIATIONS, change "VECP Value Engineering Change Proposal" to

“CSIP Cost Savings Initiative Proposal”.

Index No. 600 (Sheet 2 of 13), “TEMPORARY TRAFFIC CONTROL DEVICES”, delete existing text and substitute the following: “All temporary traffic control devices shall be on either the Department’s Qualified Products List (QPL) or the Department’s Approved Products List (APL). Ensure the appropriate QPL or APL number is permanently marked on the device at a readily visible location.

All temporary traffic control devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, temporary traffic control devices that are no longer appropriate shall be removed or covered.

Arrow Panels, Portable Changeable Message Signs, Radar Speed Display Trailers, Portable Regulatory Signs, and any other trailer mounted device shall be delineated with a temporary traffic control device placed at each corner when in use and shall be moved outside the travel way and clear zone or be shielded by a barrier or crash cushion when not in use.”

Index No. 600 (Sheets 3, 5, 8 & 9 of 13), “GENERAL INFORMATION FOR TRAFFIC CONTROL THROUGH WORK ZONES”, are deleted and Interim Index No. 600 (Sheets 3, 5, 8 & 9 of 13), Dated 01/01/11 are substituted.

Index No. 600 (Sheet 5 of 13), “END ROAD WORK SIGN”, change sign code from “(G20-2A)” to “(G20-2)”

Index No. 600 (Sheet 5 of 13), “INTERSECTING ROAD SIGNING” Delete paragraph and substitute: “Signing for the control of traffic entering and leaving work zones by way of intersecting crossroads shall be adequate to make drivers aware of work zone conditions. If work operations exceed 60 minutes, intersection leg signing will be no less than the ROAD WORK AHEAD sign.”

Index No. 600 (Sheet 6 and 7 of 13), “GENERAL INFORMATION FOR TRAFFIC CONTROL THROUGH WORK ZONE”, is deleted and Interim Index No. 600, (Sheet 6 and 7 of 13), Dated 01/01/10 is substituted.

Index No. 600 (Sheet 7 of 13), “PROJECT INFORMATION SIGN NOTES”, add “3. Payment for Project Information Sign shall be included in Lump Sum MOT.”

Index No. 600 (Sheet 9 of 13), “CHANNELIZING AND LIGHTING DEVICES”, delete the second paragraph.

Index No. 600 (Sheet 9 of 13), “TRUCK MOUNTED ATTENUATORS”, change heading to: “TRUCK/TRAILER MOUNTED ATTENUATORS”, and change first sentence of text to read, “Truck/trailer mounted attenuators”.

Index No. 600 (Sheet 9 of 13), “REMOVING PAVEMENT MARKINGS” delete the existing text and replace with the following: “Existing pavement markings that conflict with temporary work zone delineation shall be removed by any method approved by the Engineer, where operations exceed one daylight period. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration. Full pavement width

overlays of either a structural or friction course are a positive means to achieve obliteration.”

Index No. 600 (Sheet 10 of 13), in the Note beneath the “DROP-OFF PROTECTION REQUIREMENTS” table, change reference to “Index No. 600 sheet 3”.

Index No. 600 (Sheet 10 of 13), Add to Sheet, “PEDESTRIAN AND/OR BICYCLIST WAY DROP-OFF CONDITION NOTES”

1. A pedestrian and/or bicyclist way drop-off is defined as:

a. a drop in elevation greater than 10 inches that is closer than 2 feet from the edge of the pedestrian or bicyclist way

b. a slope steeper than 1:2 that begins closer than 2 feet from the edge of the pedestrian or bicyclist way when the total drop-off is greater than 30 inches.

2. Any drop-off adjacent to a pedestrian or bicyclist way shall be protected with warning devices, temporary barrier wall or approved handrail.”

Index No. 600 (Sheet 10 of 13), “NOTES”, Note 3 change “VECP” to “CSIP”.

Index No. 600 (Sheet 11 of 13), “PLACEMENT OF BUSINESS ENTRANCE SIGNS AND CHANNELIZING DEVICES AT BUSINESS ENTRANCE” add the following text as new note

no. 5. “Business entrance signs are intended to guide motorist to business entrances moved/modified or disturbed during construction projects. Business entrance signs are not required where there is minimal disruption to business driveways such as is often the case with resurfacing type projects.”

