



***RUST ARREST  
SUPPLEMENTAL  
INFORMATION***

*PIN# 02040*



## PROPERTIES – PHYSICAL AND CHEMICAL

The following properties make Rust Arrest coatings uniquely versatile:

1. **Thermal Stability:** Rust Arrest will not crack, chip, peel, or sag (-40°C) to (260°C.)
2. **Thixotropic:** Rust Arrest is thixotropic and resistant to sag, run-off, or flow, particularly at high concentrations and temperatures. This property assures clean, mess-free application.
3. **Unique Structure:** The polar, platelet nature of Rust Arrest provides a structure which is a film former and rust preventive insuring dense, tight coatings with minimum moisture vapor transmission.
4. **Resistivity:** Rust Arrest has specific resistant of approximately 10 ohm-cm. This electrical resistance is equivalent of PVC and polyethylene. Rust Arrest is highly resistant to galvanic corrosion.
5. **Bacterial and Microbiological Protection:** Rust Arrest protects against attack and degradation by sulfur reducers and other bacteria, which normally accelerate corrosion, or degradation of metal and natural fibers.
6. **U.V. Resistance:** Rust Arrest is currently being used for exterior exposure from Panama to the Gulf Coast, from the Artic to West Africa because of their U.V. resistance.
7. **Non-staining:** Rust Arrest is non-staining to the metal under most conditions when used over steel, copper, aluminum, and their alloys.
8. **Fast Drying:** The solvent used in Rust Arrest has a narrow boiling range (310-375°F) aliphatic solvent with a flash point of 105°F meeting Rule 442 and Rule 443 requirements, insuring safe, fast drying properties.
9. **Consistency:** Rust Arrest is totally synthetic and consistent from batch to batch unlike many residual or naturally occurring products. Rust Arrest is carefully filtered.
10. **Moisture Displacing and Fingerprint Suppressancy:** Rust Arrest may be affected by the incorporation of 0.5-1.0% wt. Butyl Cellosolve®.



## PROPERTIES – PHYSICAL AND CHEMICAL (continued)

11. **Compatibility:** Rust Arrest dispersions are stable at recommended concentrations. Rust Arrest is compatible with all common hydrocarbon solvents aliphatic or aromatic as well as chlorinated solvents.
12. **Inert:** Rust Arrest will not attack rubber, polymers, or paint systems, which are insensitive to low Kauri-Butanol value solvents.
13. **Weldability:** Rust Arrest is weldable using standard procedures.
14. **Fire Resistance:** Rust Arrest pass the fire resistance tests specified by the U.S. Government and will not support combustion after flame source is removed.
15. **Acid Neutralization:** Rust Arrest has total base numbers ranging from 125-235 mg KOH/gm to effectively neutralize acids.
16. **Removability:** Rust Arrest is readily removed by organic solvents – aliphatic, aromatic, and chlorinated.
17. **Handling:** Rust Arrest is easily handled.
18. **Pigmentation:** Rust Arrest is easily pigmented or dyed. Oil soluble pigments are recommended over dyes due to their inherently better color stability.
19. **Blending:** Rust Arrest formulations should be blended with shear type agitation to provide the most stable products. A Cowles Dissolver provides ideal blending. With such efficient agitation no heat is necessary.
20. **Safety:** Rust Arrest is non-toxic. Rust Arrest has an acute oral LD with rats greater than 40-g/kg body weight. Acute dermal toxicity LD with rabbits is greater than 8 g/kg.



## **RUST ARREST-RUST PREVENTIVE CONCENTRATE**

Rust Arrest is a dispersion of the inorganic-organic complex, oxidized petrolatum and microcrystalline wax modification permits the formulation of firm, wax-like coatings, with improved weathering resistance. Rust Arrest based coatings may be used to provide long or short-term protection indoors or outdoors. The inclusion of wax in this product means that, for consistent results and a completely continuous film, products must be applied to provide at least 1.0 mil dry film.

This product can be used in solvent dilutions or in combination with polymers, asphalts, or petrolatums (not more than 15% added dry solids) for the formulation of automotive body rust preventives, outdoor parts storage, overseas shipment and any other application where long term protection and relative ease of removal are important.

2-3 mils gives indefinite indoor protection.

2-3 mils gives 6 months to a year effective outdoors protection in severe atmospheres.

