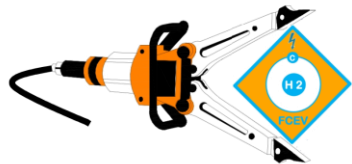


International Workshop On Hydrogen Safety Training for First Responders

SEPTEMBER 3 - 4, 2014
Aix-en-Provence, France



Tom Van Esbroeck – Chairman
Kurt Vollmacher - Project Leader

COMMISSION FOR EXTRICATION AND NEW TECHNOLOGY



CTIF



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INTERNATIONAL ASSOCIATION OF FIRE AND RESCUE SERVICES

INTERNATIONALE VEREINIGUNG DES FEUERWEHR- UND RETTUNGSWESENS

L'ASSOCIATION INTERNATIONALE DES SERVICES D'INCENDIE ET DE SECOURS



About CTIF

CTIF was founded in 1900 in Paris for encouraging and promoting co-operation among fire fighters and other experts in fire and rescue throughout the world.



Events

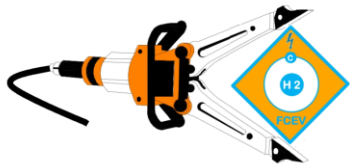
CTIF organises international conferences and competitions attended by more than 3,000 fire fighters and youth fire brigades from around the world.



Statistics

CTIF develops comprehensive world fire statistics by publishing annual reports which offer data on fire issues from 80 different countries and 90 capital cities.

CTIF is an international association of fire and rescue services who represent fire fighters in **36 countries** all over the world.

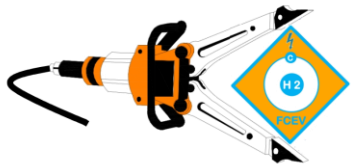


COMMISSION FOR EXTRICATION AND NEW TECHNOLOGY



Few important action points commission

- Promote close cooperation with the various manufacturers, companies and organizations;
- Promote International standardization of crucial **free of charge** information;
- Create BPP: **B**est **P**ractice **P**rocedures;
- Create worldwide database;
- Exchange of knowledge;
- Liaison between ACP(Advisory and Consultative Panel) and CTIF.



Why necessary?



Extra

Gas car explodes:

Driver dead, ten firefighters injured

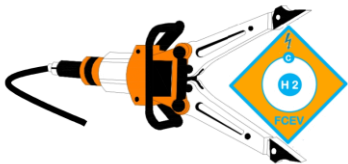
From LN-online.de Translated summary for CTIF 2014-08-27



Explosion car on Gas

August 15 2014 Germany

- 10 Fire Fighters injured
- 5 seriously: burning wounds in the face...
- No Recognition from a distance
No “drive line signs”...
- No **Best Practice Procedure** how to deal with this new energy sources...
- No “**standardised free of charge**” crucial information...



Why necessary?



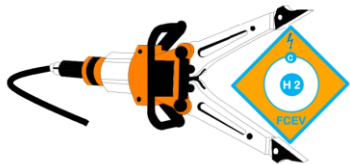
Close Call!! Wassenaar The Netherlands Oktober 29 2012

- Drive line signs?

No recognition from a distance!!

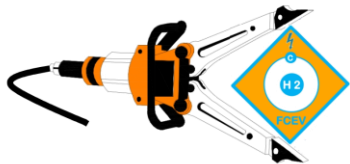
- Direction overpressure valve unknown?
- Where to positioning intervention vehicles on the safe side?

No international standard!!



Why necessary?

Firefighters battle fire at recycling plant



ANSWER!

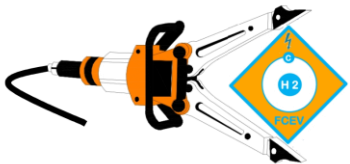
CTIF has send 3 New Working Item Proposals to ISO

TC 22 Road vehicles: Information for first and second responders:

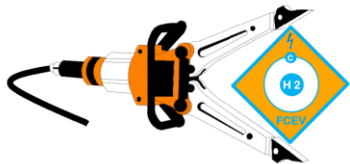
- **Part 1:** Rescue sheet: distribution soo
- **Part 2 :** Rescue sheet for busses, coaches and heavy commercial vehicles;
- **Part 3 :** Rescue and training manuals;
- **Part 4 :** Drive line signs.

