January 10, 2018

MMFX Technologies Corp.
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Toll Free: (866)-466-7878
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David.Miller@mmfx.com

Attention: David Miller

RE: MMFX ChromX 2100 & 4100 (Submission Date: September 2017)

Attached is the Product Evaluation Form of the above noted products which has been reviewed following the New Product Evaluation Process.

These products will be included in the Alberta Transportation Products list as Potential Products under the following category:

- Reinforcing Steel

These products will be listed until February, 2021 at which time it may be removed from the list if it has not been used on a department project.

It is important to note that these products will be listed as ‘Potential’ products only. Final acceptance as a ‘Proven Product’ will be based on field performance evaluation conducted by the Department. Please refer to the Product Evaluation Flow Chart below for more details on how a new submission is evaluated by the department: [http://www.transportation.alberta.ca/Content/doctype253/production/processflowchart.pdf](http://www.transportation.alberta.ca/Content/doctype253/production/processflowchart.pdf)

The Product Evaluation Form also states the restriction(s) imposed by the department in regards to its use on various bridge components.

Inclusion of your products on the Alberta Transportation Products List does not guarantee that it will be used by the Department. It is your responsibility to promote these products to the Consulting and Contracting industries in Alberta. It is also your responsibility to inform this office of the use of your products on Alberta Transportation projects at which time the product status would be upgraded to Trial status. Before use of these products, prior written approval of the Director of Bridge Engineering Branch, Technical Services Section is also required.

The Department reserves the right to remove any product or products from the Products List at any time if the performance is deemed unacceptable.

Sincerely,

Junaid Iqbal, P.Eng.
Bridge Materials Engineer, Technical Services Section

Cc:
   Roger Skirrow
   Rishi Adhikari
   Joe Filice
   Dave Besuyen
   Mike Tokar
Product ID: 8220-1-8
Initiation Date: Sep 28, 2017
Revision Date: Jan 09, 2018
Expiry Date: Feb 09, 2021

Product Evaluation

RE: Review of MMFX ChromX 2100

PRODUCT
ChrōmX 2100 Grade 100 [690] are high strength reinforcing steel bars which are specified as ASTM A1035/A1035 M Type CL Grade 100 [690]. These bars have lower corrosion resistance than either ChromX 9000 or 4000 series bars and are produced in similar manner to ChromX 9000 series bar with lower chromium (Cr) content and higher carbon (C) content than either the 9000 or 4000 series.

VENDOR CLAIMS AND INFORMATION

CLAIMS
MMFX ChromX 2100 Reinforcing Steel has improved corrosion resistant and equal, or in many cases, far superior to existing conventional carbon steel in its properties of strength, energy absorption, toughness, brittleness, ductility, and formability. MMFX steel achieves its superior properties of corrosion resistance as a result of the patented and proprietary steel microstructure that is formed during production. Web link for this product: www.mmfx.com

DESCRIPTION
Microcomposite Multistructural Formable Steel (MMFX) is steel that has unique and different microstructures which have enhanced corrosion resistance and mechanical properties over other conventional standard steels to suit the needs of advancing construction technologies. MMFX steels are highly corrosion resistant without the use of coating technologies as a result of the patented chemical composition and proprietary steel microstructure that is formed during their production associated with controlled rolling and cooling of the steels. This unique physical feature minimizes the formation of micro galvanic cells in the steel structure, hence minimizing corrosion initiation.

POTENTIAL USAGE
ChrōmX 2100 (ASTM A1035 Grade 100 Type CL) bars are appropriate for use in bridge (girders, columns, and abutments), retaining walls, pavement (dowel bars and lane tie bars) and other related cast-in-place and precast reinforced concrete members.

STANDARDS
MMFX ChromX 2100 Reinforcing Steel meets the requirements of ASTM A1035/1035M rebar standards.

ALBERTA TRANSPORTATION COMMENTS

EXPERIENCE
Alberta Transportation has no experience with this product.

As per 2017 Standard Specifications for Bridge Construction and Bridge Structures Design Criteria (Version 8.0), only Low carbon/chromium reinforcing steel shall be permitted, meeting the requirements of ASTM A1035. The alloy type shall be CS (ChromX 9100) and the minimum yield strength based on the 0.2% offset method shall be equal to 690 MPa.

APPLICABLE STANDARDS
• 2017 Standard Specifications for Bridge Construction, Section 5, Reinforcing Steel
• Bridge Structures Design Criteria Version 8.0
RECOMMENDATIONS
ChromX 2100 Reinforcing Steel will be listed as a Potential Product under Alberta Transportation's Products List, Reinforcing Steel – Proprietary, based on the information provided. Final acceptance as a proven product will be based on field performance.