5-6 mils gives approximately two years of outdoor protection.

Rust Arrest formulations are particularly effective in salt water and salt or ocean atmospheres.



## TYPICAL APPLICATIONS FOR RUST ARREST

### **Petroleum**

Brine separation tanks  
Casings  
Drill pipes  
Hand tools  
Machine parts  
Offshore rigs and platforms  
Pumps  
Splash guards  
Storage tanks  
Sucker rods

### **Marine**

Anchors  
Ballast coatings  
Barges  
Bearings  
Buoys  
Cables  
Engines  
Floatation coatings  
Gear Lubricants  
Pilings  
Pumps

### **Automotive**

Automobile undercoatings  
Automotive rust proofing  
Bearings  
Buses  
Cables  
Cabs  
Engines  
Frames  
Gear Lubricants  
Pumps  
Recreational vehicles  
Tanks  
Thread lubricants  
Trucks



## TYPICAL APPLICATIONS FOR RUST ARREST(continued)

### **Industrial**

Agricultural equipment

Bearings

Bridges

Cables

Chains and couplings

Coiled and sheet steel

Aluminum, copper and brass

Concrete sealing decorative indoor and outdoor coatings

Engines

Form re-lease and Preservative agents

Gear Lubricants

Guardrails

Hand tools

Machine Parts

Mobile homes

Outdoor equipment

Outdoor furniture

Pumps

Slushing oils

Storage containers

Tanks

Thread lubricants

Weatherproofing for

Structural urethane

Wire rope



## HANDLING AND STORAGE

Rust Arrest contains mineral spirits meeting requirements of rule 66, now replaced by Rule 442 and 443. They are combustible by DOT and OSHA standards and should be used and stored away from flame and in a well-ventilated atmosphere. Avoid prolonged breathing of vapors and repeated contact with skin.

Rust Arrest contains calcium sulfonate, which can cause eye burns. Prevent contact with eyes. Use chemical splash goggles. In case of contact, flush with water for 15 minutes and call a physician.

If application is by means of spray, ground the spray gun.

In case of fire, blanket with foam or dry chemical. In case of spills, use oil absorbent material for cleanup.



## FORMULATING RUST ARREST

1. Below is a suggested formulation based on Rust Arrest. Actual blends will be determined by the length of protection desired and the application method, which can be spray, dip, or brush.

40 - 65% wt.	Rust Arrest
0 - 5% wt.	Butyl Cellosolve
59.5 -34.5% wt.	Solvent

Rust Arrest formulations may be pigmented to provide decorative coatings.

2. A suggested aerosol formulation based on Rust Arrest is:

1. 56.6% Rust Arrest  
43.4% Varsol III
2. 60% Above Formulation #1  
40% Freon 12 Propellant

This aerosol formulation will provide a firm, wax-like film for prolonged indoor and outdoor protection.

3. Rust Arrest may be combined with asphalt, petrolatums, waxes, polymers, to provide a durable and weather resistant coating for automotive bodies, underground pipe, and marine coatings.

35 - 57% wt.	Rust Arrest
45 - 35% wt.	*Asphalt Cutback
0.5% wt.	Butyl Cellosolve
16.5- 4.5% wt.	Solvent
3.0% wt.	Oil (100 SSU @ 100°F Neutral Oil)

\* 50% solids; 170-210°F melting point for the basic asphalt; Penetration Number 10-30. This product suffers none of the disadvantages normally associated with asphalts and will not crack, chip, peel, or disbond with aging.





## PIGMENTATION OF RUST ARREST

Rust Arrest can easily be pigmented to any color using an oil dispersible pigment blended into Rust Arrest. Although oil soluble pigments are recommended due to their inherently color stability, dyes can also be used to impart color to Rust Arrest.

