

FP-002A
(Rev. 6/23)

The Commonwealth of Massachusetts
City/Town of Devens

Application For License

Massachusetts General Law, Chapter 148 §13

New License Amended License

GIS Coordinates

LAT.

LONG.

License Number

Application is hereby made in accordance with the provisions of Chapter 148 of the General Laws of Massachusetts for a license to store flammables, combustibles or explosives on land in buildings or structures herein described.

Location of Land: 39 Jackson Rd, Devens, MA 03049 Parcel 013.0-0021-1001.0
Number, Street and Assessor's Map and Parcel ID

Attach a plot plan of the property indicating the location of property lines and all buildings or structures.

Owner of Land: King 39 Jackson LLC

Address of Land Owner: 800 Boylston St, Suite 2400, Boston, MA
02199

Use and Occupancy of Buildings and Structures: Group F-1 / moderate hazard industrial manufacturing building

If this is an application for amendment of an existing license, indicate date of original license and any subsequent amendments

Attach a copy of the current license

Flammable and Combustible Liquids, Flammable Gases and Solids

Complete this section for the storage of flammable and combustible liquids, solids, and gases; see 527 CMR 1.00 Table 1.12.8.50; Attach additional pages if needed. All tanks and containers are considered full for the purposes of licensing and permitting.

PRODUCT NAME	CLASS	MAXIMUM QUANTITY	UNITS gal., lbs, cubic feet	CONTAINER UST, AST, IBC, drums
Titanium Powder	Flammable Solid	20,000	lbs	10-kg plastic containers

(see attached documents for floor plan markup and titanium powder SDS)

Total quantity of all flammable liquids to be stored: 30-gallons (under license threshold, to be stored in approved containers)

Total quantity of all combustible liquids to be stored: 150-gallons (under license threshold, to be stored in approved containers)

Total quantity of all flammable gases to be stored: n/a

Total quantity of all flammable solids to be stored: 20,000 lbs

LP-gas (Complete this section for the storage of LP-gas or propane)

Indicate the maximum quantity of LP-gas to be stored and the sizes and capacities of all storage containers. (See 527 CMR 1.00 Table 1.12.8.50)

❖ Maximum quantity (in gallons) of LP-gas to be stored in aboveground containers: N/A

List sizes and capacities of all aboveground containers used for storage: _____

❖ Maximum quantity (in gallons) of LP-gas to be stored in underground containers: N/A

List sizes and capacities of all underground containers used for storage: _____

Total aggregate quantity of all LP-gas to be stored: N/A

Fireworks (Complete this section for the storage of fireworks)

Indicate classes of fireworks to be stored and maximum quantity of each class. (See 527 CMR 1.00 Table 1.12.8.50)

❖ Maximum amount (in pounds) of Class 1.3G: N/A Type/class of magazine used for storage: N/A

❖ Maximum amount (in pounds) of Class 1.4G: N/A Type/class of magazine used for storage: N/A

❖ Maximum amount (in pounds) of Class 1.4: N/A Type/class of magazine used for storage: N/A

Total aggregate quantity of all classes of fireworks to be stored: N/A

Explosives (Complete this section for the storage of explosives)

Indicate classes of explosive to be stored and maximum quantity of each class. (See 527 CMR 1.00 Table 1.12.8.50)

❖ Maximum amount (in pounds) of Class 1.1: N/A Number of magazines used for storage: N/A

❖ Maximum amount (in pounds) of Class 1.2: N/A Number of magazines used for storage: N/A

❖ Maximum amount (in pounds) of Class 1.3: N/A Number of magazines used for storage: N/A

❖ Maximum amount (in pounds) of Class 1.4: N/A Number of magazines used for storage: N/A

❖ Maximum amount (in pounds) of Class 1.5: N/A Number of magazines used for storage: N/A

❖ Maximum amount (in pounds) of Class 1.6: N/A Number of magazines used for storage: N/A

I, Tyson Reynoso, hereby attest that I am authorized to make this application. I acknowledge that the information contained herein is accurate and complete to the best of my knowledge and belief. I acknowledge that all materials stored pursuant to any license granted hereunder must be stored or kept in accordance with all applicable laws, codes, rules and regulations, including but not limited to Massachusetts Chapter 148, and the Massachusetts Fire Code (527 CMR 1.00). I further acknowledge that the storage of any material specified in any license granted hereunder may not exceed the maximum quantity specified by the license.

Signature [Signature] Date 4/10/26 Name Tyson Reynoso

PLEASE NOTE THAT ONLY APPLICATIONS WITH ORIGINAL WET SIGNATURES WILL BE ACCEPTED. PHOTOCOPIES OF APPLICATIONS WILL NOT BE PROCESSED.