Index No. 600 (Sheet 12 of 13), “CHANNELIZING AND LIGHTING DEVICE NOTES”, delete notes 1 and 2 and renumber remaining notes.

Index 603 (Sheet 2 of 2), “TWO-LANE TWO-WAY, WORK WITHIN THE TRAVEL WAY”, is deleted and Interim Index No 603 (Sheet 2 of 2), Dated 07/01/10 is substituted.

Index 613 (Sheet 1 of 2), “DURATION NOTES”, delete the existing text and replace with the following:

1. Temporary white edge line may be omitted for work that occupies a location for less than 3 consecutive calendar days.

2. For work operations up to approximately 15 minutes, signs, channelizing devices, arrow panel and buffer space may be omitted if all of the following conditions are met:

a. Speed limit is 45 mph or less.

b. No sight obstructions to vehicles approaching the work area for a distance equal to the buffer space and the taper length combined.

c. Volume and complexity of the roadway has been considered.

d. The closed lane is occupied by a class 5 or larger, medium duty truck(s) with a minimum gross weight vehicle rating (GWVR) of 16,001 lb with high-intensity, rotating, flashing, oscillating, or strobe lights mounted above the cab height and operating.

3. For work operations up to 60 minutes, arrow panel and buffer space may be omitted if conditions

a, b, and c in DURATION NOTE 2 are met, and vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.

Index 616 (Sheet 1 of 3), "DURATION NOTES", delete the existing text and replace with the following:

1. For work operations up to approximately 15 minutes, signs, channelizing devices, and arrow panel may be omitted if all of the following conditions are met:

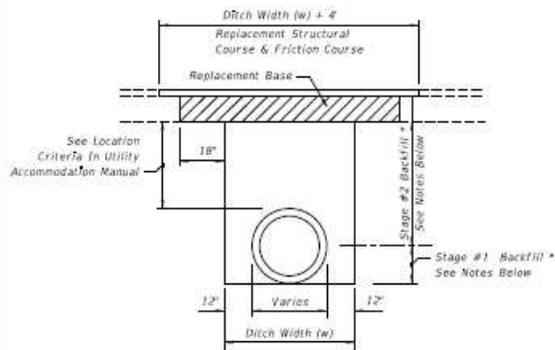
a. Speed limit is 45 mph or less.

b. No sight obstructions to vehicles approaching the work area for a distance equal to twice the taper length.

c. Volume and complexity of the roadway has been considered.

d. The closed lane is occupied by a class 5 or larger, medium duty truck(s) with a minimum gross weight vehicle rating (GWVR) of 16,001 lb with high-intensity, rotating, flashing, oscillating, or strobe lights mounted above the cab height and operating.

2. For work operations up to 60 minutes, the arrow panel may be omitted if conditions a, b, and c in DURATION NOTE 1 are met, and vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.



**FLEXIBLE PAVEMENT NOTES**

**PAVEMENT REMOVAL AND REPLACEMENT**

Pavement shall be mechanically sawed.

The replacement asphalt shall match the existing structural and friction courses for type and thickness in accordance with current FDOT asphalt mix specifications.

The new base materials shall be either of the same type and composition as the materials removed or of equal or greater structural adequacy (See Index No. 514).

**BACKFILL**

**COMPACTED AND STABILIZED FILL OPTION**

Backfill material shall be placed in accordance with Section 125 of the Standard Specifications.

In Stage #1, construct compacted fill beneath the haunches of the pipe, using mechanical tamps suitable for this purpose. This compaction applies to the material placed beneath the haunches of the pipe and above any bedding.

In Stage #2, construct compacted fill along the sides of the pipe and up to the bottom of the base with the upper 12" receiving Type B Stabilization. In lieu of Type B Stabilization, the Contractor may construct using Optional Base Group 3.

**\* FLOWABLE FILL OPTION**

If compaction can not be achieved through normal mechanical methods then flowable fill may be used.