Two types of pigment dispersion are available for pigmenting Rust Arrest:

- 1) Preground pigment pastes dispersed in oil are the easiest to use when pigmenting Rust Arrest. Preground oil pigments may simply be dispersed into Rust Arrest by stirring.
- 2) The addition of dry pigment or pigments to Rust Arrest require the following steps:
  - a. Disperse the pigment or pigments in a small amount of Rust Arrest and pass the material through a ball mill to grind the pigment.
  - b. After ball-milling the pigment, it can be dispersed in the Rust Arrest by either stirring pigment into the Rust Arrest or circulating the pigment and Rust Arrest by use of a circulating pump.
- 3) Rust Arrest can be readily pigmented to the following colors utilizing 4 – 8% of the pigments listed below:

Aluminum Paste  
Bronze  
Toluidine Red Barium  
Rose Maroon

Zulu Green  
Zulu Blue  
Dustless Sunglow Yellow  
Din Orange



## RUST ARREST AEROSOL HARDWARE

- A) Rust Arrest Aerosol Composition
  - 60% Rust Arrest Aerosol Formulation
  - 40% Freon 12 Propellant
- B) Actuator - RAR 90
- C) Valve - Dip tube valve assembly, AR 74 valve no vapor tap.
- D) Gasket - Neoprene
- E) Cup - Conical uncoated, flowed in gasket
- F) Spring - Regular Spring Steel (NOT STAINLESS)
- G) Propellant - Freon 12

Note: Several points should be kept in mind when preparing Rust Arrest aerosols:

- 1) To ensure uniform mixing of the Rust Arrest and propellant (Freon 12), a “Shaker Marble” should be placed in each aerosol can.
- 2) To obtain a smooth uniform spray coating using the above aerosol hardware the recommended viscosity range of Rust Arrest should be maintained between 400 and 450 CPS.



## APPENDIX A

<b>TYPICAL VISCOSITY – DILUTION DATA – RUST ARREST</b>
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%RUST ARREST	%SOLVENT ADDED	%NON- VOLATILE	BROOKFIELD VISCOSITY @ 77°F CPS	SPINDLE NUMBER @ RPM
100	0	62	45,000	6 10
81	19	50	11,000	3 10
65	35	40	3,000	3 10
48	52	30	800	3 10
32	68	20	150	3 10

### TYPICAL SALT FOG PERFORMANCE DATA HOURS

#### RUST ARREST – yields firm wax like coating

Dry Film	Rust Arrest
0.5 mil	800+
1.0 mil	1500+
2.0 mil	2000+
5.0 mil	3000+

Salt Fog – Federal Standard 791B Method 4001.2. Panels are judged by reading the face of the panel (not the edges). Failure occurs when more than 3 dots of rust, no one of which is larger than a millimeter in diameter, appear on the face of the panel.

Note: Solvents with a boiling point between 310-340°F require a minimum of 72 hours of drying time prior to testing in the salt fog cabinet.



## RUST ARREST WEATHEROMETER TESTS

A test method to evaluate Rust Arrest other than the salt fog test is accelerated weathering test commonly referred to as the Weatherometer Test.

The weatherometer test was run in accordance with the federal Test Method 6151 that calls for exposure to high levels of UV light, moderate thermal cycling (145°F) and water spray.

Below are the laboratory's results and interpretation of the results:

<u>RUST</u>	<u>DRY FILM</u>	<u>APPROX.</u>	<u>APPROX.</u>	<u>FILM</u>	<u>HOURS OF</u>	<u>LAB</u>
<u>ARREST</u>	<u>THICKNESS</u>	<u>% AREA</u>	<u>% AREA</u>	<u>CRACKED</u>	<u>EXPOSURE</u>	<u>RESULTS</u>
		<u>STAINED</u>	<u>RUSTED</u>	<u>OR BROKEN</u>		
1 <sup>ST</sup>	1	3	0	No	300	Passes
2 <sup>nd</sup>	5	0	0	No	300	Passes

The test supports several of the claims we make concerning Rust Arrest properties:

1. Exposure of Rust Arrest to UV light, temperature variations, and moisture does not lead to the destruction of the film and subsequent failure of the coating. This is not true of the competitive products.
2. The test confirms that Rust Arrest provides the optimum in protection. They should be recommended in areas where conditions are severest such as for marine, oil field, chemical plants and automotive applications.



