

Components and Systems suitable for World Markets and Export to North America



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Key international markets for industrial machinery and panel builders



Many countries world-wide, as well as various shipboard classification agencies, require product approvals and rely on IEC standards.

Approvals are a requirement for export to North America. Individual component standards and localized installation practices, in addition to specialized market conventions, need to be followed.

Approvals and Certifications

Approval standards for switching and protective devices are based on regional, country specific or application based certification standards specifically geared towards the proper application of these products in those markets.

- Additional testing conducted by nationally recognized testing authorities are often required, and certain approvals are subject to periodic review and reexamination as a pre-condition for their certification.
- In the majority of cases, product certification is tied to the display of respective approval marks on the product themselves.
- Certain approvals may mandate possible changes from IEC based technical rating values.

- Product approvals are sometimes subject to specific conditions of acceptability.
- Flexibility on the part of manufacturers can occasionally be affected by the fact that each product modification may be subject to a re-submittal.

The meaning and purpose of approvals

The question as to whether an approval process necessarily leads to increased quality and higher degree of product safety, or whether the need to approve is motivated by purely economical interests, is generally dependent on the country involved.

- Switching and protective devices which conform to IEC standards are amongst the most efficient, safest and technologically advanced products available in the world today.

- IEC switching and protective devices have been installed in large quantities world-wide, and proven themselves in the most demanding of applications.
- Most approval processes no longer lead to an enhanced and verifiable improvement in quality.
- North American standards put great emphasis in the prevention of fire. The high requirements imposed on plastics lead to a higher level of quality in the global market place.
- North American standards, particularly in the area of circuit breakers, are amongst the most stringent.
- In North America, the approval process through neutral, nationally recognized testing laboratories is considered to provide an additional layer of product quality guarantee. (*Third Party Approval*).

Globally, approvals and certifications are varied and wide ranging.



The export market to North America takes on special considerations in view of product standards and market conventions which can markedly differ from those in most countries operating under the IEC umbrella.

The export of goods to North America is both economically and strategically vital for European machine manufacturers and panel builders! A viable reason to approach this market with a sound knowledge of North American requirements. The ability to export is a vital and powerful tool in today's global marketplace.

What do North Americans expect from exporters?



- Sound knowledge of North American safety and installation standards, particularly:
 - The NEC and CEC
 - UL 508 / CSA 22.2 No. 14,
 - UL 489 / CSA 22.2 No. 5-02
 - NFPA 79 (*Industrial Machinery Panels*),
 - UL 508A (*Industrial Control Panels*)
- Understanding of North American market conventions:
 - Environmental Ratings per NEC/CEC (UL/CSA Type 12, 4X etc...)
 - Electrical data given in HP, *Pilot Duties*, AWG sizes etc...
 - Product approvals + NEC/CEC determine the proper application of components and systems.

What has proven itself world-wide for many generations doesn't necessarily make it an acceptable practice in North America.

Example: Motor Protective switches require additional verification as *UL 508 Type E and F combination starters* for proper application in North America.

The electrical inspector in North America: *Authority Having Jurisdiction*



Electrical equipment in North America, including controls and systems for industrial machinery, are subject to approvals by local electrical inspection authorities (AHJs).

- Local city and state ordinances may also be applicable in addition to NEC/CEC guidelines and UL/CSA standards.
- In the US alone, there are literally thousands of independently governed jurisdictions which could differ in the way they interpret the requirements. There always remains a risk of an approval setback at the time of commissioning.
- Without the approval of the local inspection authorities, the power to an installation may not be allowed to flow, and the ability to insure the premises would also be compromised.
- The need to follow local approval requirements is to be considered a must and is strongly recommended in all cases.
- Third party verification e.g. in the form of a UL listing label applied to a component or assembly at a suitably certified manufacturing location in the country of origin, can prove particularly helpful to a local inspector since it can greatly simplify the task of verifying that the installation is in compliance with the local installation Codes.

Special considerations, which are not readily apparent in the IEC world

- Product groupings and application relevant conditions
- Product specific differences based on scope of approval
- *Feeder and Branch Circuits*
- Application limitations based on particular supply network configurations
- Application dependent differences in product selection
- These differences often lead to misunderstandings, improper component selection and approval problems when dealing with approval authorities locally, as well as with electrical inspection authorities in North America.
- The approval issue is so complex, comprehensive and frequently associated with changes that it's really not worth it to just occasionally busy oneself with the design and planning of installations for the North American market.