Fire Department Use Only

I, _____, Head of the _____ Fire Department endorse this application with my

Approval Disapproval

Signature of Head of the Fire Department _____

Date _____

Recommendations: _____

PARCEL-013.0-0021-1000.0
 NOW OR FORMERLY
 KING 33 JACKSON LLC
 33 JACKSON ROAD
 W.C.R.D. BK 66481 PG 74
 PLAN BK. 958 PL. 60
 (LOT 2 - 445,081± S.F. 10.217± AC)
 2 STORY BUILDING
 125,055 S.F.
 2.87 ACRES±

PARCEL-013.0-0021-1001.0
 NOW OR FORMERLY
 KING DEVENS LLC
 45 JACKSON ROAD
 W.C.R.D. BK 66478 PG 116
 PLAN BK. 955 PL. 19
 (LOT 1 - 314,447± S.F. 7.219± AC)
 2 STORY BUILDING
 82,840.94 S.F.
 1.9 ACRES±

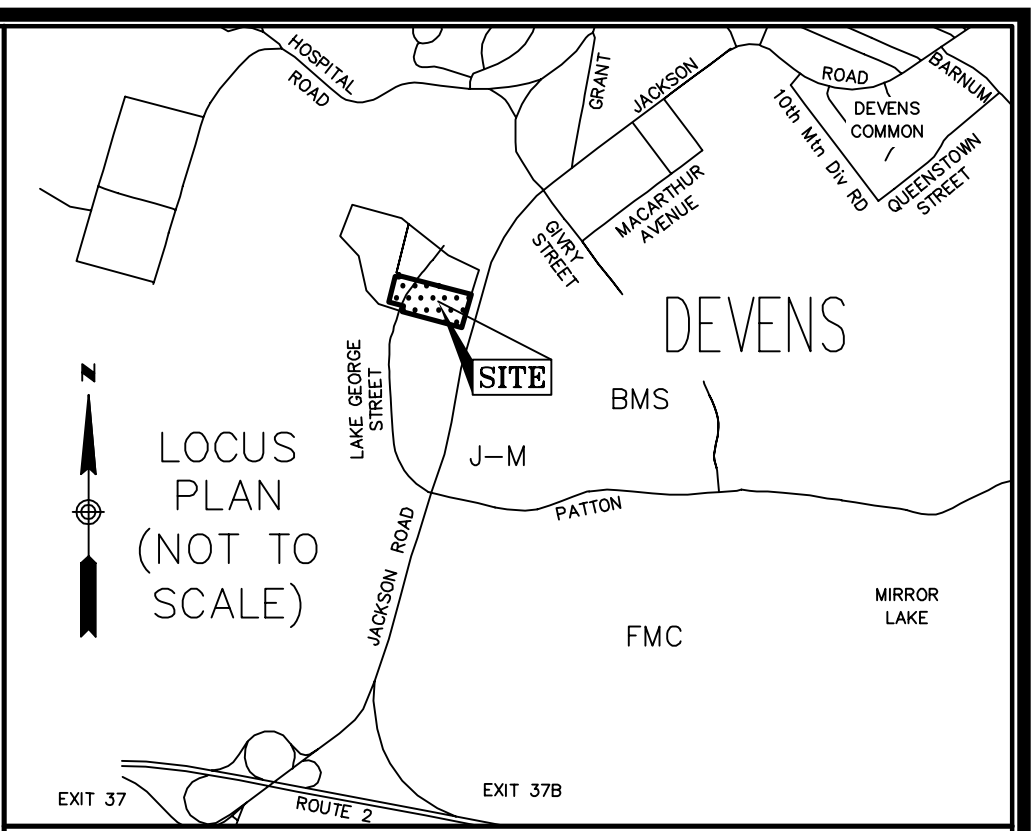
PARCEL-013.0-0021-1001.0
 NOW OR FORMERLY
 KING 39 JACKSON LLC
 39 JACKSON ROAD
 W.C.R.D. BK 68005 PG 64
 PLAN BK. 958 PL. 60
 (LOT 3 - 293,993± S.F. 6.428± AC)
 2 STORY BUILDING
 77,957.57 S.F.
 1.79 ACRES±

013.0-0021-0500.0
 NOW OR FORMERLY
 ONE JACKSON
 PLACE, LLC
 27 JACKSON ROAD
 W.C.R.D. BK 39383 PG 181
 SEE PLAN BK 845 PG 37
 (LOT 9)

PARCEL 013.0-0021-0700.0
 NOW OR FORMERLY
 MDFA CONSERVATION AREA
 45 LAKE GEORGE STORMWATER
 POND
 W.C.R.D. BK 45355 PG 176
 PLAN BK. 880 PL. 6
 (LOT 10B)

39 Jackson Road - Parking
 4 EV parking spots with 2 chargers
 153 Non-EV parking spots
157 TOTAL PARKING SPOTS
TOTAL: 3,140 Gallons of Gasoline
(calculated as 20 gal per vehicle)