## **RUST ARREST DILUTION STABILTY**

Values represent solvent separation in upper layer (ml/100ml)

Concentration	1 day	3 days	1 week	2 weeks	1 month	2 months	3 months
65	0	0	0	0	0	0	0
60	0	0	0	0	0	.7	.7
55	0	0	0	0	.6	1.4	2.2
45	0	0	.7	.7	.7	3.0	4.5
35	0	1.0	1.1	1.9	3.1	6.5	11.4
25	.7	1.1	1.5	2.2	4.5	9.0	13.5
10	.7	1.2	2.2	5.8	8.8	15.4	27.2

## **RUST ARREST DIP FILM (DRY) VS VISCOSITY & NON-VOLATILE**

Rust Arrest

% Non Volatile

60%	45000 CPS / 40 MILS
50%	11000 CPS / 9.0 MILS
40%	2000 CPS / 2.5 MILS
30%	800 CPS / 0.9 MILS
20%	150 CPS / 0.2 MILS

ALL VISCOSITIES ARE MEASURED VIA BROOKFIELD VISCOSIMETER.

ALL FILM THICKNESS MEASURED BY "TOOKE INSPECTION GAGE".

Application to panel is accomplished in accordance with Fisher-Payne Dip Coater – Federal Standards 141a – Method 2121. Rate of withdrawal is 4" per minute. Not before 72 hours are the panels ready for exposure in the salt Fog and Humidity Cabinets.



## **PROTECTION FROM MICROBIOLOGICAL ATTACK**

It has been demonstrated that Rust Arrest concentrate or intermediate formulated products can protect materials from microbiological degradation. This was illustrated by coating various natural fibers with very thin film of Rust Arrest coatings. The fibers were then placed on the surface of a culture nutrient in a culture dish.

Prior to the above, cultures of various organisms known to destroy natural fibers were grown. The spores were harvested and placed in sterile water. This spore suspension was then sprayed on both the uncoated and coated fibers. An incubation period followed.

The spore suspension contained the following organisms:

Aspergillus niger  
Aspergillus ustus  
Chaetomium globosom  
Trichophyton viridi  
Myrothecium verrucaria

Several other series of experiments were conducted by exposing the cultures to atmospheric microbiological contamination.

After four months, the samples were removed from the culture. The untreated fibers could not be removed. They were completely consumed by the organisms.

In all cases, the Rust Arrest protected the fibers from degradation. This was shown by checking the tensile strength of the exposed fibers. Testing was carried out via Instron. Comparison of the exposed coated fibers with new coated fibers of the same variety, showed little, if any, difference. Further details are available if needed.



## WELDABILITY OF RUST ARREST

There is no problem in either cutting (with a torch) or welding (electric welder) steel coated with Rust Arrest formulations. A very thick coating of Rust Arrest was applied to a mild steel coupon by milling the coupon to a rough finish and dipping it in Rust Arrest 100-A coating composition. After several days' aging, the end of the coupon with a cutting torch and bead of weld was laid across the middle of the coupon with an electric welder. Where the metal became very hot the Rust Arrest coating burned. After it burned itself out to an area of cooler metal, the flame died. Beyond the burned zone, there was zone where the Rust Arrest coating blistered. Beyond that, the coating remained intact. The electric welder operated very well despite the Rust Arrest coating, with no apparent effect on the strength of the weld.

## ELECTRICAL PROPERTIES OF RUST ARREST

Rust Arrest concentrate products are extremely good electrical insulators. The resistivity, conductivity and dielectric constants are comparable to PVC, Teflon®, polyethylene, Bakelite®, nylon, Plexiglas®, etc. The actual measured data on resistivity is as follows:

<u>Material</u>	<u>Resistivity (ohm-cm )</u>
Rust Arrest	$1.3 \times 10^{15}$
Nylon	$4.0 \times 10^{14}$
Polyethylene	$1.0 \times 10^{16}$
Bakelite	$1.0 \times 10^{13}$
Plexiglas	$1.0 \times 10^{15}$
Teflon	$1.0 \times 10^{16}$
PVC	$1.0 \times 10^{14}$



## RUST ARREST REMOVABILITY

Several solvents were screened for cleaning Rust Arrest coatings. The solvents ranked (> means better than): Chlorothene > benzene > 50% benzene + 50% kerosene > hexane and toluene > xylene > wash naphtha = light cycle oil > kerosene > #2 diesel > crude oil > water, caustic solution, isopropanol, acetone and methanol, all of which failed to remove the coating at the conditions tested. Caustic and the alcohols showed a marked visual change on the surface of the coating, but very little penetration.

As expected, the rate of cleaning increases with the mechanical action. It also increases with temperature up to 150°F.

