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Title: FRAMES, GRATES, COVERS AND CURB BOXES			
Distribution: <input checked="" type="checkbox"/> Manufacturers (18) <input type="checkbox"/> Surveyors (33) <input checked="" type="checkbox"/> Main Office (30) <input checked="" type="checkbox"/> Consultants (34) <input checked="" type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Contractors (39) <input checked="" type="checkbox"/> Regions/Agencies (32) <input type="checkbox"/> _____ ()	Approved:  R. J. Clark, Deputy Chief Engineer Design Division <div style="text-align: right;"> 12/10/97 Date </div>		

Effective Date: This Engineering Instruction will be effective with the letting date of 04/09/1998. Any new designs for Cast Iron Frames, Grates, Covers and Curb Boxes will have to pass the proof load requirements as given in Test Method "PROOF LOADING OF CAST IRON FRAMES, GRATES, COVERS AND CURB BOXES". Before the effective date, new designs that successfully pass proof load requirements will be placed on the Department's Approved List. The current Standard Sheets for Cast Iron Articles - "CAST MANHOLE FRAMES, GRATES AND COVERS" (M655-9R1) and "CAST FRAMES AND CURB BOXES AND WELDED FRAMES" (M655-11R1) would remain effective. Any design that conforms to the current Standard Sheets would be accepted without the proof load requirements since they have been performing successfully for a number of years.

Ongoing Projects: After the effective date, a Contractor may choose to use the proof loaded new designs from the Approved List for any ongoing projects.

Transmittals: This Engineering Instruction transmits the following:

1. Modifications to Section 655 - FRAMES AND GRATES and sub-section 715-09 MALLEABLE IRON CASTINGS and a new sub-section 715-07 PROOF LOADED IRON CASTINGS for the Standard Specifications of January 2, 1995.
2. New Standard Sheets - "PROOF LOADED CAST STEEL OR IRON MANHOLE FAMES, GRATES, COVERS" (M655-12) and "WELDED FRAMES AND PROOF LOADED CAST STEEL OR IRON FRAMES AND CURB BOXES" (M655-13).
3. Revision to Standard Sheets - "PARALLEL BAR FRAMES AND GRATES" (M655-8R1), "CAST MANHOLE FRAMES, GRATES AND COVERS" (M655-9R1), "RETICULINE GRATES" (M655-10R1), and "CAST FRAMES AND CURB BOXES AND WELDED FRAMES" (M655-11R1).

New Items: Replace the five existing 655 items with the following:

OLD ITEM	NEW ITEM
655.01 M Frames and Grates (Castings)	655.0101 M Frames and Grates (Castings)
655.02 M Frames and Grates (Fabricated)	655.0201 M Frames and Grates (Fabricated)

655.03 M Frames and Grates (Parallel Bar Type)	655.0301 M Frames and Grates (Parallel Bar Type)
655.04 M Frames and Grates (Parallel Bar Type with Cast Frames)	655.0401 M Frames and Grates (Parallel Bar Type with Cast Iron Frames)
655.05 M Steel Fabricated Grates in Cast Iron Fabricated Frames	655.0501 M Steel Fabricated Grates in Cast Iron Frames

Background: Currently cast iron drainage articles are manufactured to the dimensional specifications of the Standard Sheets M655-9 and M655-11 which originated a long time ago. Since then there have been a lot of changes in manufacturing techniques and also there is reason to believe that the cast iron articles may be over-designed as depicted in the current Standard Sheets.

Changes in cast iron articles: The new Standard Sheets take into account manufacturing techniques like pattern drafts. Only controlling dimensions (with tolerances) have been specified. The manufacturer has the freedom to design some of the thicknesses and features of the articles. All testing will be conducted by the Main Office Laboratory facility. The proof load procedure is based on AASHTO M 306. The proof loading requirements will be issued by a Materials Bureau Test Method. After the cast iron articles successfully pass the tests, Materials Details for the articles will be placed on an Approved List. The old pay item numbers have been replaced as mentioned above.

The openings of the manhole grate have been re-designed to make the grate bicycle safe.

Proof Load: Since cast iron is a brittle material, fatigue load becomes an important consideration for its design. The Research Bureau has determined that a factor of safety of 2.5 would adequately take fatigue into account. Including a 30% impact factor, the minimum proof load for HS20 loading works out to be 222.4 kN. To take into account the variability of the strength of iron after it is cast, a graph of proof load versus the B-Bar tensile strength of the cast iron material was developed. This graph is based on Table 2 of AASHTO M 105, since our critical loading condition is in flexure.

