FWO DMP Template

Project supervisors (from application round 2018 onwards) and fellows (from application round 2020 onwards) will, upon being awarded their project or fellowship, be invited to develop their answers to the data management related questions into a DMP. The FWO expects a **completed DMP no later than 6 months after the official start date** of the project or fellowship. The DMP should not be submitted to FWO but to the research co-ordination office of the host institute; FWO may request the DMP in a random check.

At the end of the project, the **final version of the DMP** has to be added to the final report of the project; this should be submitted to FWO by the supervisor-spokesperson through FWO's e-portal. This DMP may of course have been updated since its first version. The DMP is an element in the final evaluation of the project by the relevant expert panel. Both the DMP submitted within the first 6 months after the start date and the final DMP may use this template.

1. General Information	
Name applicant	Burak Karabulut
FWO Project Number & Title	FWO Project Number: 1256522N Title: Wire arc additive manufactured (WAAM) steel components for structural applications
Affiliation	☒ KU Leuven ☐ Universiteit Antwerpen ☐ Universiteit Gent ☐ Universiteit Hasselt ☐ Vrije Universiteit Brussel ☐ Other:
2. Data description	
Will you generate/collect new data and/or make use of existing data?	☒ Generate new data ☐ Reuse existing data
Describe the origin, type and format of the data (per dataset) and its (estimated) volume If you **reuse** existing data, specify the **source** of these data. Distinguish data **types** (the kind of content) from data **formats** (the technical format).	The data that are being collected are part of the junior postdoctoral FWO research project: "Wire arc additive manufactured (WAAM) steel components for structural applications". In brief, this project starts form today's real need to have more efficient, swifter and more economic processes to produce structural steel components. In addition, on **complex mechanical steel parts** for which **WAAM process** would truly be profitably used, which are, evidently, most of the time submitted to variable **loading cycles** leading to **fatigue** problems. Such parts are also mostly used in **harsh environments** where **corrosion** can occur. Understanding the underlying phenomena and defining the most important influential parameters when WAAM components are submitted to cyclic loading combined or not with corrosion are

very important topics to explore. Thus, the overall objective of this project is to investigate experimentally and numerically the mechanical performance of robotic WAAM steel components when affected by (i) dynamic loading and (ii) the localized deterioration due to corrosion, compare with those made of base metal and forged samples and develop appropriate design rules based on the current theoretical scientific knowledge.

All data relevant to this research project have been created/produced or collected by the applicant unless otherwise specified. The tables below give an overview of types and volumes of data being collected/produced per work package:

Table 1 Data files per WP1 w.r.t mechanical behavior of WAAM components.

Type of data	Format	Volume	How created
WP1.1 ❖ Preproduction and postproduction images, scans	.jpg, .stl & .ipt	2GB	Pictures taken before, during and after welding are stored in ".jpg" format. The files in ".stl and .ipt" formats are the laser scans and CAD models of 3D walls, resp.
❖ Production parameters, welding process/procedure	.xlsx	10MB	Welding process and procedure data acquired during welding of the walls and organized by the applicant in ".xlsx" format.
❖ Material certificates, sampling drawings	.pdf	100MB	Certificates provided by the supplier of the material and drawings are prepared by the applicant (e.g., scheme for sampling).
❖ Cutting schemes	.dwg & .dxf	10MB	Drawings of cutting schemes and designed dimensions prepared by the applicant.
❖ Literature review	.docx & .pdf	2-3GB	Downloaded literature data via the open-access service of KU Leuven and the summary of collected references with citations to the source files.
WP1.2 ❖ Microstructural data, Scanning Electron Microscope (SEM) images, hardness maps	.jpg & .xlsx	5GB	Images taken by Hirox KH-8700 optical microscope and TESCAN VEGA3 SEM (access granted by KU Leuven Materials Engineering Dept. at Campus De Nayer); microstructural and hardness results