Product groupings and application relevant conditions in North America

Important and fundamental differences,
which are not apparent in the IEC world!

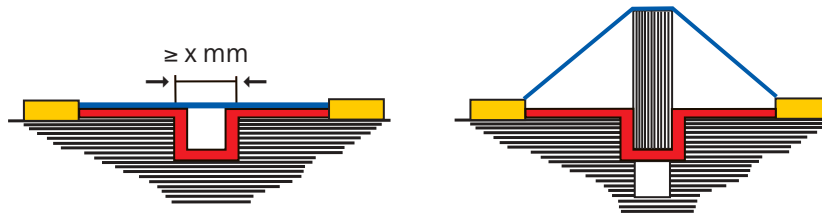
Product Groupings in North America	
Energy Distribution Equipment	Industrial Control Equipment
<i>e.g. UL 489 and CSA-C22.2 No. 5-02</i>	<i>e.g. UL 508 and CSA-C22.2 No. 14</i>
<ul style="list-style-type: none"> • Molded Case Circuit Breakers (UL 489) • Molded Case Switches (UL 489) • Safety Switches (UL 98) • Fusible Disconnect Switches (UL 98)) • Fuses (UL 248) <p><i>Note: UL \triangle CSA has similar standards UL 98 \triangle CSA-C22.2 No. 4 UL 248 \triangle CSA-C22.2 No. 248</i></p>	<ul style="list-style-type: none"> • Contactors • Control Relays • Overload Relays • Cam Switches • Pilot devices and Limit switches • Solid State relays and equipment • Programmable Controllers

There is a differentiation made in North America between products in Energy Distribution, e.g. molded case circuit breakers per UL 489, and those found in Industrial Control, typically falling under UL 508.

- Standards such as UL 489 and CSA C22.2 No. 5-02 require significantly larger air and creepage clearances than the IEC standards and their harmonized European counterparts.
- An example of its impact would be the European motor protective switch which features a large spacings terminal on its supply side for usage as a stand-alone protective switch.

Air and Creepage clearances, an important approval consideration

Example:



■ spacing over surface, creepage distance

■ spacing through air, clearance, air gap

■ live parts

Requirements for products used in Energy Distribution

- Components must be constructionally robust and feature larger electrical clearances: (for 301..600 V: 1" over air, 2" over surface).



Requirements for products used in Industrial Control

- Components are usually smaller dimensionally and the necessary clearances are not as great as the energy distribution products.

Product specific differences based on scope of approval

Example: *Listed Industrial Control Equipment*





<i>Listed Industrial Control Equipment</i> No restrictions in terms of application	<i>Recognized Component Industrial Control Equipment</i> Application based on Conditions of Acceptability
<ul style="list-style-type: none"> • Devices listed for „<i>field wiring</i>“ • „<i>factory wiring</i>“ is covered by „<i>field wiring</i>“ provisions <p>That means</p> <ul style="list-style-type: none"> - Suitable for control panels, and considered complete for field wiring in factories or panel shops. 	<ul style="list-style-type: none"> • As components, products are suitable for „<i>factory wiring</i>“ only <p>That means</p> <ul style="list-style-type: none"> - Component selection is conducted by trained personnel and subject to Conditions of Acceptability - For use in control panels; designed, wired and tested by technically trained personnel in appropriate factories and panel shops.
Mark: 	Mark: 

- Amongst industrial control (UL 508) and energy distribution products there is a difference made between unrestricted (e.g. *UL-Listed*) and conditional (*Recognized*) approvals.
- A different mark denotes each type.



Example: Motor Starter

The components of the motorstarter must be tested commonly.