Changes in the other standard sheets: The parallel bar grates have been made more bicycle safe by requiring the top surface of the cross bars to be flush with that of the bearing bars (M655-8R1). The openings of the manhole grate have been re-designed to make the grate bicycle safe (M655-9R1). The minimum material strength of the longitudinal bars for 10PCB, 11PCB, 12PCB, G1, G2, G3 grates has been increased, so they now have to meet the requirements of ASTM A529M Gr. 345 (M655-8R1 and M655-10R1). The stirrups on the drilled legs of the welded frames have been eliminated (M655-11R1).

Contact Persons: Questions regarding this Engineering Instruction should be directed to Pratip Lahiri (518-457-4090) of the Design Quality Assurance Bureau or Dave Graves (518-457-4285) of the Materials Bureau.

FRAMES, GRATES AND COVERS

Make the following changes to the Standard Specifications of January 2, 1995:

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Under SECTION 655 - FRAMES AND GRATES, replace Title, §655-1, and §655-2 in their entirety with the following:

"SECTION 655 - FRAMES, GRATES AND COVERS

655-1 DESCRIPTION. This work shall consist of furnishing and placing frames, grates, covers and curb boxes for drainage structures as shown on the plans or as directed by the Engineer.

655-2 MATERIALS

655-2.01 Castings. All gratings, covers, frames and curb boxes shall meet the requirements of §715-02, Steel Castings, Grade N-1; or §715-07, Proof Loaded Iron Castings, Class No. 30B or Class No. 35B; or §715-09, Malleable Iron Castings, Grade 22010, at the Contractor's option. All cast gratings, covers, frames and curb boxes shall be selected from the Department's Approved List unless manufactured in conformance to the Standard Sheets "CAST MANHOLE FRAMES, GRATES AND COVERS" (M655-9R1) AND "CAST FRAMES AND CURB BOXES AND WELDED FRAMES" (M655-11R1). No substitutions will be allowed.

655-2.02 Fabricated Articles. All frames, grates and appurtenant parts shall be fabricated from steel conforming to ASTM A36M, AISI Grade 1020 Steel, AISI Grade 1025 Steel, or ASTM A529M Gr. 345, except that the longitudinal bars for grates G1, G2, G3, 10 PCB, 11 PCB and 12 PCB shall meet the requirements of ASTM A529M, Gr. 345. Welding or splicing by welding of any member of the frame or grate, other than the welds shown on the standard sheets, plans, approved shop drawings, approved Materials Details, or in the proposal will not be permitted. Galvanizing shall be in accordance with §719-01 Type I, unless indicated otherwise.

Welding shall comply with the requirements specified in the New York State Steel Construction Manual, except that radiographic inspection will not be required."

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Replace **715-07 AND 715-08 (VACANT)** with the following:

"715-07 PROOF LOADED IRON CASTINGS

SCOPE. This specification covers material and testing requirements for proof loaded iron castings.

MATERIAL REQUIREMENTS. Iron castings shall conform to the requirements of AASHTO M 105 - Class 30B or Class 35B. Castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow holes and other defects at locations affecting their strength and value for the service intended.

Grates, covers and curb boxes shall have continuous, full, and uniform bearing contact with their corresponding frames and shall be non-rocking when in place and under the influence of traffic or other loads. Methods that are permissible to achieve secure non-rocking fit between grates, covers and their corresponding frames are:

- A. Ground mating surfaces.
- B. Machined and milled mating surfaces (horizontal and/or vertical).

All gratings, covers, frames and curb boxes shall be delivered to the work site free of any coatings unless specified otherwise.

Castings shall be boldly filleted at angles and the arises shall be sharp and perfect.

Castings having blow holes plugged or filled with putty or cement of any kind will be rejected.

Castings that fail to meet the requirements of this specification shall be rejected and immediately removed from the work site.

APPROVED LIST. All iron castings conforming to the requirements of Standard Sheets "CAST MANHOLE FRAMES, GRATES AND COVERS" (M655-9R1) and "CAST FRAMES AND CURB BOXES AND WELDED FRAMES" (M655-11R1) will be approved without any proof load requirements. No Materials Details need be prepared for those articles.