- = EV Parking Spots & Chargers
- = Abutters
- = 39 Jackson Rd Property Line



LOCUS OWNER
 39 JACKSON ROAD - (LOT 3)
 KING 39 JACKSON LLC
 BK 68005 PG 64
 PLAN BK. 958 PL. 60

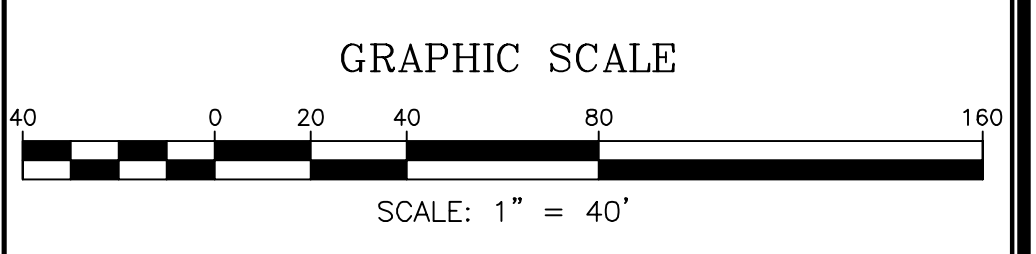
CERTIFICATION
 To:
 King 39 Jackson LLC
 First American Title Insurance Company
 Gouletson & Storrs

This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2021 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes items 2-4, 6(c/b), 8, 13 and 15, 17 and 20 of Table A thereof. The property shown on this survey is the same property as described in the title commitment. The fieldwork was completed in October of 2022 and field verified/updated in June of 2023.

Date of Plat or Map: June 14, 2023

PROGRESS PRINT
 Jun 15, 2023 - 12:04pm

June 15, 2023
 DARREN J. HARDY, P.L.S.
 REG. NO. 48385
 WSP USA, Inc. Date



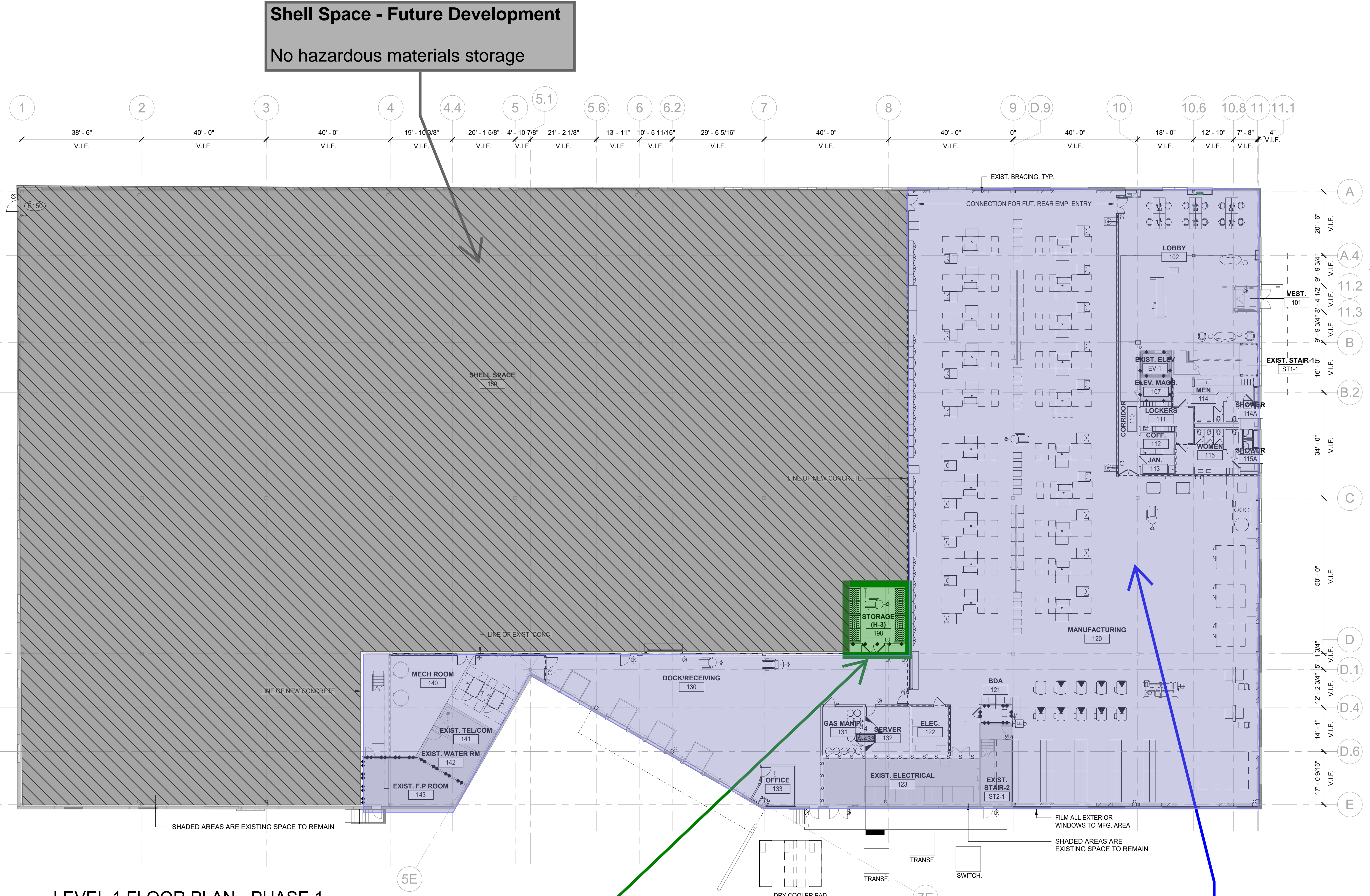
REVISION	DATE	DESCRIPTION
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ALTA/NSPS LAND TITLE SURVEY
 39 JACKSON ROAD (LOT 3)
 HARVARD (DEVENS), MA
 PREPARED FOR
 KING STREET PROPERTIES