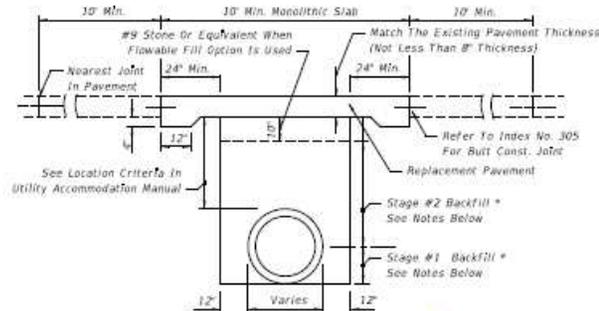
Flowable fill is to be placed in accordance with Section 121 of the Specifications, as approved by the Engineer.

Do not allow the utility being installed to float. If a method is provided to prevent flotation from occurring, Stages #1 and #2 can be combined, if approved by the Engineer.

In Stage #1, place flowable fill midway up on both sides of the utility. Allow to harden before placing Stage #2.

In Stage #2, place flowable fill to the bottom of the existing base course.

**FLEXIBLE PAVEMENT CUT**



**RIGID PAVEMENT NOTES**

**PAVEMENT REMOVAL AND REPLACEMENT**

High early strength cement concrete (3000 psi) meeting the requirements of Standard Specification 346 shall be used for rigid pavement replacement.

Pavement shall be mechanically sawed and restored to conform with existing pavement joints within 12 hours (See Index No. 305).

**GRANULAR BACKFILL**

Any edgdrain system that is removed shall be replaced with the same type materials. Any edgdrain system that is damaged shall be repaired with methods approved by the Engineer.

Fill material shall be placed in accordance with the Standard Specifications. Fill material shall be compacted in accordance with Index No. 305.

In Stage #1, construct compacted fill beneath the haunches of the pipe, using mechanical tamps suitable for this purpose. This compaction applies to the material placed beneath the haunches of the pipe and above any bedding.

In Stage #2, construct fill along the sides of the pipe and up to the bottom of the existing pavement.

**\* FLOWABLE FILL OPTION**

If mechanical compaction can not be achieved through normal mechanical methods then flowable fill may be used.

Flowable fill is to be placed in accordance with Section 121 of the Specifications, as approved by the Engineer.

Do not allow the utility being installed to float. If a method is provided to prevent flotation from occurring, Stages #1 and #2 can be combined, if approved by the Engineer.

In Stage #1, place flowable fill midway up on both sides of the utility. Allow to harden before placing Stage #2.

In Stage #2, place flowable fill to the bottom of the stone layer.

**RIGID PAVEMENT CUT**

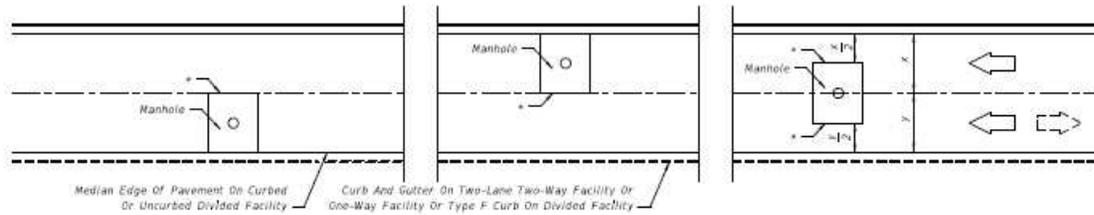
**TRENCH CUTS AND RESTORATIONS ACROSS ROADWAYS**

**GENERAL NOTES**

- The details provided in this standard index apply to cases in which jack and bore or directional boring methods are not required by the Engineer.
- Flowable fill shall not be placed directly over loose, or high plastic, or muck material (see Index 505) which will cause settlement due to fill weight. Where highly compressible material exists, the amount, shape and depth of flowable fill must be engineered to prevent pavement settlement.
- These details do not apply to utility cuts longitudinal to the centerline of the roadway which may require the additional use of geotextiles, special bedding and backfill, or other special requirements.
- Method of construction must be approved by the Engineer.
- Some pipe may require special granular backfill up to 6" above top of pipe. Geotextiles may be required to encapsulate the special granular material.
- Where asphalt concrete overlays exist over full slab concrete pavement, the replacement pavement shall have an overlay constructed over the replacement slab. The overlay shall match the existing asphalt pavement thickness. The replacement friction course shall match the existing friction course, except structural course may be used in lieu of dense graded friction course.
- All shoulder pavement, curb, curb and gutter, and their substructure disturbed by utility trench cut construction shall be restored in kind.
- The use of flowable fill to reduce the time traffic is taken off a facility is acceptable but must have prior approval by the Engineer. Flowable fill use is allowed only when properly engineered for pavement crossings, whether straight or diagonal, and shall not be installed for significant depths or lengths. The maximum length shall be fifty (50) feet and a maximum depth of six (6) feet unless supported by an engineering document prepared by a registered professional engineer that specializes in soils engineering. The engineering document shall address the evaluation of local groundwater flow interruption and settlement potential.
- Excavatable flowable fill is to be used when the flowable fill option is selected.