For all other iron castings Materials Details shall be prepared and submitted to the Director of Materials Bureau for approval. All dimensions shall conform to those depicted on the standard sheets - "PROOF LOADED CAST STEEL OR IRON MANHOLE FRAMES, GRATES, COVERS" (M655-12) and "WELDED FRAMES AND PROOF LOADED CAST STEEL OR IRON FRAMES AND CURB BOXES" (M655-13). Also the articles will be proof load tested in accordance to the Department's Test Method "PROOF LOADING OF CAST IRON FRAMES, GRATES, COVERS AND CURB BOXES", a copy of which may be obtained from the Director of Materials Bureau. After the proof load tests are successful and the drawings are approved, the manufacturer's name, material details reference number and approval date will be placed on the Department's Approved List.

MATERIALS DETAILS. All dimensions, including specified tolerances, in the Material Details shall be within the limits specified on the standard sheets - "PROOF LOADED CAST STEEL OR IRON MANHOLE FRAMES, GRATES, COVERS" (M655-12) and "WELDED FRAMES AND PROOF LOADED CAST STEEL OR IRON FRAMES AND CURB BOXES" (M655-13). Corresponding section thicknesses of frames F1, F2 and F3 shall be same unless load tested. Corresponding section thicknesses and number of stiffeners of the mountable and unmountable curb boxes shall be same. Also corresponding section thicknesses and number of stiffeners of all curb boxes (CUs and CMs) shall be same unless load tested. The Class of iron to be used shall be clearly identified. Payment areas as indicated on the Standard Sheets shall be included.

TESTING FACILITY. The Department's laboratory will conduct the proof load testing for acceptance of the design.

SAMPLES AND SUBMISSIONS. The manufacturer/supplier shall provide the following to the Materials Bureau before any testing can begin:

1. Two (2) copies of the Material Details for each iron casting that needs to be approved.
2. Two (2) samples of each cast iron article to be load tested as directed by the Materials Bureau.
3. One (1) sample of corresponding reticuline grate and any nuts and bolts required for assembly.
4. Two (2) B-Bar test specimens cast within an hour of casting each of the test samples and machined as per AASHTO M 105. Both ends of the specimen shall be machined to 28.5 mm X 7 threads per 25 mm.

It is the manufacturer/supplier's responsibility to remove in an expedient manner all supplied material from the Department's premises after the tests are done.

FAILURE CRITERIA. The design of an iron casting will be rejected if each of the following conditions are not met:

Permanent Set: This criterion applies to cast iron grate and cover. The maximum permanent set in any article, measured relative to a fixed horizontal plane, shall not exceed the lesser of 3.0 mm or $\frac{1}{150}$ of the clear opening.

Cracks: All articles will be inspected after the completion of each test. No part of any article shall break or have any cracks.

RETESTS AND RE-SUBMISSIONS. If the dimensions of the article(s) do not fall within the limits of the Material Details, either new article(s) or new Details shall be submitted at the

manufacturer's option. Upon failure under proof loading no retests will be allowed. Complete new designs shall be submitted for further testing.

QUALITY ASSURANCE DURING PRODUCTION. The B-Bar test results for each lot of castings (a lot is defined as per AASHTO M 105) shall be maintained by the foundry for a period of seven (7) years and shall be made available to the Department upon request. Although proof load testing is not required during the production phase, the Department reserves the right to test any piece at any time.

BASIS OF ACCEPTANCE. Cast iron frames, grates, covers and curb boxes shall be accepted at the project site based on the manufacturer's name appearing on the Approved List, conformance to the approved Materials Details or Standard Sheets, and the required manufacturer's certifications. For each Contract supplied, the following shall be provided to the Engineer:

- A. The manufacturer shall provide certification that every piece of cast iron frame, grate, cover and curb box supplied was manufactured in accordance with these specifications and the approved Materials Details or Standard Sheets - "CAST MANHOLE FRAMES, GRATES AND COVERS" (M655-9R1) and "CAST FRAMES AND CURB BOXES AND WELDED FRAMES" (M655-11R1).
- B. Two (2) copies of the approved Material Details, identified by reference number and approval date as shown on the Approved List.

715-08 (VACANT)"

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Under 715-05 IRON CASTINGS, replace **SCOPE** with the following:

"SCOPE. Iron castings shall conform to the requirements of ASTM A48, Class 30B or Class 35B, unless specified otherwise."

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Under 715-09 MALLEABLE IRON CASTINGS, replace **SCOPE** with the following:

"SCOPE. Malleable Iron Castings shall conform to the requirements of ASTM A47M. The Grade shall be Grade 22010 unless Grade 22018 is required by the plans or specifications."