WSP USA, Inc. 10 Al Paul Lane, Suite 103 Merrimack, NH 03054 603.324.0894		
Drawn By ES	Date JUNE 15, 2023	Job No. 190360C
Surveyed By TC EC RZ JL MA	Scale 1" = 40'	Sheet No. 1 OF 2
Checked By DH	Book No. CHA-84/N-155N-0	

Autodesk Docs/2025096/BW-Kennedy/VulcanForms-39 Jackson Road/BW_Kennedy_VulcanForms_P24.rvt

CONSTRUCTION MANAGER	(781)777-2920
BWKENNEDY & CO	
STRUCTURAL ENGINEER	(781)670-9900
GOLDSTEIN-MILANO	
HVAC	(508)226-6006
ESI - ENVIRONMENTAL SYSTEMS, INC.	
ELECTRICAL	(781)273-6697
NAPPA ELECTRICAL CONTRACTORS	
PLUMBING	(800)299-6762
NORTH SHORE MECH. CONTR., INC.	
FIRE PROTECTION	(978)304-1506
IMPACT FIRE SERVICES, LLC	
CODE CONSULTING	(617)864-2987
ARUP	
CIVIL ENGINEERING	(781)770-0973
HIGHPOINT ENGINEERING, INC.	



LEVEL 1 FLOOR PLAN - PHASE 1
1/16" = 1'-0"

Shell Space - Future Development
No hazardous materials storage

Group H-3 - Flammable Solids Storage Room
1-hour fire-rated separation (walls and ceiling)

Centralized storage room for flammable solids (titanium alloy powder, refer to attached SDS for additional information) supporting 3D printing processes. Partial height ceiling at 14-ft within full height warehouse space.

Storage of flammable solids in 10-kg containers on racks.

Flammable Solids Storage Total: 19,500 lbs

Control Area 1 (Remainder of Fitout Area):
100% MAQ with allowable increases for sprinkler protection and safe storage in flammable cabinets

Maximum Flammable Storage Quantities:

Class I Flammable Liquids Total: **30 gallons Isopropyl Alcohol**
 Class II Combustible Liquids Total: 0 gallons
 Class IIIA Combustible Liquids Total: 0 gallons
 Class IIIB Combustible Liquids Total: **150 gallons (Lube Oil)**
 Flammable Gases Total: 0 ft3
 Flammable Solids: **500 lbs (Titanium Alloy Powder)**