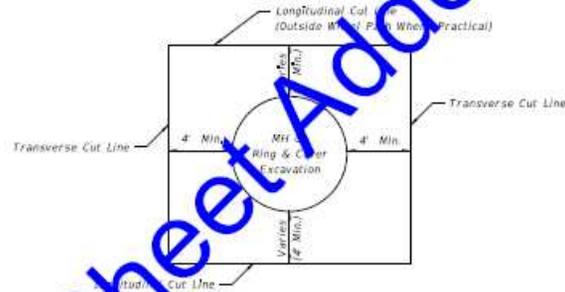
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|               |              |   |   |                                      |           |           |
|---------------|--------------|---|---|--------------------------------------|-----------|-----------|
| LAST REVISION | DESCRIPTION: |  | <b>FDOT DESIGN STANDARDS</b><br><b>2013</b> | <b>MISCELLANEOUS UTILITY DETAILS</b> | INDEX NO. | SHEET NO. |
| 07/01/12      |              |   |   |                                      | 307       | 1         |



\* Longitudinal Cut Lines For Both Curbed And Uncurbed Facilities Must Coincide With A Regular Seam Or Midlane Point In Order To Be Outside The Wheel Path

**PLAN VIEW  
FOR TWO OR MORE LANES (TWO LANES SHOWN)**



**PARTIAL CUTS FOR RING AND COVER ADJUSTMENTS**

**NOTES**

1. No irregular seams are permitted. All seams must be clean sawed.
2. Pavement cut seams for underground utility structures in rigid pavement are the same longitudinally, but the transverse seams shall extend to the nearest existing joint.
3. See Sheet 1 for replacement pavement.

**NONTRENCH PAVEMENT CUTS FOR UNDERGROUND UTILITY STRUCTURES IN PAVEMENT**

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| LAST REVISION | DESCRIPTION: | <b>FDOT DESIGN STANDARDS</b><br>2013 | <b>MISCELLANEOUS UTILITY DETAILS</b> | INDEX NO. | SHEET NO. |
| 04            |              |                                      |                                      | 307       | 3         |

**425-6.7 Adjusting Existing Structures:** Cut down or extend existing manholes, catch basins, inlets, valve boxes, etc., within the limits of the proposed work, to meet the finished grade of the proposed pavement, or if outside of the proposed pavement area, to the finished grade designated in the Plans for such structures. Use materials and construction methods which meet the requirements specified above to cut down or extend the existing structures.

The Contractor may extend manholes needing to be raised using adjustable extension rings of the type which do not require the removal of the existing manhole frame. Use an extension device that provides positive locking action and permits adjustment in height as well as diameter and meets the approval of the Engineer.

When a three-piece adjustable frame and cover is installed, make adjustments using the inner frame in accordance with the manufacturer's installation recommendations so the inner frame and cover meet the grade and slope of the pavement surface opened to traffic.