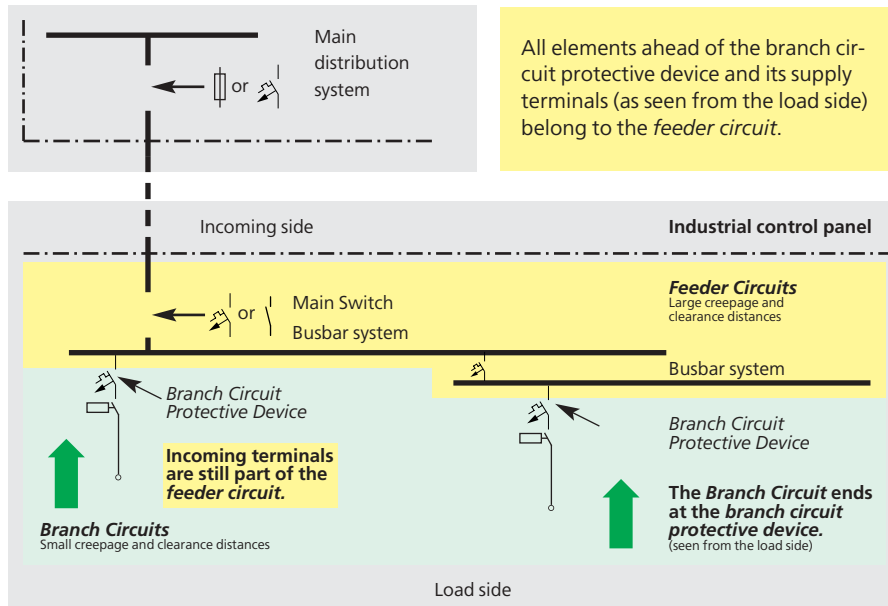
Listed Industrial Control Equipment No restrictions in terms of application	Recognized Component Industrial Control Equipment Application based on Conditions of Acceptability
	<ul style="list-style-type: none"> The devices must be completed with additional components, i.e. they are sub-elements of a more complete component configuration. <p>Application considerations: Manufacturer <i>„Conditions of Acceptability COA’s“</i> must be followed! Refer to guidelines in UL 508A SA1. Additional selection hints: Category Control Numbers</p>
Mark: 	Mark: 

An unrestricted approval does not necessarily translate into the same kind of design flexibility enjoyed in the IEC world!

- Certain groupings of components cannot always be combined with the same kind of self-determination on the part of designers and manufacturers.
- The component array must be tested as a unit, with the results tabulated in a report format.
- Generally speaking, the process involves components from a single source or manufacturer.

Important Concepts: *Feeder Circuit, Branch Circuit*

It is best to adopt these specialized terms as part of the common language.



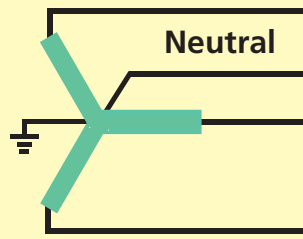
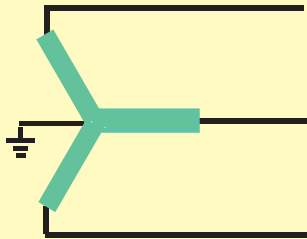
The array of *Feeder* and *Branch circuits* will have a marked impact on component selection and should be considered carefully at the design stage.

Feeder components and *branch circuit* protective devices will only allow products with large electrical spacings.

Important Concepts: *Slash*-Rated Voltage forms



Switching and protective devices, which have only been approved for use in slash rated systems, are only suitable for the supply networks pictured below.



Example of a slash rating: 480Y/277 V AC
480 V line to line; 277 V line to ground or neutral

These supply systems are indicative of grounded *slash* rated voltage networks:

USA: 480Y / 277 V

Kanada: 600Y / 347 V

/ = *Slash*

- The application of certain product groups in North America is only permissible in grounded *slash* rated systems (*Slash* rated supply systems). For example, *UL 508 Type E* and *F* combination motor starters.
- If a control panel includes a power switching component which is *slash* rated, then the control panel nameplate voltage rating must default to the *slash* rating.

Example of a component selection peculiar to North America

MCB = *Miniature Circuit Breaker*

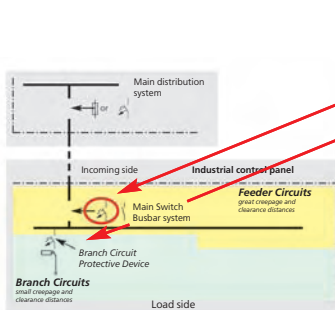
MCCB = (*Miniature*) **Molded Case Circuit Breaker**

MCCB for Feeder- and Branch Circuit Protection

MCB for Supplementary Protection

USA: **UL 489**
 Canada: **CSA C22.2 No. 5-02**
 Large electrical spacings
LISTED Component ←