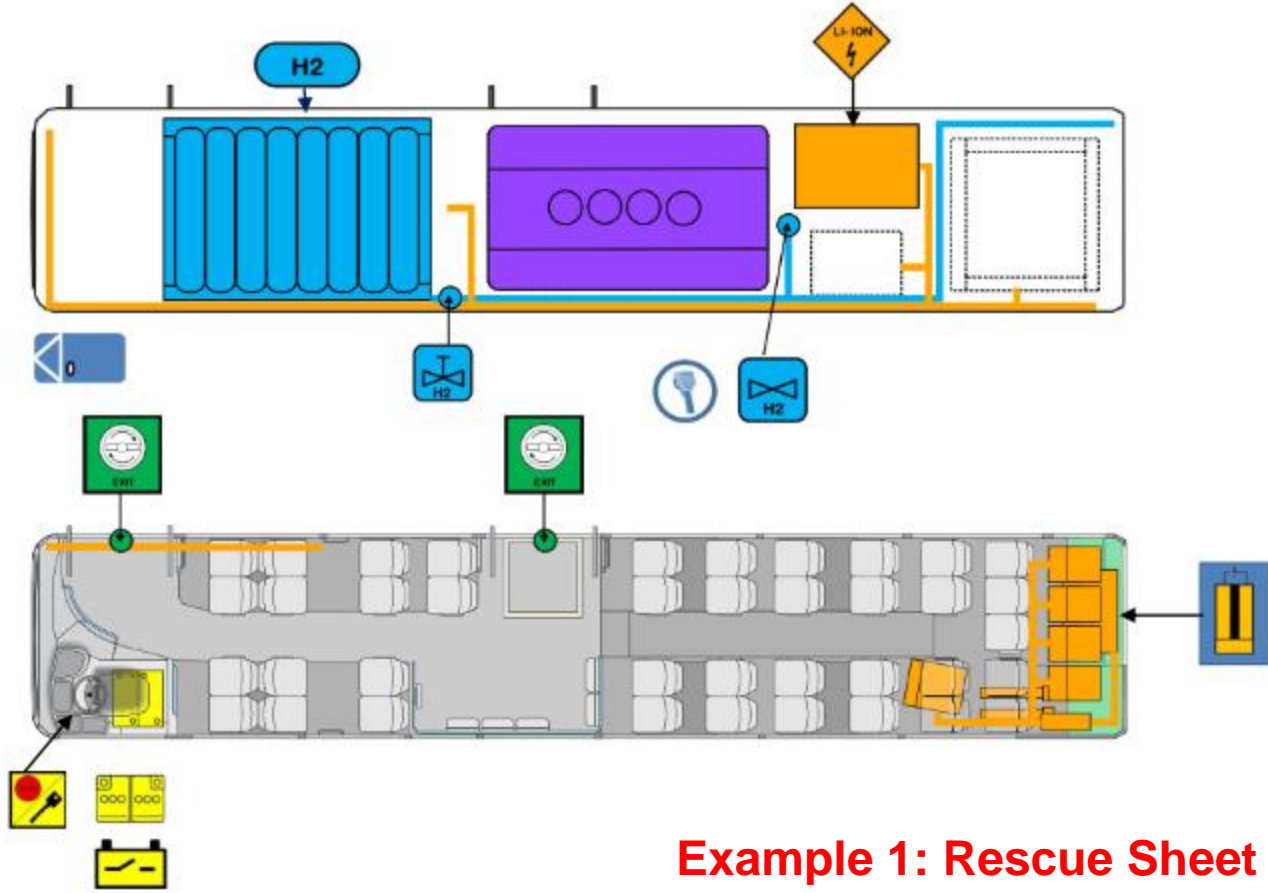
First responders: fire fighters, police, medical personal...