			summarized in Excel files (".xlsx" format).
WP1.3 ❖ Tensile test results with Digital Image Correlation (DIC) data and data processing files with MatchID	.tif, .mti3d, .csv, .xlsx, & .xlsm	150GB	DIC pictures saved in ".tif" format, and data processing files saved in ".mti3d" format compatible with MatchID software. The raw data of results are stored in ".csv" format and processed results are saved in ".xlsx" format. For data processing, Excel Visual Basic Codes are written whose macros are saved in ".xlsm" format.
WP1.4 ❖ Fatigue test results, experimental data collection from the literature, fracture surface images	.xlsx & .jpg	5GB	Fatigue test results of the WAAM walls and examples from the literature saved in ".xlsx" format. Fracture surface images saved in ".jpg" format after analyses with microscope and SEM.
WP1.5 ❖ Numerical simulation files	.cae, .odb, .jnl & .py (Abaqus files)	250GB	All numerical models and analyses are handled on licensed Abaqus software via KU Leuven servers and saved in ".cae & .odb" formats, resp. The source files and Python scripts are saved in ".jnl & .py" formats.

Table 2 Data files per WP2 w.r.t corrosion resistance of WAAM components.

Type of data	Format	Volume	How created
WP2.1 ❖ Color-coded orientation maps, texture characteristics	.jpg	2GB	Grain boundary angles and grain size distribution images saved in ".jpg" format with color codes.

Type of data	Format	Volume	How created
WP2.2 ❖ Electrochemical corrosion test data and test methods (source files)	.pssession & .psmethod (data files from PalmSens instruments)	10MB	The results and source files of the test method generated in PSTrace software saved in ".pssession & .psmethod" formats, resp.
❖ Electrochemical corrosion test results, cyclic polarization plots, images of corrosion damage	.xlsx & .jpg	1GB	The potentiostatic/dynamic scans are saved into Excel files in ".xlsx" format, microscopic pictures of corrosion pits are saved in ".jpg" format.
WP2.3 ❖ Exposure test results	.xlsx & .jpg	5GB	The mass loss measurements are saved in ".xlsx" format while the corrosion products are analyzed by Hirox KH-8700 optical microscope and TESCAN VEGA3 SEM saved in ".jpg" format.

Table 3 Data files per WP3 w.r.t combined fatigue and corrosion behavior of WAAM components.

Type of data	Format	Volume	How created
WP3.1 ❖ Microstructural investigations of precorroded WAAM samples	.jpg	2GB	Same as Table 1, see WP1.2

	❖ Static tensile test results of precorroded WAAM samples	.tif, .mti3d, .csv, .xlsx, & .xlsm	150GB	Same as Table 1, see WP1.3
	WP3.2 ❖ Fatigue test results of precorroded samples, comparison with unaffected specimens	.xlsx &.jpg	5GB	Same as Table 1, see WP1.4
	❖ Numerical simulation files of corrosion-related imperfections	.cae, .odb, .jnl & .py (Abaqus files)	100GB	Same as Table 1, see WP1.5

3. Ethical and legal issues

Will you use personal data? If so, shortly describe the kind of personal data you will use AND add the reference to your file in your host institution's privacy register. *In case your host institution does not (yet) have a privacy register, a reference is not yet required of course; please add the reference once the privacy register is in place in your host institution.*	☐ Yes ☒ No If yes: - Privacy Registry Reference: - Short description of the kind of personal data that will be used:
Are there any ethical issues concerning the creation and/or use of the data (e.g., experiments on humans or animals, dual use)? If so, add the reference to the formal approval by the relevant ethical review committee(s).	☐ Yes ☒ No If yes: - Reference to ethical committee approval:
Does your work possibly result in research data with potential for tech transfer and valorization? Will IP restrictions be claimed for the data you created? If so, for what data and which restrictions will be asserted?	☐ Yes ☒ No If yes, please comment:
Do existing 3rd party agreements restrict dissemination or exploitation of the data you (re)use? If so, to what data do they relate and what restrictions are in place?	☐ Yes ☒ No If yes, please comment:

4. Documentation and metadata	
What documentation will be provided to enable understanding and reuse of the data collected/generated in this project?	Folders are organized in a structured way where 'ReadMe' files are provided for spotting the file locations comfortably. For each experimental data, the background information such as specimen dimensions, testing protocols, etc., are given to ensure the reproducibility of such tests by other researchers. The bare script files will be provided along with text files in ".txt" format which are arranged by means of in-line comments describing the content of the codes.
Will a metadata standard be used? If so, describe in detail which standard will be used. If not, state in detail which metadata will be created to make the data easy/easier to find and reuse.	☐ Yes ☒ No If yes, please specify:

5. Data storage & backup during the FWO project	
Where will the data be stored?	All data files mentioned in Table 1, Table 2 and Table 3 are stored on an external hard drive with a capacity of 6TB. This hard drive will be mirrored to a second external hard drive on regular basis. In addition, the same data are mirrored to KU Leuven OneDrive for Business (personal storage with max. capacity 2TB). All source files (e.g., numerical models and scripts) are also stored on the ICTS data center of KU Leuven named "Desktop File Storage". This will make up less data volume (+/- 50GB) as the unnecessary analysis results (e.g., ".odb" files of Abaqus results) will be excluded because they are reproducible with the provided source files of numerical models.
How will the data be backed up?	The mirroring between the two external hard drives will back up the data. The uploads on KU Leuven OneDrive for Business takes up an extra safety role on data storage. In addition, the "Desktop File Storage" server of KU Leuven is automatically backed up with 'snapshot' technology and mirrored every hour to a second ICTS data center.
Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.	☒ Yes ☐ No If no, please specify:
What are the expected costs for data storage and backup during the project? How will these costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of **the allocated project budget** to be used to cover the cost incurred.*	The overall expected cost for data storage is +/- 338€ with the following considerations: ❖ The two external hard drives of 6TB make up a total cost of 260€ incl. VAT with a cost of +/-130€ each. ❖ The use of KU Leuven OneDrive for Business is free of charge. ❖ The cost for the use of "Desktop File Storage" server of KU Leuven is 519€/TB/year, thus making a total sum of +/- 78€

Data security: how will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?	No sensitive or personal information are being collected/created throughout this project. Thus, no extra precaution is taken. However, it is worth mentioning that data files that are stored on "Desktop File Storage" servers of KU Leuven are stored in a secure data center and highly protected against unauthorized persons.

6. Data preservation after the end of the FWO project
FWO expects that data generated during the project are retained for a period of minimally 5 years after the end of the project, in as far as legal and contractual agreements allow.

Which data will be retained for the expected 5 year period after the end of the project? In case only a selection of the data can/will be preserved, clearly state the reasons for this (legal or contractual restrictions, physical preservation issues, …).	All data will be retained for a period of 5 years conforming to the KU Leuven Research Data Management (RDM) policy.
Where will these data be archived (= stored for the long term)?	The data will be stored on the so-called 'Archive Storage' of KU Leuven as well as the mirrored two external hard drives for a period of 5 years.
What are the expected costs for data preservation during these 5 years? How will the costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of **the allocated project budget** to be used to cover the cost incurred.*	The cost for 'Archive Storage' of KU Leuven is 113.84€/TB/year, corresponding to a total cost of +/- 387€. Preservation costs of these data will be covered by the allocated budgets of the division.

7. Data sharing and reuse

Are there any factors restricting or preventing the sharing of (some of) the data (e.g., as defined in an agreement with a 3rd party, legal restrictions)?	☐ Yes ☒ No If yes, please specify:
Which data will be made available after the end of the project?	The investigations on the fatigue behavior of the studied material and the manufacturing techniques within this research are of high importance to the research community. Therefore, the processed data and proposals for the fatigue design rules of such WAAM components will be made available after the end of the project (e.g., Zenodo, Mendeley Data or other open access repositories).

Where/how will the data be made available for reuse?	☒ In an Open Access repository ☐ In a restricted access repository ☐ Upon request by mail ☐ Other (specify):
When will the data be made available?	The data will be made available as soon as the main findings of the project have been published.
Who will be able to access the data and under what conditions?	The data will be published under the following license: "Creative Commons Attribution Non Commercial Share Alike 4.0 International".
What are the expected costs for data sharing? How will these costs be covered? *Although FWO has no earmarked budget at its disposal to support correct research data management, FWO allows for part of **the allocated project budget** to be used to cover the cost incurred.*	No charges are foreseen/expected for data sharing.

8. Responsibilities	
Who will be responsible for the data documentation & metadata?	The PI, Burak Karabulut.
Who will be responsible for data storage & back up during the project?	The PI, Burak Karabulut.
Who will be responsible for ensuring data preservation and sharing?	The PI, Burak Karabulut, and the supervisors, Prof. Raf Dewil and Prof. Barbara Rossi.
Who bears the end responsibility for updating & implementing this DMP? *Default response: The PI bears the overall responsibility for updating & implementing this DMP*	The PI, Burak Karabulut.