USA: **UL 1077**
 Canada: **CSA C22.2 No. 235**
 Small electrical spacings
Recognized Component ←



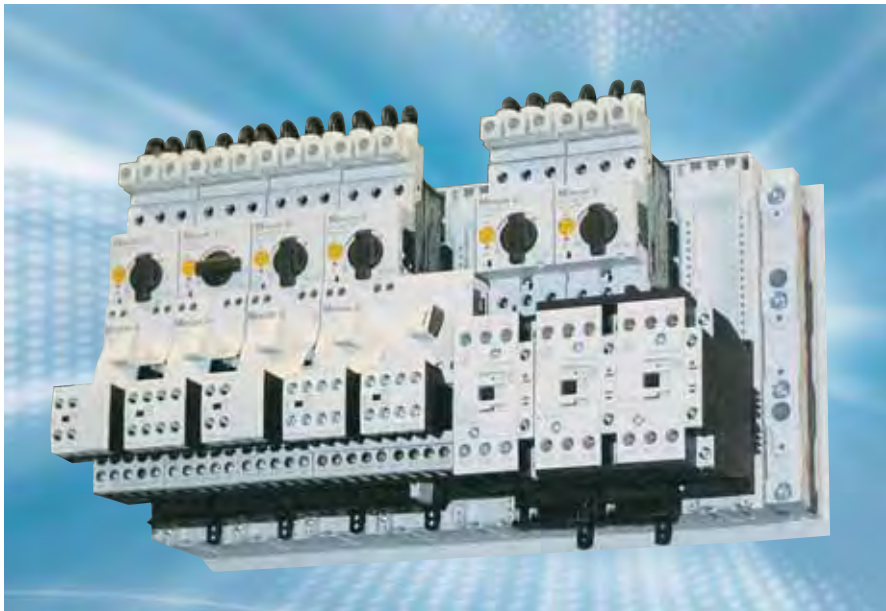
IEC / EN 60 898

Caution!
 An improper component selection in this area counts as one of the 10 most frequently made errors flagged by inspection authorities.

A significant source of error concerns the misapplication of miniature circuit breakers in North America.

- Moeller offers the *FAZ-NA* type, per UL 489, featuring larger electrical spacings and suitability as protective devices in *feeder* and *branch circuits*.
- Standard miniature circuit breakers, per UL 1077, are applicable for supplementary protection (*Supplementary Protectors*).

Motor Starters on busbar adapters, fed from *Feeder Circuit*

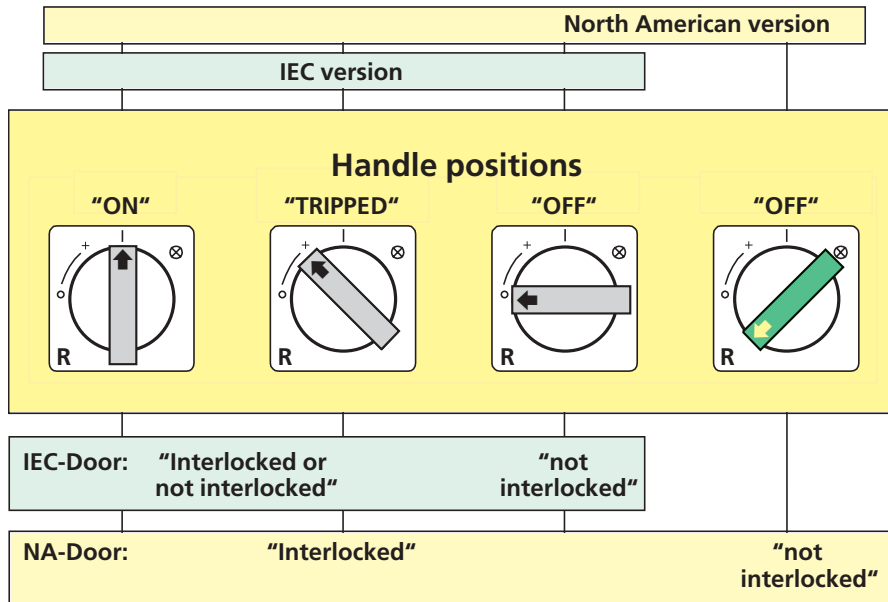


Each *Type F* combination starter makes up an individual *branch circuit*

- If a starter is mounted on a bus system supplied from a *Feeder*, the **UL 508 Type F Starter** is provided with a large spacing terminal on its incoming side.
- Only for use with certified busbar systems and parts!
- A bottom plate is necessary for mounting to maintain proper clearances!

