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# Concrete spraying profile 1.0

**Documentation – draft**

# Table of Contents

1. General information....3
2. History of the document....4
3. Referenced standards....4
4. Related documents....4
5. Structure of the profile....6
6. CSPQual....8
7. CSPPlan....9
8. CSPPerf....9
9. CSPMWS....10
10. CSRecipe....11

# 1. General information

As modern mining machinery today is controlled electronically and even operates autonomously, a smooth and cost efficient flow of data in the mining process will be crucial for cost efficient future mine operations. Therefore, the International Rock Excavation Data Exchange Standard (IREDES) was launched by major players in the industry. The task of this initiative is to define a common electronic language for easy and standardized data exchange between mining machines and central computer systems.

This standard is expected to have significant impact on the use of automated mining equipment. Multi vendor installations will be controlled much easier than today as IREDES offers a standardized interface to all machines. Cost can be reduced as no vendor specific import/export filters have to be developed.

By using IREDES, the mining equipment will become an active part of a mining companies IT infrastructure. All data produced by IREDES compliant machines can be stored in databases. This will lead to a continuous productivity control and helps improving production planning. The XML technology used in IREDES is widely supported and open for the future.

In case of ambiguities, the standard's XML schema is the standard's normative basis. It supersedes all other information given in text documents, presentations etc.

As the XML definitions only can contain the formal aspects of the standarization, this document adds all content definitions which base on mutual agreement. Therefore it is an important document for correct interpretation of the standard and for crossover compatibility. A fully IREDES compliant implementation has to fulfill all demands stated in the IREDES XML schema as well as in this accompanying documentation.

The Concrete Profile standardizes shotcreting.

Errors in the documentation as well as in the XML schemes have to be reported to the IREDES office (mkorczynski@iredes.org or info@iredes.org). Thank you for your help!

# 2. History of the document

| Date | Person | Changes |
|---|---|---|
| 09.08.2013 | Mateusz Korczyński | First draft of the document. |
| | | |

# 3. Referenced standards

ISO 8859-1: 1987, Part 1: Latin Alphabet No 1

XML Schema Part 0: Primer: http://www.ww3.org/TR/xml-schema-0/

XML Schema Part 1: Structures: http://www.ww3.org/TR/xml-schema-1/

XML Schema Part 2: Datatypes: http://www.ww3.org/TR/xml-schema-2/

XML base: http://www.ww3.org/TR/xmlbase/

Extensible Markup Language (XML) 1.0: http://www.ww3.org/TR/2000/REC-xml-20001006

XML Namespaces:

RFC1321:

Please note: The IREDES office is not responsible for the content provided by the above mentioned links. Please let us know if a link is not longer working or if content has changed so it does not relate to the intended purpose any longer.

# 4. Related documents

This document is a part of a set of documents describing the different parts of the IREDES standard:

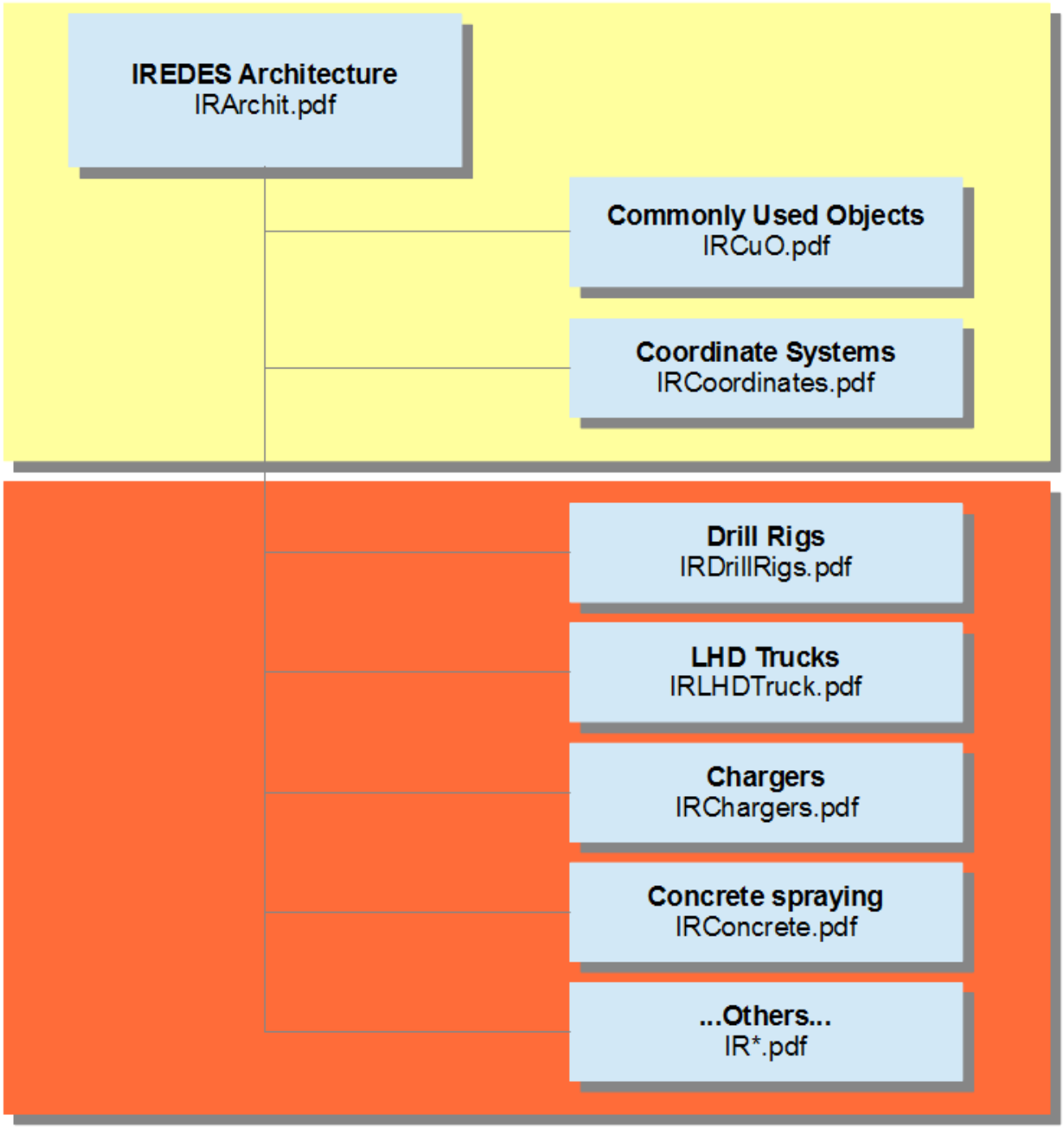


*Illustration 1: The IREDES' documents structure*

The uppermost document is the IREDES Architecture description explaining the general setup and collaboration of the different parts of the standard. The “IREDES Architecture” document will be the best choice to start with as it gives an overview and basic information needed to understand the structure of IREDES.

Detail information about single parts of the IREDES standard are available from separate documents. Readers of these documents should be familiar with XML, XML schemas and implementation relevant issues.

Standard definition used in common throughout multiple equipment profiles are covered by the corresponding documentation of the “General Objects” (Application Profiles, General Data Types etc) and “Commonly used Objects” (CuO's).

All standard information concerning a particular equipment type (Drill Rigs, LHD's, …) is contained in a separate document related to the equipment profile.

Beside the textual descriptions, the entire standard is available as XML schemes as they contain the formal description of the standard. In case of ambiguities, the definitions in the XML schema override all definitions made in the accompanying textual documentation. Textual description available for different IREDES profile is additional information mainly containing parts of the standard not definable in XML schemes. Implementors should take care of these documents as they may contain important information which must be defined basing on “mutual agreement” to make the standard work.