Stamp

Project
VulcanForms™
Accelerating Innovation
39 JACKSON ROAD

Client

Vulcan Forms, Inc.
112 Barnum Road
Devens, MA 01432

3	ISSUE FOR CONSTRUCTION	04/01/2026
2	ISSUE FOR PERMIT	03/11/2026
1	ISSUE FOR UNDERGROUND PERMIT	02/27/2026

SCALE: As indicated
PROJECT #: 2025096
REVIEWED BY: DSA
DATE: 04/01/26

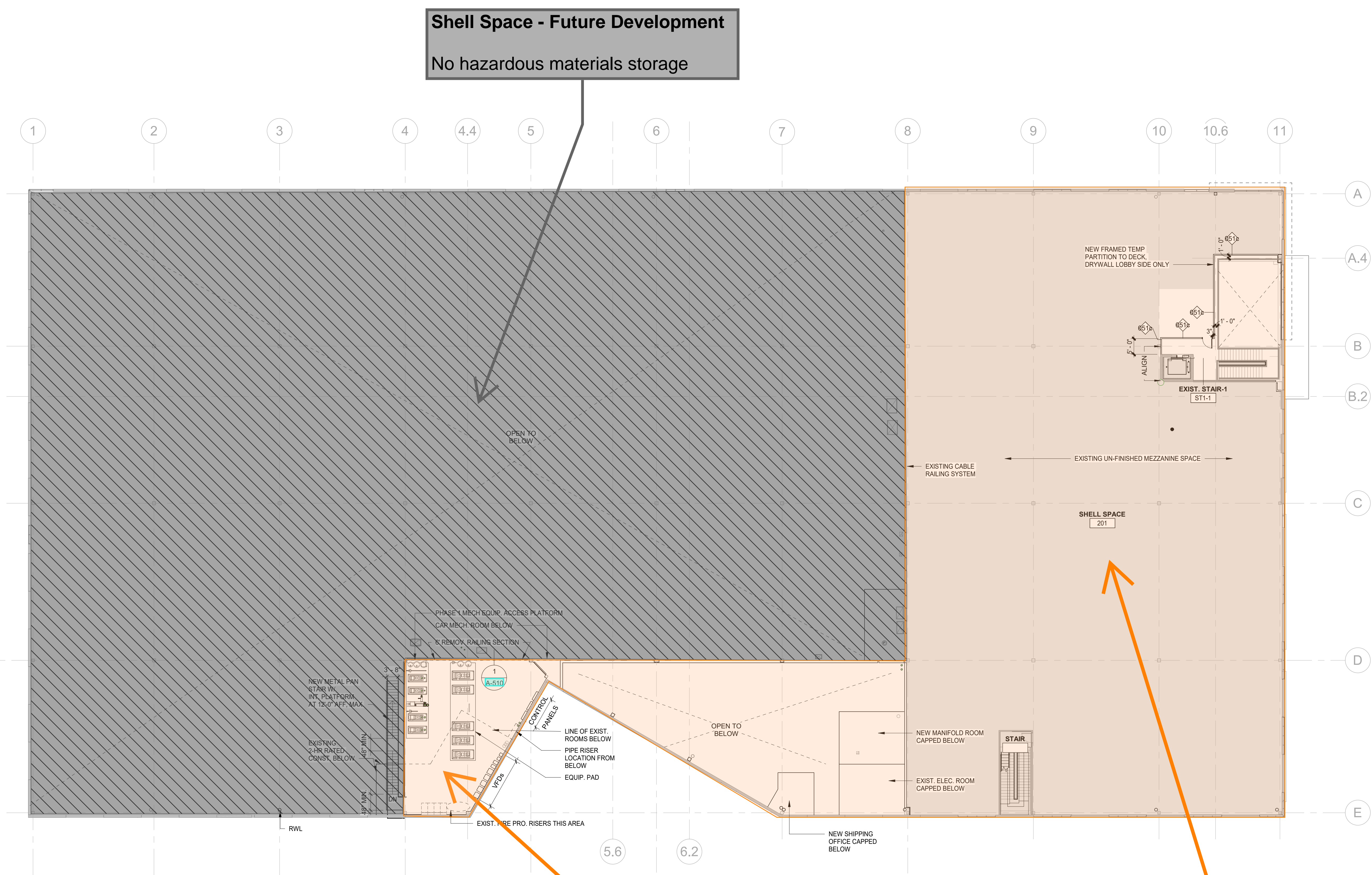
**LEVEL 1 FLOOR
PLAN - PHASE 1**

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Autodesk Docs/2025096/BW-K-VulcanForms-39 Jackson/2025096_BW-K_VulcanForms_P24.rvt

Project Team

CONSTRUCTION MANAGER	(781)777-2920
BWKENNEDY & CO	
STRUCTURAL ENGINEER	(781)670-9900
GOLDSTEIN-MILANO	
HVAC	(508)226-6006
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IMPACT FIRE SERVICES, LLC	
CODE CONSULTING	(617)864-2987
ARUP	
CIVIL ENGINEERING	(781)770-0973
HIGHPOINT ENGINEERING, INC.	



LEVEL 2 FLOOR PLAN - PHASE 1
1/16" = 1'-0"