Example of a component selection peculiar to North America

Door Mounted Rotary Handles for North America (NA- Version)



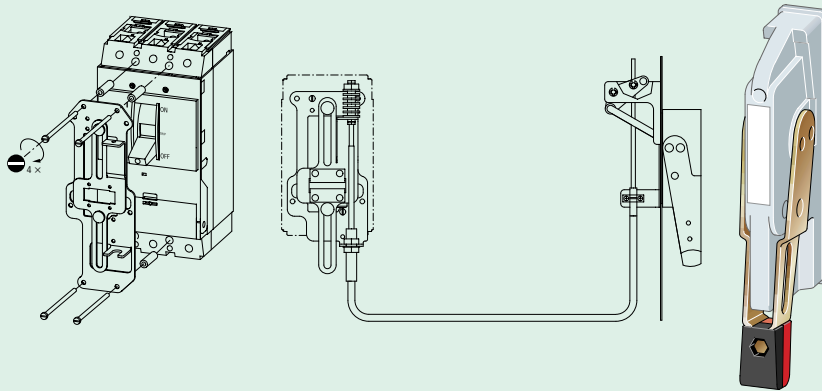
North American market conventions

A fourth position for the door mounted rotary handles

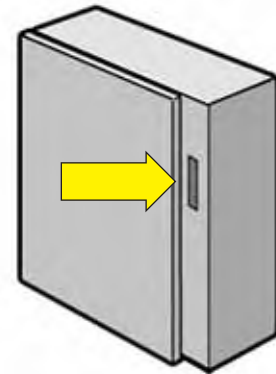
The enclosure door can only be opened in the fourth position (turning to RESET). The IEC handles with 3 positions are also approved (R = RESET)

“Flange mounted vertical motion handle”

Typical North American version of disconnect switches in accordance with NFPA 79 (*Industrial Machinery Standard*)



Typical North American enclosure with flange mount for the supply circuit disconnect handle.



A mechanical or electrical interlocking provision for all main panel enclosure doors is mandatory.

Application based component selection

Motor Starters are only suitable for switching and protecting motors!



UL 508 Type E and Type F motor starters can only protect motors and are not suitable for:

- Power Transformers
- Lighting
- Heaters
- Variable Frequency Drives*

Switching and Protection!

The regulations are more narrowly defined than IEC with respect to applications. Motor Circuit requirements are extensively described in various standards.

*Exception: A Type E device can protect a drive if it has been tested and approved for use with the drive (refer to markings on the drive).

Which fuse is the correct one to use in North America?

The use of fuses is not without its difficulties. There are many types of various sizes, and matching fuse holders can even be quite large. The focus is often placed on the very high interrupting ratings enjoyed by a great number of fuse classes, particularly in view of the emphasis on Short Circuit Ratings for control panels, but high interrupting ratings are also associated with correspondingly high let-through values which must be considered in an overall determination.

Selection and application guidelines for North American power fuses used in Feeder and Branch Circuits