Three types of mechanical action were tested: Soak cleaning, dip cleaning, and stirred cleaning. In all tests except those at room temperature, the solvents were contained in beakers in a constant temperature bath to maintain the desired temperature. All tests were done on Q-panels coated with Rust Arrest concentrate based coatings and the cleaning was judged visually.

The soak cleaning consisted of immersing the coupon in the fluid and removing it every five minutes for inspection. The only agitation came from this periodic removal.

The dip cleaning was similar to the soak cleaning except the coupon was suspended from a windshield wiper motor and an oscillated up and down forty times per minute. At the bottom of the stroke about half the coupon was immersed. At the top of the stroke about one-fourth of the coupon remained immersed. Cleaning took place much faster on the portion of the coupon, which went in and out of the solvent. The data reported here is for the lower one-fourth of the coupon.

The stirred cleaning consisted of turning the coupon in the solvent at one hundred revolutions per minute with a Sunbeam mixer. This test gave the most mechanical action for cleaning while the soak test gave the least. The data is recorded in the attached table.





## ALKALINE WASH SYSTEMS

The preferred method of removing Rust Arrest coatings is by means of a hydrocarbon solvent system. However, there are instances where it may not be possible to use a hydrocarbon solvent to remove Rust Arrest. For example, because of flash and fume considerations, hydrocarbon solvent systems may be undesirable in certain plants. Under these circumstances, an alkaline wash may be considered for removal of Rust Arrest coatings even though it is not as effective as solvent systems.

An alkaline wash system will not remove Rust Arrest protective coating as effectively as would a hydrocarbon wash.

Rust Arrest contains wax as a matrix. Because of the wax properties, an excellent vapor barrier against moisture transmission is provided by the Rust Arrest film. The wax barrier makes ordinary alkaline wash almost completely ineffective in removing the Rust Arrest coating. In order to remove a Rust Arrest film the alkaline wash must be heated to above 180°F. This will melt the wax and allow the wash to penetrate the film and remove the Rust Arrest coating.

## PREPARING RUST ARREST DILUTIONS

Below are a series of Rust Arrest dilutions that can be prepared by diluting the Rust Arrest concentrate with any aliphatic, aromatic, or chlorinated solvent.

100 Parts				
Rust Arrest Concentrate			Expressed as Percent	
<u>Rust Arrest</u>	<u>% Non-Volatile</u>	<u>Plus Parts Solvent</u>	<u>%Rust Arrest Con.</u>	<u>%Solvent</u>
Rust Arrest	60	0	100.0	0
Rust Arrest	50	20	83.0	17.0
Rust Arrest	40	50	66.0	33.0
Rust Arrest	30	100	50.0	50.0

We should point out that the above values are typical values and slight adjustment for actual non-volatile content on each shipment must be made.



## SPRAYING CHARACTERISTICS OF RUST ARREST CONCENTRATE BASED COATINGS

The spraying characteristics for Rust Arrest coating formulations on the concentration of the Rust Arrest concentrate in solvent. Using Rust Arrest concentrate as an example, the significant data follows:

### FILM THICKNESS VS. NON VOLATILE FOR AIRLESS SPRAY EQUIPMENT APPLICATION FROM A BLEND OF:

%Non-Volatile <u>Rust Arrest</u>	Spray Wet Film Thickness ( Mils ) _____	Dry Film Thickness ( Mils ) _____
50	6	2.2
40	5	2.0
30	3.6	1.0
20	1.2	0.2

Notes on spraying Conditions and Equipment:

- |                 |   |   |
|-----------------|---|---|
| Airless Sprayer | - | Grayco Hydra-Spray<br>Model 205-591 Series R  |
| Nozzles         | - | Round Pattern Tip – 0.008 orifice<br>Fan Tip (163-311) – 0.011 orifice<br>Fan Tip (163-315) – 0.015 orifice |

- At concentrate of Rust Arrest concentrate greater than 60% by weight, the sag resistance is such that film build is within the control of the spray operator.

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## USE OF SOLVENTS WITH RUST ARREST

Rust Arrest Concentrate may be diluted with aliphatic, aromatic, or chlorinated solvents. The choice of solvent will be determined by the specific requirements being placed on drying time, flash point, odor, environmental restraints, and cost.