Second responders: towing and maintenance personal...



Part 2 : Rescue sheet for busses, coaches and heavy commercial vehicles



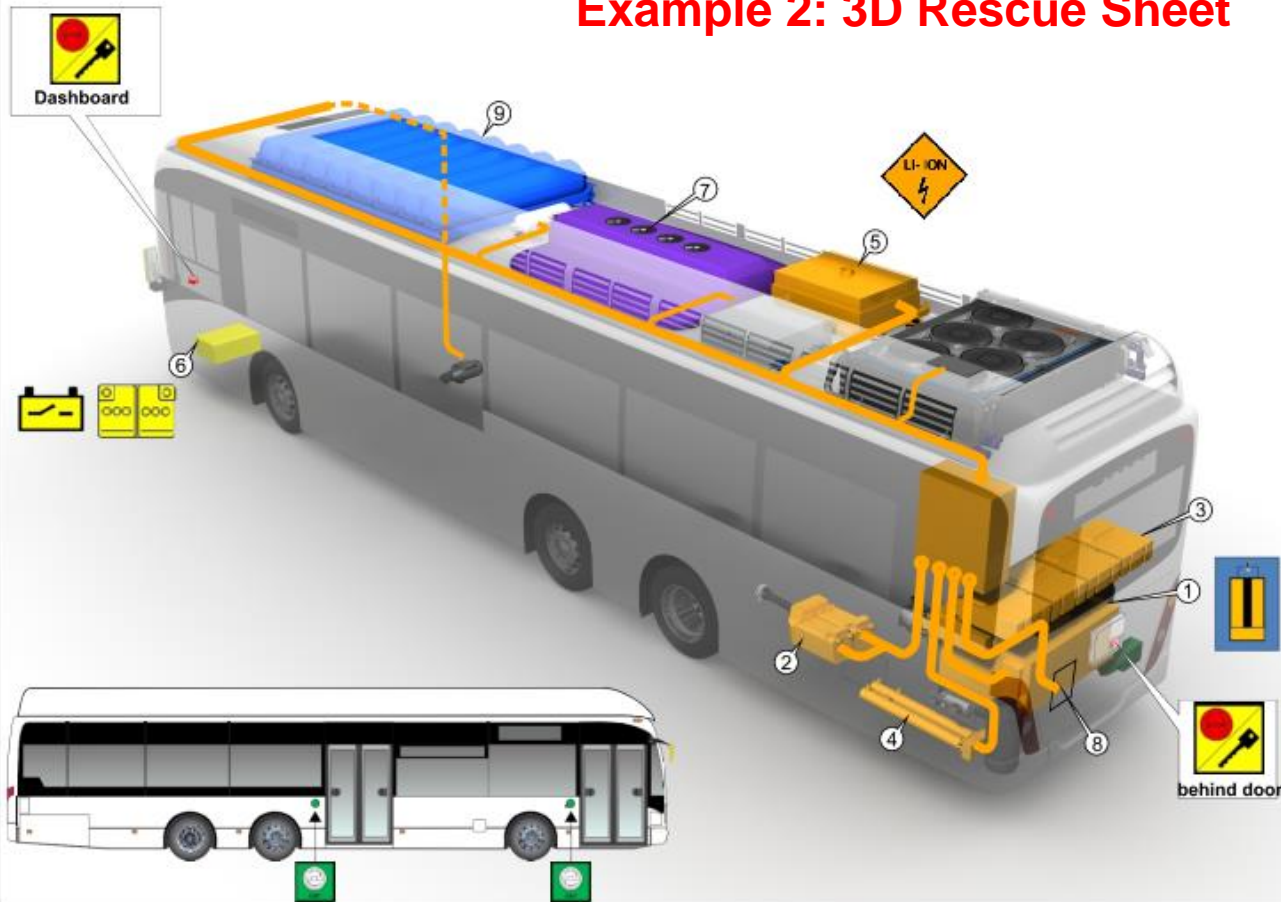


Example 1: Rescue Sheet

Safety Regulations/PPE		
In Case Of Fire		
Small fire		
Big Fire and High Voltage Battery Fire		