Suitable for use in:		UL/CSA Standards	Characteristics	SCCR	Typical ranges in Amps	Applications	Comments
Class H, "Coke"	Class H, No. 59 "Coke"	UL 248-8 / C22.2 248-8	Fast-Acting	15kA / 250VAC 15kA / 600VAC	0...800	Residential, Commercial, Industrial	Class H, R and No. 59 "Coke" fuses are physically interchangeable and fit in the same fuseholders. Refer to comments below under Class R.
Class CC	Class CC	UL 248-4 / C22.2 248-4	Fast-Acting & Time Delay	20kA / 600VAC	0.5...30	Fast-Acting; Time Delay	Extremely compact size! Current limiting per UL/CSA Standards
Class G	Class G	UL 248-9 / C22.2 248-9	Fast-Acting Time Delay	100 / 480VAC 1 / 600VAC	21...80 0.5...20	Protection of resistive and inductive loads.	Compact size! Current limiting per UL/CSA Standards Non-interchangeable with any other fuse class
Class J	Class J HRC-J	UL 248-9 / C22.2 248-9	FF "J" type	4 / 600VAC	1...800	Appliances, Motors, Lighting, Mixed loads in Feeders and Branch Circuits.	Electrical Motors, Transformers, Lighting... Compact size! Current limiting per UL/CSA Standards! Non-interchangeable with any other fuse class
Class R, R1, R3	Class R, R1, R3	UL 248-10 / C22.2 248-10	FF "R" type	10kA, 100kA, 200kA / 600VAC	0...800		Not marked current limiting per UL/CSA Standards! That's why Class R fuses are often substituted by reaction-type Class RK... fuses.
Class L	Class L	UL 248-11 / C22.2 248-11	FF "L" type	20kA / 600VAC	801...8000		Current limiting per UL/CSA Standards! Non-interchangeable with any other fuse class.
Class R, R03, R05	Class R, HRC-R, R03, R05	UL 248-12 / C22.2 248-12	J-Acting & Time Delay	10kA, 100kA, 200kA / 600VAC	0...800		Current limiting per UL/CSA Standards! Types R03, R05 and HRC-R fit in the same reaction-type fuseholders, and are non-interchangeable with any other fuse class. R01 fuses have been set through values from R05 fuses.
Class T	Class T	UL 248-15 / C22.2 248-15	Fast-Acting	20kA / 300VAC 20kA / 600VAC	0...1200		Extremely compact size! Current limiting per UL/CSA Standards! Non-interchangeable with any other fuse class.

The characteristics and application guidelines mentioned above provide a rough overview only. For more precise information on local conditions it is recommended to consult with the end user. Most fuse types also carry DC ratings per UL and CSA standards.



For export purposes it's definitely advantageous to go fuseless. Protective switches will spare you all difficulties.

Discussions are part of the package!

Successful exports are based on more than just using approved products.

Moeller: “More than Products”



A checklist is a useful tool to clarify important issues and minimize costs during the engineering phase. Special considerations which are overlooked during the initial stages, and remedied after the fact, will not only be costly but very time consuming as well.

- In addition to product approvals, a firm understanding of the standards and market conventions involved is necessary to insure that electrical systems and assemblies are also properly applied.

Product and selection guidelines for World Markets



A sampling of more extensive technical documentation related to Export



VER1210+1280-928D
VER1210+1280-928GB



VER1210-951D
VER1210-951GB



VER1200+2100-953D
VER1200+2100-953GB




























VER1230-950D
VER1230-950GB

Selective topics on the export of low voltage system and components to North America
Free Download: <http://www.moeller.net/de/support/index.jsp>

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Shipboard approvals and classifications

For further details on certifications, consult the current edition of the Main Catalog.

														
 France	Bureau Veritas 	●	●	●	●	●	●	●	○	●	–	–	–	●
 Norway	Det Norske Veritas 	●	●	●	●	●	●	●	○	●	–	–	–	●
 Germany	Germanischer Lloyd 	●	●	●	●	●	●	●	○	●	●	–	–	●
 Great Britain	Lloyd's Register 	●	●	●	●	●	●	●	○	●	●	–	–	●
 Poland	Polski Reiestr. Statkow 	●	–	–	●	●	●	●	–	●	–	–	–	●
 Italy	Registro Italiano Navale 	–	–	●	●	●	–	●	–	–	–	–	–	●































● Approved ○ Under submittal – Not currently under submittal N No approval required

Approval Overview

World Markets

For further details on certifications, consult the current edition of the Main Catalog.

Suitable for global markets:
Availability of world market devices and approval work have always been particularly strong Moeller traits.

														
 Argentina		N	N	N	●	N	N	●	–	N	N	N	N	N
 Australia		N	N	●	●	N	N	N	N	–	–	●	●	–
 China		●	●	●	●	●	●	●	–	●	●	●	N	N
 Canada		●	●	●	●	●	●	●	●	●	–	●	●	●
 Russia		●	●	●	●	●	●	●	●	●	●	●	●	●
 South Africa		N	N	N	●	●	●	●	○	●	–	N	N	N
 Ukraine		●	●	●	●	●	●	●	●	●	●	●	●	●
 USA		●	●	●	●	●	●	●	●	●	–	●	●	●

● Approved ○ Under submittal – Not currently under submittal N No approval required