The solvent chosen for use in Rust Arrest is a narrow-boiling, low aromatic mineral spirits with a 150°F minimum Flash Point.

Suggested primarily aliphatic solvents from various manufacturers are shown below for reference.

<u>Solvent</u>	<u>% Aliphatic/Aromatic*</u>		<u>Flash Point*</u>	<u>Boiling Point*</u>
Varsol #3	89.5	10.5	107°F	324-346°F
Amsco 66/3	86.0	14.0	107°F	315-388°F
Shell #340 EC	97.7	2.3	104°F	318-348°F
Shell #145 EC	83.3	6.7	112°F	317-353°F
Ashland Kwik-Dri	No Data		105°F	310-400°F
Gulf B.T. Solvent	90.5	9.5	118°F	330-385°F

\* Typical values supplied by the manufacturer.



## HANDLING OF RUST ARREST

Rust Arrest concentrates have a high viscosity and as a result present a problem in bulk handling. While they are routinely shipped in drums, we are unable to ship the concentrates in bulk either by tank wagon or tank car. In order to effect movement in bulk, the concentrate must be extended usually with solvent or oil.

It has been established that in order to pump a Rust Arrest it must have a viscosity below 15,000 cps @ 77°F. It can be said that the viscosity of the concentrates, which now run between 5,000 and 65,000 can be handled by heating, but this is not possible because of the solvent content in the product which would be lost in the product.

It is therefore, necessary to cut back the Rust Arrest concentrates with solvent or oil to the required viscosity for the ease of handling.

It may be in order to suggest the optimum method for removing Rust Arrest concentrate from drums. Aside from scooping Rust Arrest out of the drum, the product can be removed from the drum by pumping. A suitable pump made by ALEMITE would be one to pump a Class IV or V solid. Depending on the speed of removal of Rust Arrest from a drum, a number of pumps that fit directly into a drum are available as well as various pump accessories to facilitate rapid unloading.



## RUST ARREST SUMMARY OF INFORMATION

<b>% Non-Volatile</b>	-	62
<b>Viscosity</b>	-	45, 000
<b>Flash Point</b>	-	105
<b>Base Number</b>	-	160
<b>Film Description</b>	-	Firm, Wax-like
<b>Application</b>	-	Spray, Dip, Brush
<b>Removal</b>	-	Solvent, Hot Alkaline Brush
<b>End Use</b>	-	Automotive undercoating and rust proofing. Barge coating. Offshore rig, tank and bridge coating. Concrete sealants. Guard rail and piling coatings. Brine tank, splash guard and ballast tank coatings.



## MINUTES FOR 100% REMOVAL OF RUST ARREST COATING

Solvent	Soak Cleaning (1)				Dip Cleaning (2)				Stirred Cleaning (3)			
	75°F	100°F	150°F	200°F	75°F	100°F	150°F	200°F	75°F	100°F	150°F	200°F
Water											240	180
Caustic Cleaner					180	180	240	180				180
Kerosene	185		55	45	165	100	30	28	60			
Light Cycle Oil (5)	150		50	30	90		30	26				
Clorothene (6)	7		6		5		3					
#2 Diesel	180		100		270		35					
Crude Oil (7)	240		240		240		55					
Toluene					10							
Isopropanol					150							
Wash Naphtha (8)					90							
Acetone					150							
Methanol					150							
Benzene	65				5							
Xylene					30							
Hexane					10							
50% Kerosene/ 50% Benzene	65											

- (1) Coupon immersed in solvent and lifted every 5 minutes for inspection. No additional agitation.
- (2) Coupon oscillated up and down in solvent at 40 cycles per minute. Timea are for that portion of coupon which is still immersed at top of cycle.
- (3) Coupon turned in solvent at 100 revolutions per minute
- (4) A commercial caustic cleaning solution containing 4.69% sodium hydroxide, 1.56% sodium metasilicate, 1.56% trisodium phosphate, and 0.16% Antara Gafac RE-610\* phosphate ester in water.
- (5) Oil, approximately 50% aromatic
- (6) Chlorothene NU 1, 1, 1-trichloroethane
- (7) Crude Oil
- (8) Wash naphtha kerosene, and #2 diesel are similar solvents with the boiling points increased in that order.

\* A trademark of GAF Corporation