Shell Space - Future Development
No hazardous materials storage

MEP Room
No hazardous materials storage

Fitout Shell Space
No hazardous materials storage

Stamp

Client

Vulcan Forms, Inc.
112 Barnum Road
Devens, MA 01432

3	ISSUE FOR CONSTRUCTION	04/01/2026
2	ISSUE FOR PERMIT	03/11/2026
1	ISSUE FOR UNDERGROUND PERMIT	02/27/2026

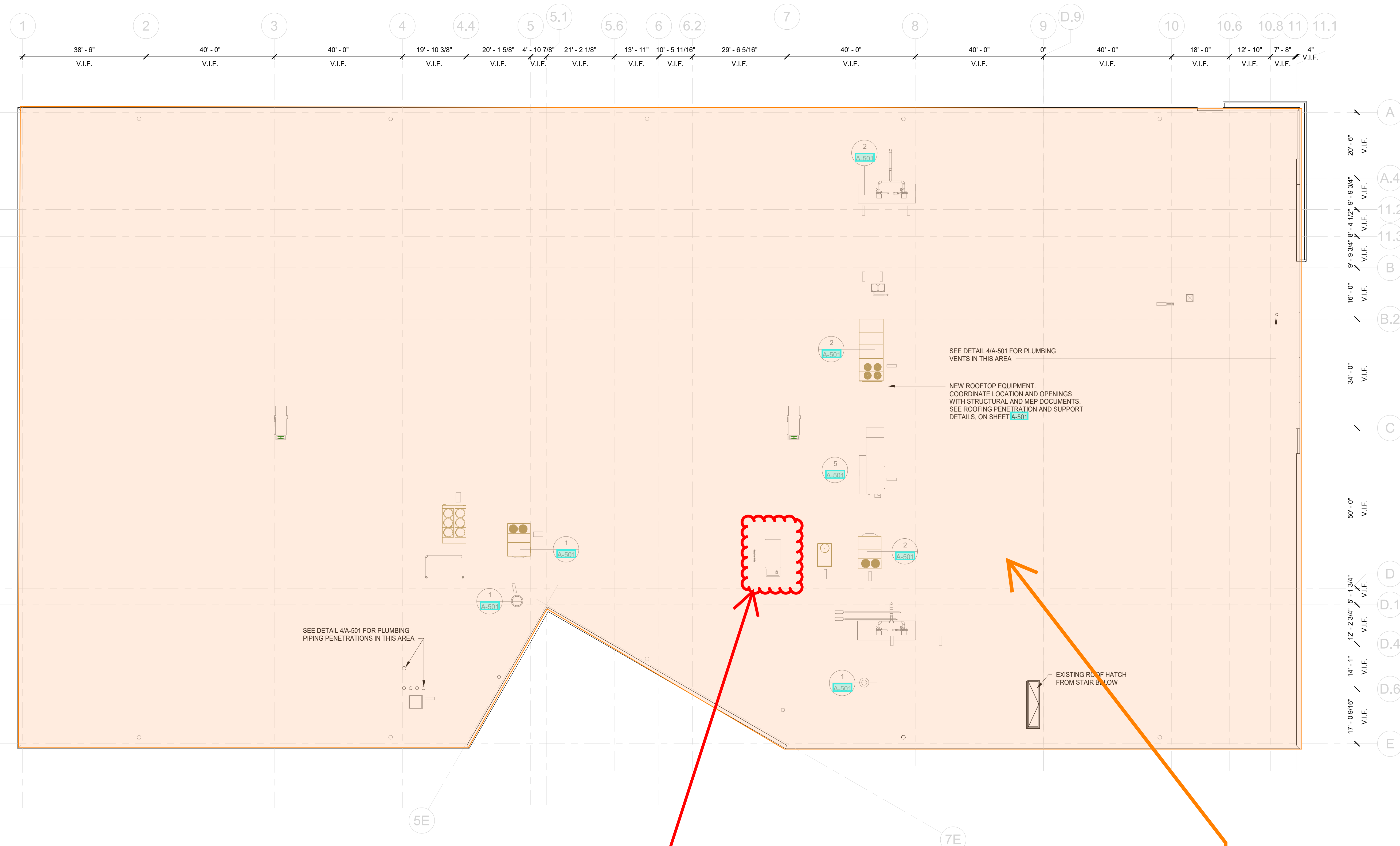
SCALE: As indicated
PROJECT #: 2025096
REVIEWED BY:
DATE: 04/01/26

**LEVEL 2 FLOOR
PLAN - PHASE 1**

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CONSTRUCTION MANAGER	(781)777-2920
BWKENNEDY & CO	
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PLUMBING	(800)299-6762
NORTH SHORE MECH. CONTR., INC.	
FIRE PROTECTION	(978)304-1506
IMPACT FIRE SERVICES, LLC	
CODE CONSULTING	(617)864-2987
ARUP	
CIVIL ENGINEERING	(781)770-0973
HIGHPOINT ENGINEERING, INC.	



ROOF PLAN
1/16" = 1'-0"

Building Generator
No fuel storage tank. Generator is supplied by site natural gas

Roof / MEP
No hazardous materials storage

Stamp



Client

Vulcan Forms, Inc.
112 Barnum Road
Devens, MA 01432

3	ISSUE FOR CONSTRUCTION	04/01/2026
2	ISSUE FOR PHASE-2 ENABLING WORK	TBD
1	ISSUE FOR PERMIT	03/11/2026

SCALE: 1/16" = 1'-0"
PROJECT #: 2025096
REVIEWED BY: DSA
DATE: 04/01/26

ROOF PLAN

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39 Jackson Rd, Devens MA - Flammable Storage Summary

Building Space	Description	Flammable Storage Method	Maximum Storage Quantities of Flammable Materials					
			Class I Flammable Liquids (gal)	Class II Combustible Liquids (gal)	Class IIIA Combustible Liquids (gal)	Class IIIB Combustible Liquids (gal)	Flammable Gases (ft ³)	Flammable Solids (lbs)
Roof	MEP / Generator supplied by natural gas No hazardous materials storage	<i>Non-Control Area</i>	0	0	0	0	0	0
Level 2 / Mezzanine Shell Space	MEP/BOH No hazardous materials storage	<i>Non-Control Area</i>	0	0	0	0	0	0
Level 1	Manufacturing/3D Area Storage in Flammable Cabinets	Control Area 1 ^a	30	0	0	150	0	500
	Group H-3 Room Flammable Solid Storage in 10-kg containers on racks	Group H-3 Room	0	0	0	0	0	19,500
Vehicle Parking	Gasoline in vehicle gas tanks in parking lot	Outside Parking	3,140 ^b	0	0	0	0	0
	Total	1 Control Area & 1 Group H-3 Room	3,170	0	0	150	0	20,000