Hydrogen tanks 	Hydrogen pipes 	High voltage component 	Fuel Cell 	Overpressure valve 	High voltage lines
Emergency exit window 	Emergency exit door 	Battery key 	Manual Valve 	Li ion battery 	A 330 Fuel Cell Bus Rescue Sheet
Swith off power 	Airco 	Battery low voltage 	Direction overpressure valve 	Fuel cell electric vehicle 	

Example 2: 3D Rescue Sheet



Safety Regulations/PPE

In Case Of Fire

Small fire		
Big Fire and High Voltage Battery Fire		

Hydrogen reservoir 8x205L. ±350 bar	Lithium-ion battery High voltage 600V - 100A	Component High voltage
High voltage lines	Fuel Cell	Switch off motor/High voltage
Battery key	Low voltage battery	Emergency exit

1. Fuel Cell	4. Brake resistors	7. Airconditioning
2. Traction engines	5. Li Ion Battery	8. Night Charging
3. Inverters	6. Low voltage battery	9. Hydrogen reservoir

RESCUE SHEET High Voltage lines

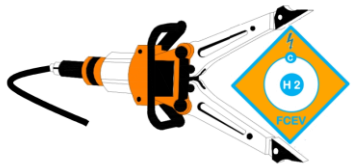
YANHOOL CTIF

A330 Fuel Cell bus

Van Hool +32(0)3420 20 20

S7043

Part 3 : Rescue and training manuals



A) Rescue and training manual vehicle

INFORMATION FOR FIRST AND SECOND RESPONDERS
RESCUE AND TRAINING MANUAL VEHICLE

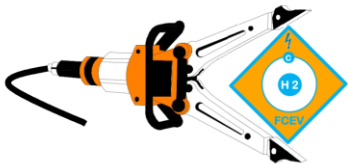
FUEL CELL BUS

A 330

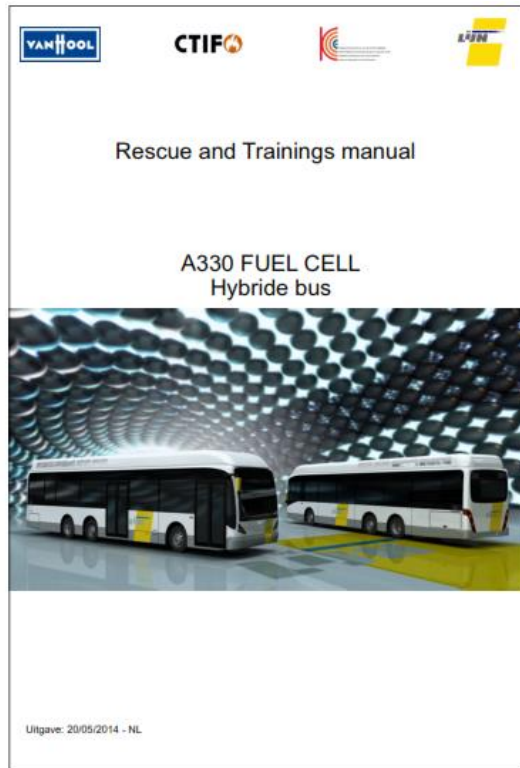


CONTENT

1. Recognition/type/fuel	Page ...
2. Structure/overview important vehicle parts/access to them	Page ...
3. Disable direct hazards/safety regulations/ PPE	Page ...
4. Access to the occupants	Page ...
5. Dangers/contents stored liquids/gasses/solids/ PPE	Page ...
6. Dangers in case of fire/safety regulations/PPE	Page ...
7. Dangers in case of water submersion/safety regulations/PPE	Page ...
8. Guidelines concerning immobilisation/stabilisation/lifting	Page ...
9. Information for towing-services	Page ...
10.Explanation used symbols	Page ...