**555-4.3 Product Bore Hole Diameter:** Minimize potential damage from soil displacement/settlement by limiting the ratio of the bore hole to the product size. The size of the back reamer bit or pilot bit, if no back reaming is required, will be limited relative to the product diameter to be installed as follows:

| <u>Maximum Pilot or Back-Reamer Bit Diameter When Rotated 360 Degrees</u>  |                                    |
|--|------------------------------------|
| <u>Outside Pipe Diameter Inches*</u>                                       | <u>Maximum Bit Diameter Inches</u> |
| <u>&lt;8</u>   | <u>Diameter + 4</u>                |
| <u>8 to 24</u>   | <u>1.5 x Diameter</u>              |
| <u>&gt;24</u>  | <u>Diameter + 12</u>               |
| <u>*Use manufacturer's recommendation for pipe with restrained joints.</u> |                                    |

**555-4.4 Drilling Fluids:** Use a mixture of bentonite clay or other approved stabilizing agent mixed with potable water with a minimum pH of 6.0 to create the drilling fluid for lubrication and soil stabilization. Do not use any other chemicals or polymer surfactants in the drilling fluid without written consent from the Engineer. Certify to the Engineer in writing that any chemicals to be added are environmentally safe and not harmful or corrosive to the facility. Identify the source of water for mixing the drilling fluid. Any water source used other than a potable water source may require a pH test.

**556-2 Materials:**

~~Select materials approved for installation within the right-of-way based on their suitability for the construction method as defined in Table 556-2.1. After determining product suitability, individual material standards as contained in Table 556-2.2 apply.~~

**Table 556-2.1**  
**Product Suitability by Construction Method**

| Type            | Pipe/Casing Installation Mode | Suitable Pipe/Casing                 |
|-----------------|-------------------------------|--------------------------------------|
| Jack and Bore   | Jacking                       | Steel, Plastic                       |
| Micro-tunneling | Jacking                       | DI, FRPM, PC, PCCP, RCCP, RCP, Steel |

**Table 556-2.2**  
**Material Standards Acceptable for J&B and MT Installations**

| Material Type                               | Non-Pressure  | Pressure                           |
|---|---|------------------------------------|
| Ductile Iron (DI)                           | AWWA C150/C151<br>ASTM A716, A747                         | AWWA C150/C151                     |
| Fiberglass Reinforced Polymer Mortar (FRPM) | ASTM D 3262   | ASTM D 3517<br>AWWA C950           |
| Polymer Concrete (PC)                       | DIN 54815-1 & 2   | N/A                                |
| Prestressed Concrete Cylinder Pipe (PCCP)   | N/A   | AWWA C300                          |
| Reinforced Concrete Cylinder Pipe (RCCP)    | N/A   | ASTM C361                          |
| Reinforced Concrete Pipe (RCP)              | ASTM C 76   | ASTM C361<br>AWWA C300/C302        |
| Steel                                       | ASTM A139 Grade B <sup>(1)</sup><br>API 2B <sup>(2)</sup> | AWWA C200<br>API 2B <sup>(2)</sup> |
| Polyvinyl Chloride (PVC)                    | ASTM D 1785   | N/A                                |
| Polyethylene (PE)                           | ASTM D 2447<br>ASTM D 2513 FOR GAS<br>> 3 Inches          | N/A                                |
| Polybutylene (PB)                           | ASTM D 2662   | N/A                                |

|   |  |                |
|---|--|----------------|
| <del>Cellulose Acetate Butyrate (CAB)</del>                                     | <del>ASTM D 1503</del>                   | <del>N/A</del> |
| <del>Acrylonitrile Butadiene Styrene (ABS)</del>                                | <del>ASTM D 1527</del>                   | <del>N/A</del> |
| <del>Reinforced Thermosetting Resin Pipe (RTRP)</del>                           | <del>ASTM D 2296 OR<br/>ASTM D2997</del> | <del>N/A</del> |
| <del>(1) No hydrostatic test required<br/>(2) Dimensional tolerances only</del> |  |                |

Unless otherwise tested and approved by the Department, only use encasement pipe or uncased carrier pipe material that is new and has smooth interior and exterior walls.

**556-2.1 Steel Pipe Casing and Welds:** In addition to meeting or exceeding the conditions contained in Tables 556-2.1 and Table 556-2.2, meet the following requirements:

- (a) The size of the steel casing must be at least 6 inches larger than the largest outside diameter of the carrier.
  - (b) The casing pipe must be straight seam pipe or seamless pipe.
  - (c) All steel pipe may be bare inside and out, with the manufacturer's recommended minimum nominal wall thicknesses to meet the greater of either installation, loading or carrier requirements.
  - (d) All steel casing pipe must be square cut and have dead even lengths which are compatible with the J&B equipment.
- Use steel pipe casings and welds meeting or exceeding the thickness requirements to achieve the service life requirements noted in the Department Drainage Manual Chapter 6. For purposes of determining service life, ensure that casings installed under roadways meet or exceed cross drain requirements and casings under driveways meet or exceed side drain pipe requirements. For purposes of material classification, consider steel pipe casing structural plate steel pipe. Ensure that steel pipe casing of insufficient length achieves the required length through fully welded joints. Ensure that joints are air tight and continuous over the entire circumference of the pipe with a bead equal to or exceeding the minimum of either that required to meet the thickness criteria of the pipe wall for jacking and loading or service life. A qualified welder must perform all welding.