RESTRICTIONS
ChromX 2100 Reinforcing Steel may only be considered for use in substructure components (foundations, piers, and abutments) where the use of the high strength properties may effectively reduce the reinforcing steel congestion and improve constructability. ChromX2100 may not be used as approach slab connection dowels or in areas where increased corrosion protection is warranted.

It is to be noted that as per Bridge Structure Design criteria V8.0 Section 5.6.2, the design and proportioning of the low carbon/chromium steel reinforcing bar, including hooks, development lengths and bar splices, shall be based on yield strength of 500MPa. In essence although 690MPa yield strength is a requirement but in design Maximum 500 MPA yield strength shall be used.

The use of ChromX 2100 Reinforcing Steel requires prior written approval of the Director of Bridge Engineering Section of Technical Services Branch.

TRIAL PROJECTS

Junaid Iqbal
Erum Mohsin
Cc: Innovation Evaluation Group – Roger Skirrow
    Mike Tokar
    Dave Besuyen
    Joe Filice
Product Evaluation

RE: Review of MMFX ChrōmX 4100

PRODUCT
ChrōmX 4100 Grade 100 [690] are high strength reinforcing steel bars which are specified as ASTM A1035/A1035 M Type CM Grade 100[ [690]. These bars have moderate corrosion resistance than either ChromX 9000 series bars and are produced in similar manner to ChromX 9000 series bar with lower chromium (Cr) content and higher carbon (C) content than either the 9000 series bars.

VENDOR CLAIMS AND INFORMATION

CLAIMS
MMFX ChromX 4100 Reinforcing Steel has improved corrosion resistant and equal, or in many cases, far superior to existing conventional carbon steel in its properties of strength, energy absorption, toughness, brittleness, ductility, and formability. MMFX steel achieves its superior properties of corrosion resistance as a result of the patented and proprietary steel microstructure that is formed during production. Web link for this product: www.mmfx.com

DESCRIPTION
Microcomposite Multistructural Formable Steel (MMFX) is steel that has unique and different microstructures which have enhanced corrosion resistance and mechanical properties over other conventional standard steels to suit the needs of advancing construction technologies. MMFX steels are highly corrosion resistant without the use of coating technologies as a result of the patented chemical composition and proprietary steel microstructure that is formed during their production associated with controlled rolling and cooling of the steels. This unique physical feature minimizes the formation of micro galvanic cells in the steel structure, hence minimizing corrosion initiation.

POTENTIAL USAGE
ChrōmX 4100 (ASTM A1035 Grade 100 Type CM) bars are appropriate for use in bridge (decks, girders, columns, and abutments), retaining walls, marine facilities (docks, piers, fenders, etc.), pavement (dowel bars and lane tie bars) and other related cast-in-place and precast reinforced concrete members.

STANDARDS
MMFX ChromX 4100 Reinforcing Steel meets the requirements of ASTM A1035/1035M rebar standards.

EXPERIENCE
Alberta Transportation has no experience with this product.

As per 2017 Standard Specifications for Bridge Construction and Bridge Structures Design Criteria (Version 8.0), only Low carbon/chromium reinforcing steel shall be permitted, meeting the requirements of ASTM A1035. The alloy type shall be CS (ChromX 9100) and the minimum yield strength based on the 0.2% offset method shall be equal to 690 MPa.

APPLICABLE STANDARDS
- 2017 Standard Specifications for Bridge Construction, Section 5, Reinforcing Steel
- Bridge Structures Design Criteria Version 8.0
RECOMMENDATIONS
ChromX 4100 Reinforcing Steel will be listed as a Potential Product under Alberta Transportation’s Products List, Reinforcing Steel – Proprietary, based on the information provided. Final acceptance as a proven product will be based on field performance.

RESTRICTIONS
ChromX 4100 Reinforcing Steel may only be considered for use in substructure components (foundations, piers, and abutments) where the use of the high strength properties may effectively reduce the reinforcing steel congestion and improve constructability. ChromX4100 may not be used as approach slab connection dowels or in areas where increased corrosion protection is warranted.

It is to be noted that as per Bridge Structure Design criteria V8.0 Section 5.6.2, the design and proportioning of the low carbon/chromium steel reinforcing bar, including hooks, development lengths and bar splices, shall be based on yield strength of 500MPa. In essence although 690MPa yield strength is a requirement but in design Maximum 500 MPA yield strength shall be used.

*The use of ChromX 4100 Reinforcing Steel requires prior written approval of the Director of Bridge Engineering Section of Technical Services Branch.*

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