A) Rescue and training manual vehicle



3. Disable direct hazards/safety regulations/ PPE

Disable immediate hazards	Shutdown complete system (high voltage and hydrogen supply interruption) instrument panel. 1) press "Emergency button" 2) Open the cover and turn the switch upwards.	A
	Shutdown complete system (high voltage and hydrogen supply interruption) behind rear hatch. 1) press "Emergency button"	B
Safety Precautions	After switching off the high voltage is the energy immediately disconnected. For the sake of the discharge capacity wait an additional 5 minutes! There is always high tension present in the lithium-ion Battery! This can never be discharged.	
	In suspected damaged high voltage components and lines. Wear gloves with a breakdown voltage greater than 1000V. Never touch high voltage components!	







A Shutdown system on dashboard

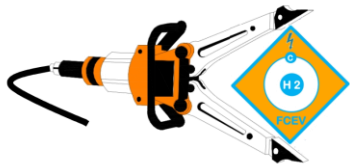


Symbols to be used in the rescue and training manual and rescue sheet

Proposition drafted by CTIF Commission for Extrication and New Technology
Designer Kurt Vollmacher Project Leader

Version 13/08/2014

	Hydrogen pipes <i>Draft</i> Blue R/G/B: 0/176/240 Black
	Manual hydrogen shut-off valve <i>Draft</i> Blue R/G/B: 0/176/240 Black Text: Arial rounded MT Bold
	Automatic hydrogen overpressure safety valve <i>Draft</i> Blue R/G/B: 0/176/240 Black Text: Arial rounded MT Bold
	Airco pipes <i>Draft</i> Purple R/G/B: 204/0/204
	Airco component <i>Draft</i> Purple R/G/B: 204/0/204
	Direction overpressure safety valve <i>Draft</i> Direction arrow in red colour – direction overpressure safety valve "front, back, left, right" Bullet in red – direction overpressure safety valve "up" No colours used – direction overpressure safety valve "down" Red R/G/B: 255/0/0 Black E.g. Hydrogen: Blue R/G/B: 0/176/240 Text: Arial rounded MT Bold



B) Rescue and training manual High Voltage Battery build in a vehicle

INFORMATION FOR FIRST AND SECOND RESPONDERS RESCUE AND TRAINING MANUAL

DRAFT

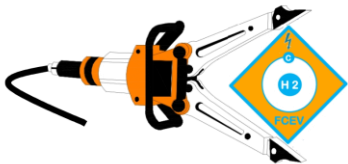
HIGH VOLTAGE (HV) LITHIUM-ION BATTERIES

IN AN HYBRID (HEV), PLUG-IN HYBRID (PHEV) , FULL ELECTRIC VEHICLE (EV)
AND FUEL CELL ELECTRIC VEHICLE (FCEV)






CONTENT

1. GENERAL INFORMATION	Page 2.
2. HAZARD ASSOCIATED WITH LEAKING Lithium-Ion BATTERIES	Page 5.
3. Hazards Associated with a Lithium-Ion Battery Fire	Page 6.
4. Environmental Aspects	Page 8.
5. Damaged Lithium-Ion batteries: additional precautionary measures – reactivation of the battery.	Page 9.
6. Specific requirements for packaging, storage and transportation of damaged Lithium-Ion batteries and batteries at end of life.	Page 9.
7. Explanation Used Symbols	Page 11.