**556-2.2 Reinforced Concrete Pipe Casing:** In addition to meeting or exceeding the conditions contained in Tables 556-2.1 and Table 556-2.2, meet the following requirements:

Ensure that concrete pipe complies with the following minimum requirements:

- (a) 5,000 psi concrete compressive strength
- (b) Class III, IV, or V as required by load calculations, with a C wall
- (c) Full circular inner and/or outer reinforcing cage
- (d) Multiple layers of steel reinforcing cages, wire splices, laps and spacers are permanently secured together by welding in place
- (e) Straight outside pipe wall with no bell modification

- (f) No elliptical reinforcing steel is allowed
- (g) Single cage reinforcement with a 1-inch minimum cover from the inside wall
- (h) Double cage reinforcement with a 1-inch minimum cover from each wall
- (i) Joints are gasket type
- (j) Additional joint reinforcement

Upon installation, the Engineer may, at his discretion, require the Contractor to perform concrete wiping or injection of the joints if it is believed the joints have not maintained their water tightness during the jacking operation. No additional payment will be made for this operation.

**556-2.3 Plastic Pipe Casing:** Plastic pipe may be jacked and bored if its physical properties are sufficient, and it is rigid such that when supported or suspended at mid point it maintains a straight alignment. If plastic pipe is Jacked and Bored it may not be used as a pressurized carrier. Plastic pipe casing installed by the jack and bore method requires the use of an auger. Open end jacking without the use of an auger for continuous cleanout of the bore as the pipe is advanced is not permitted. Closed end jacking is not permitted.

**556-2.4 Pipe Couplings and Joints:** In addition to meeting or exceeding the conditions contained in Tables 556-2.1 and 556-2.2, to minimize potential for bore failure, couplings must not project at right angles from the casing diameter by more than 3/4 inch.

(a) Steel Pipe Coupling and Joints:

1. Welds must comply with 556-2.1(d) when couplings are not used or when the coupling thickness is less than the casing thickness.
2. When couplings are used the casing joint needs only to be tack welded. Couplings must have a full bead weld such that the thickness, when measured at an angle of 45 degrees to the casing and coupling interface, must be no less than the casing thickness.

(b) Plastic Pipe Couplings and Joints:

1. Must meet or exceed all ASTM strength and composition standards established for the casing material to which they are being attached.
2. Joints must be made sufficiently strong to withstand the pressures of jacking. All chemical welds must be completely set and cured before any jacking is attempted.

SAE J845 Changes:

1. Various editorial changes were made to harmonize the language with that used in other warning lights and devices standards.
2. Multiple flash patterns and cyclic patterns have been added. End users have increasingly been requesting non-repetitive flash patterns to prevent complacency.
3. Light source definition has been added.
4. Light pulse and flash definitions have been revised.
5. Optical power has been defined.
6. Multiple flash patterns that are user adjustable must be rated as the lowest performance mode.
7. Flash Rate was added to Section 5, "Tests".

8. Test Voltage – In conformance with other optical warning device reports, a tolerance has been added to the test voltages, and requirements added for 36 volt systems.
9. Environmental tests for flash rate were revised.
10. Photometric performance has been changed from flash energy to meeting a specified optical power and peak intensity. Advances in laboratory instrumentation have made it practical and cost effective to directly measure the optical power generated by an optical warning device. The direct measurement of peak intensity also is readily done with current technology.
11. The redefinition of the white boundary toward blue was added in anticipation of a change to the SAE J%&\* specification to harmonize color boundaries with the ECE standard.
12. New markings for selective coverage devices were added to provide a marking distinction between omnidirectional devices and devices with selective coverage.