# 5. Structure of the profile

The concrete spraying profile contains four main schemas:

- **CSPPlan –** plan of shotcreting – info to the machine //generated by a planning software
- **CSPQual –** describes quality of shotcreting process //generated by a machine
- **CSPPerf –** describes performance of shotcreting process //generated by a machine
- **CSPMWS –** measurements while shotcreting //generated by a machine

The new data type is designed: **CSPRecipe**. This type is prepared to describe materials used to prepare concrete.

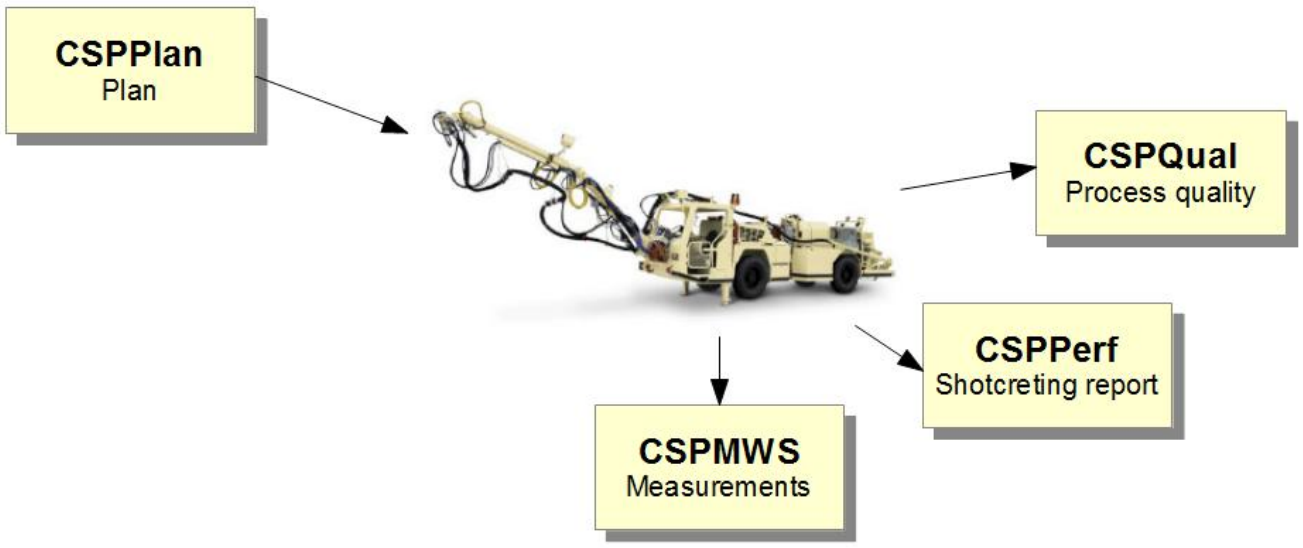


*Illustration 2: The profile structure*

# 6. CSPQual

**CSPQual**

| optional | Element name | Type | Unit | Enum values | Description |
|---|---|---|---|---|---|
| | Process Type | text | - | Concrete, Water proofing, Fire proofing, Washing | name of the process |
| | PumpCalibration | boolean | - | - | pump calibrated before the process or not |
| | RefToPlanID | text | - | - | reference to the plan ID |
| | DeliveryConcrete | text | - | - | tag of the concrete delivery |
| | Additives | | | | |
| | AcceleratorType | float | - | - | name of the accelerator type |
| | AcceleratorTolerance | text | % | - | tolerance of the accelerator |
| | AcceleratorQuantity | float | kg | - | quantity of the accelerator |
| | AcceleratorDensity | float | kg/m³ | - | density of the accelerator |
| * | WorkReport | | | | |
| * | WorkEvent | text | - | - | work events as text |
| * | Location | text | - | - | location of the shotcreting machine, text description |
| | Washing | int | - | - | amount of washings |
| | Prewatering | int | - | - | amount of prewatering |
| * | TemperatureWarning | | | | |
| * | StartTime | dateTime | - | - | start time of the temperature warning |
| * | EndTime | dateTime | - | - | end time of the temperature warning |