B) Rescue sheet High Voltage Battery build in a vehicle








Template Rescue and Training Manual Battery Version 17/08/2014

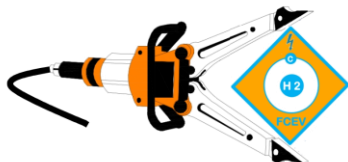
3. Hazards Associated with a Lithium-Ion Battery Fire	
Under normal conditions of use the battery does not present any risk of exposure to its content.	
FIRE	
Specific Attention 	<ul style="list-style-type: none"> - If you detect leaking fluids, sparks, smoke, flames, increased temperature, gurgling or bubbling sounds from the HV battery compartment, assume there is a battery fire and ventilate the passenger area (roll down windows or open doors).
	3.1 Fire in the HV Battery Assembly <ul style="list-style-type: none"> - Be alert. There is a potential for delayed fire with damaged lithium-ion batteries. - When the inside cells of the battery are damaged flammable liquid may be expelled from the battery. - The battery contains a combustible organic solvent. - When one cell ignites there is a risk a propagation of the fire to neighbour cells (Thermal runaway). - Parts of the battery(e.g. cells) may be ejected as projectile.
	3.2 Inhalation in Fire Situations <ul style="list-style-type: none"> - Hazardous gases are given off as by-products of combustion. - Vapour emitted in case of a fire contains CO, CO2 and hazardous fluorinated substances! - May rupture or explode in a fire, which could release hydrogen, hydrogen fluoride, carbon monoxide, carbon dioxide, aldehydes, and short chain hydrocarbons.
Safety Measures 	<ul style="list-style-type: none"> - Keep distance from the vehicle and evacuate people upwind from the immediate area. - Keep any person not involved in the rescue, 15 meters away from the fire zone.
	3.3 Recommended Personal Protective Equipment: <ul style="list-style-type: none"> - Wear always full Personal Protective Equipment suitable for organic solvents and Self-Contained Breathing Apparatus (SCBA).
	<ul style="list-style-type: none"> - To avoid serious injury or death from severe burns or electric shock, never breach or remove the high voltage battery assembly cover under any circumstance.
Extinguish Measures 	3.3 Extinguish Fire 1st Objective: <ul style="list-style-type: none"> - In case of a large fire: cool down the battery with an overflow of water with in order to reduce the temperature of the battery. 2nd Objective: <ul style="list-style-type: none"> - Shutting off the oxygen supply to the fire: using if possible (dry) sand or other suitable mineral agent.

Template Rescue and Training Manual Battery Version 17/08/2014

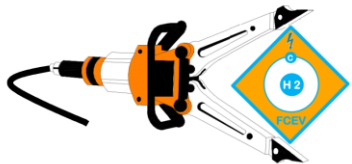
4. Environmental Aspects	
IN ALL CASES	
Specific Attention 	4.1 Absorbent materials. <ul style="list-style-type: none"> - To confine the spillage of liquids and the fire: use dry materials such as sand or mineral absorbing agents. - Cleanup all spills/leaks immediately using an absorbent material such as vermiculite or dry sand. Neutralization is not necessary. - Collect all contaminated absorbent material in a designated approved plastic waste container (non-conductive). - In case of abundant use of water, care should be taken to confine and neutralise the water outflow. - After intervention, rinse the affected areas with water adequately.
Safety Measures 	4.2 Recommended Personal Protective Equipment: <ul style="list-style-type: none"> - Handle Li-ion spills using the following personal protective equipment (PPE) <ul style="list-style-type: none"> • Safety glasses or face shield • Chemical resistant neoprene or nitrile gloves • Protective apron or coveralls • Protective mask for acidic vapours or SCBA.
	Perform gross decontamination by removing affected clothing. Wash skin with water and soap.
	4.2 Treatment of Waste Water. <ul style="list-style-type: none"> - Confine the effluent or the contaminated material and collect it as hazardous waste (water) for appropriate treatment. - Pick up and transfer to properly labelled containers. - Dispose of in accordance with local waste management legislation and emissions regulations.

Template Rescue and Training Manual Battery Version 17/08/2014

Used Symbols	
Important: only mention the used symbols in these list Remove the details: E.G: ISO 7010 Blue R/G/B: 77/77/255, Red R/G/B: 255/0/0	
	High voltage battery pack with indication type of battery Draft Orange R/G/B: 255/165/0 Black Text: Arial rounded MT Bold
	NIMH battery, high voltage Draft Orange R/G/B: 255/165/0 Black Text: Arial rounded MT Bold
	Lithium ion battery, high voltage Draft Orange R/G/B: 255/165/0 Black Text: Arial rounded MT Bold
	Ultra capacitor, high voltage Draft Orange R/G/B: 255/165/0 Yellow R/G/B: 255/255/0 Black
	Induction power (magnetic field) Draft Orange R/G/B: 255/165/0 Black
	Use water to extinguish Draft Blue R/G/B: 56/93/138 White
	Don't use water to extinguish Draft Red R/G/B: 255/0/0 White



Part 4 :Drive line signs



Part 4 :Drive line signs



Gasoline-powered vehicle.