# 7. CSPPlan

**CSPPlan**

| optional | Element name | Type | Unit | Enum values | Description |
|---|---|---|---|---|---|
| | ProcessType | text | - | Concrete, Water proofing, Fire proofing, Washing | name of the process |
| | (CSRecipe) | | | | |
| | Accelerator | | | | |
| | AcceleratorType | text | - | - | name of the accelerator type |
| | AcceleratorTolerance | float | % | - | tolerance of the accelerator |
| | AcceleratorQuantity | float | kg | - | quantity of the accelerator |
| | AcceleratorDensity | float | kg/m³ | - | density of the accelerator |

# 8. CSPPerf

**CSPPerf**

| optional | Element name | Type | Unit | Enum values | Description |
|---|---|---|---|---|---|
| | ProcessType | text | | Concrete, Water proofing, Fire proofing, Washing | name of the process |
| | PumpOpHours | duration | - | - | duration of the pump operation |
| | SprayedConcrete | float | m³ | - | amount of sprayed concrete |
| | SprayedAdditives | float | kg | - | amount of sprayed additives |
| | Maintenance | int | - | No maintenance, Warning, Alarm | info about maintenance needed by the machine |
| | Blockages | int | - | - | amount of blockages |
| * | PumpStrokes | int | - | - | amount of pump strokes |

# 9. CSPMWS

**CSPMWS**

| optional | Element name | Type | Unit | Enum values | Description |
|---|---|---|---|---|---|
| | TimeStamp | dateTime | - | - | timestamp of the measurements |
| | Process Type | text | - | Concrete, Water proofing, Fire proofing, Washing | name of the process |
| * | NozzlePosition | pointType | - | - | 3D vector which defines the nozzle position |
| * | SprayingVector | pointType | - | - | 3D vector which defines the spraying vector |
| * | AirFlow | float | m³/h | - | air flow |
| * | MaterialFlow | float | m³/h | - | material flow |
| * | AcceleratorFlow | float | l/min | - | accelerator flow |
| | AcceleratorTemperature | float | °C | - | accelerator temperature |
| | ConcreteTemperature | float | °C | - | concrete temperature |
| | AmbientTemperature | float | °C | - | ambient temperature |
| | CompressedAirTemperature | float | °C | - | compressed air temperature |
| * | ExtElement | | | | |
| * | ExtElementName | text | - | - | name of the additional measurement |
| * | ExtElementValue | float | - | - | value of the additional measurement |
| * | Events | text | - | - | events |

# 10. CSRecipe

**CSRecipe**

| optional | Element name | Type | Unit | Enum values | Description |
|---|---|---|---|---|---|
| | TimeStamp | dateTime | - | - | timestamp of the recipe |
| | MixtureName | text | - | - | name of the mixture |
| | Water | float | kg/m^3 | - | amount of water |
| | WaterCementRatio | float | - | - | water/cement ratio |
| | Cement | | | | |
| | CementType | text | - | - | type of cement |
| | CementVolume | float | kg/m^3 | - | amount of cement |
| | Fibres | | | | |
| | FibresType | text | - | - | type of fibres |
| | FibresQuantity | float | kg/m^3 | - | amount of fibres |
| | AirAdds | | | | |
| | AirAddsType | text | - | - | type of air adds |
| | AirAddsQuantity | float | kg | - | amount of air adds |
| | Silica | | | | |
| | SilicaType | text | - | - | type of the silica |
| | SilicaQuantity | float | kg | - | amount of silica |
| | Retarder | | | | |
| | RetarderType | text | - | - | type of retarder |
| | RetarderQuantity | float | kg | - | amount of retarder |
| * | Additives | | | | |
| * | AdditiveName | text | - | - | name of additive |
| * | AdditiveQuantity | float | kg | - | amount of additive |