Diesel-powered vehicle.



Bio diesel-powered vehicle.



Plug In Hybrid Electric Vehicle and Gasoline



Electric Vehicle



Fuel Cell Electric Vehicle



Bio diesel-powered vehicle with for example 85% ethanol.



Hybrid Electric Vehicle and Diesel



Plug In Hybrid Electric Vehicle And Diesel



Hydrogen powered vehicle (liquefied)



Hydrogen powered vehicle



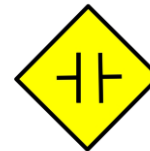
LPG (liquefied petroleum gas)



LNG (liquefied natural gas)



CNG (compressed natural gas)



Super capacitor low-voltage



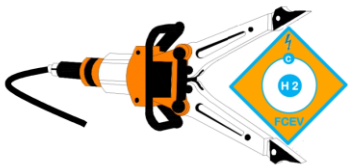
Diesel powered vehicle with super capacitor



Gasoline/LPG powered vehicle



Super capacitor high-voltage



Part 4 :Drive line signs

The colors are mostly common used in vehicle indication.



blue R/G/B: 0/176/240: Hydrogen;



Green R/G/B: 0/176/80: Gas;



Yellow R/G/B: 255/255/0: Low voltage;



Orange R/G/B: 255/165/0: High voltage;



Gray R/G/B: 127/127/127: Diesel;



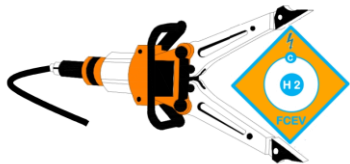
Red R/G/B: 161/37/3: Gasoline;



Green R/G/B: 80/224/22: Bio Diesel.

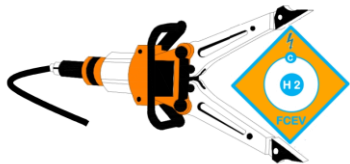
These colors are also usable for:

- Highlight content by coloring pipe/tank/reservoir in rescue information;
- Coloring symbols to be used in rescue information;
- Coloring specific components of the vehicle (e.g.: orange= high voltage);
- Coloring indication specific fuel stations/pumps...



Part 4 :Drive line signs

- Are using existing pictures (e.g. fuel pump);
- Are made from the perspective of a firefighter;
- Are using common names (HEV, PHEV, EV...);
- Are made to maximum inform the fire fighter/rescue worker just using
- 1 sign; (e.g. Fuel Cell Electric Vehicle);
 - orange: high voltage;
 - blue: hydrogen;
 - **H2**: hydrogen;
 - **FCEV**: Fuel Cell Electric Vehicle);
 - **C**: compressed hydrogen;
- are usable for trucks, busses, cars,...;
- **the location of the signs has to be the yet to be determined.**

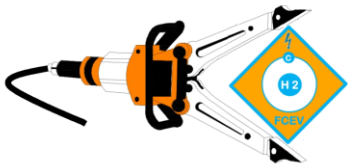


Summary

- International standardization of “**crucial free of charge**” information;
- Good cooperation needed with the various manufacturers, companies and organizations ;
- Exchange of knowledge;
- New countries are welcome to join our commission.

Please support the CTIF NWIP to ISO before October 19

- 5 countries needed: through the national body of your country;
- Fire fighters/manufacturers in the working groups.



Information

Chairman CTIF Commission for Extrication and New Technology

Tom Van Esbroeck: tom.vanesbroeck@gent.be

Project Leader CTIF Commission for Extrication and New Technology

Working area: Extrication and New Vehicle Technology

Kurt Vollmacher: kurt.vollmacher@gent.be