Notes:

a. Quantities are below the Maximum Allowable Quantities (MAQs) for a 1st Floor Control Area with automatic sprinkler system and safe storage increases

b. Assumed 20 gallons of gas per vehicle. Gasoline in vehicle fuel tanks are not counted against MAQs



Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878
Reference number: Ti64-A-12.2-EN
Issue date: 9/26/2023 Revision date: 11/30/2022 Supersedes version of: 8/13/2021 Version: 12.2

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	: Mixture
Name	: AP&C - Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)
Trade name	: Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)
Product code	: Various, EBM powder (431184, 430944)
Type of product	: size: 15-53 µm, 20-63 µm, 45-106 µm, 45-150 µm, 0-180 µm, or similar
Synonyms	: Ti-6Al-4V Grade 5 Powder / Ti-6Al-4V Grade 23 Powder / Ti-6Al-4V ELI Powder (Extra Low Interstitials)
Product group	: Metal Alloy powders
Other means of identification	: Powder size: 15/20-53 µm, 15/20-63 µm, 45-106 µm, > 45µm, > 106 µm, as-produced, or similar

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Main use category	: Industrial use
Use of the substance/mixture	: Raw material for 3D-printing and Powder Metallurgy Uses (HIP, MIM Additive Manufacturing). For Industrial, Research & Development (R&D) or Laboratory Use Only (Reserve Only to Trained personnel).

1.2.2. Uses advised against

Restrictions on use	: Other uses than the identified uses indicated above.
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1.3. Details of the supplier of the safety data sheet

Manufacturer

GE Additive / AP&C Advanced Powders and Coatings Inc.
3765 La Vérendrye, suite 110
CA- J7H 1R8 Boisbriand, Québec
Canada
T +1 450.434.1004
GEAdd.SDS@ge.com - www.advancedpowders.com

Distributor, Only Representative

GE Additive / Arcam AB
Designvägen, 2
SE- 435 33 Mölnlycke
Sweden
T +46 (0)31 710 32 00 - F +46 (0)31 710 32 01

Distributor

GE Additive / Concept Laser GmbH
An der Zeil, 8
DE- 96215 Lichtenfels
Germany
T +49 (0)9571 1679 0

1.4. Emergency telephone number

Emergency number	: For Chemical Emergency Call INFOTRAC (Canada additional: CANUTEC +1 613.996.6666) 24hr/day 7days/week Within USA and Canada: 1-800-535-5053 Outside USA and Canada: +1-352-323-3500 (collect calls accepted)
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Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Not classified

Adverse physicochemical, human health and environmental effects

To our knowledge, this product does not present any particular risk, provided it is handled in accordance with good occupational hygiene and safety practice.

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Precautionary statements (CLP) : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources.
No smoking.
P280 - Wear protective gloves/protective clothing/eye protection/face protection/hearing protection.
P241 - Use explosion-proof electrical/ventilating/lighting equipment.
P370+P378 - In case of fire: Use media other than water to extinguish.

Extra phrases : May form combustible dust concentrations in air.

2.3. Other hazards

Other hazards which do not result in classification : Dust clouds may form weak explosive mixtures with air. Handling and/or processing of this material may generate a dust which may form flammable or explosive mixture with air. Such dust can also cause mechanical irritation of the eyes, skin, nose and throat. May form potentially combustible dust concentrations when suspended in air or other oxidizing medium.

Contains no PBT/vPvB substances $\geq 0.1\%$ assessed in accordance with REACH Annex XIII

Component	
vanadium (7440-62-2)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

The mixture does not contain substance(s) included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at a concentration equal to or greater than 0,1 %

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Comments : The powders declared herein are considered "mixtures" from a GHS SDS point of view, but are in reality "alloyed powders" (so not a "mixture" of different "elemental" powders). The GHS & SDS structure forces us to use such "mixture" categorization. See the Notes below the table for more details.

Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
titanium, powder, dry, slightly self-heating	CAS-No.: 7440-32-6 EC-No.: 231-142-3 REACH-no: 01-2119484878-14	88.75 – 91	Not classified
aluminium, powder, uncoated, non pyrophoric, water-reactive	CAS-No.: 7429-90-5 EC-No.: 231-072-3 EC Index-No.: 013-002-00-1 REACH-no: 01-2119529243-45	5.5 – 6.75	Flam. Sol. 1, H228 Water-react. 2, H261
vanadium	CAS-No.: 7440-62-2 EC-No.: 231-171-1 REACH-no: 01-2119537418-34	3.5 – 4.5	Not classified

Comments

- : The substances identified as "constituents" are chemical compounds that are typically present in the UVCB substance. Their presence may be relevant for hazard classification, or other health / environmental reasons (i.e. OELs)
- The substances identified above and forming the mixture are all purposely selected to be in powder form, when available. The Table is primarily indicative of individual elements identification, classification and % in the alloyed powders. The final products are classified in the SDS, section 2. Per our metal powder SDS authoring process, we always use the powder form of a given chemical element in sect. 3, when it is available from our recognized external chemical database. This is to ensure all risk inherent to the powder form of any substance is taken into account as a baseline. Only scientific evidence and/or test data can in the end determine the final product classification and "declassify" it, if applicable. This process assures a maximum safety level for all users.

Full text of H- and EUH-statements: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

- First-aid measures general** : IF exposed or concerned: Get medical advice/attention. Call a poison center or a doctor if you feel unwell.
- First-aid measures after inhalation** : Remove person to fresh air and keep comfortable for breathing. Remove the victim into fresh air. Give oxygen or artificial respiration if necessary. Get medical advice/attention.
- First-aid measures after skin contact** : After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of water. If skin irritation occurs: Get medical advice/attention. Brush off loose particles from skin. Immerse in cool water/wrap in wet bandages. Wash skin with plenty of water.
- First-aid measures after eye contact** : Rinse with water. Remove contact lenses, if present and easy to do. Continue rinsing. Rinse eyes with water as a precaution.
- First-aid measures after ingestion** : Immediately call a POISON CENTER/doctor. Obtain emergency medical attention. Do not induce vomiting. Call a poison center or a doctor if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

- Symptoms/effects** : May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation.
- Symptoms/effects after inhalation** : Dust of the product, if present, may cause respiratory irritation after an excessive inhalation exposure. Inhalation may cause irritation (cough, short breathing, difficulty in breathing).

Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

Symptoms/effects after eye contact : Dust from this product may cause eye irritation.
Symptoms/effects after ingestion : May cause irritation to the digestive tract.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Dry Sand, Class D extinguisher, Limestone, Unpressurized Water with local Safety Office/Fire Department approved metal fire additive (e.g. surfactants)
Use fire extinguishing methods suitable to surrounding conditions.
Unsuitable extinguishing media : Any media not listed as suitable (above) and/or not approved by local authorities.).
Water (without local Safety Office/Fire Department approved additive).

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products in case of fire : Toxic fumes may be released.

5.3. Advice for firefighters

Protection during firefighting : Wear appropriate protective equipment and self-contained breathing apparatus (SCBA).
Self-contained breathing apparatus. Do not attempt to take action without suitable protective equipment. Complete protective clothing. Wear appropriate protective equipment and self-contained breathing apparatus (SCBA).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Avoid generating dust. Avoid breathing dust. Eliminate every possible source of ignition. No open flames. No smoking. Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment.
6.1.1. For non-emergency personnel
Emergency procedures : No open flames, no sparks, and no smoking. Avoid contact with skin, eyes and clothing. Do not touch or walk on the spilled product. Only qualified personnel equipped with suitable protective equipment may intervene. See section 8 of the SDS for more information on personal protective equipment.
6.1.2. For emergency responders
Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Prevent entry to sewers and public waters. Do not allow to enter drains or water courses.

6.3. Methods and material for containment and cleaning up

For containment : Collect spillage. Do not use compressed air for pumping over spills. Do not push powder long distances across the floor. Keep in small piles away from each other.
Methods for cleaning up : Mechanically recover the product. Notify authorities if product enters sewers or public waters.
Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13. For further information refer to section 8: "Exposure controls/personal protection".

Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2020/878

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Additional hazards when processed : Dust may form flammable and explosive mixture with air. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- Precautions for safe handling : Ensure good ventilation of the work station. Wear personal protective equipment. Keep away from sources of ignition - No smoking. Handle under inert gas. Protect from moisture. Do not allow contact with water. Maintain a supply of "coarse" (rock-type) salt and/or "Class D" (for metal fires) fire extinguisher located near processing and storage areas. Keep work areas clean and free of waste. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground/bond container and receiving equipment. Limit quantities of product at the minimum necessary for handling and limit the number of exposed workers. Floors, walls and other surfaces in the hazard area must be cleaned regularly. Provide local exhaust or general room ventilation to minimize exposure to dust. Do not breathe dust/fume/gas/mist/vapours/spray. Avoid contact with skin and eyes. When plastic liners are present in pails and are the primary powder barrier bag, it is not recommended to handle powder only in those liners. The powder should at all times be handled within their liners & pails (as shipped/received). This to prevent powder leaks and safely carry the powder (in case of damaged bag during transport, etc.).
- Hygiene measures : Do not eat, drink or smoke when using this product. Always wash hands after handling the product. Separate working clothes from town clothes. Launder separately. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Comply with applicable regulations. Keep in a cool, well-ventilated place away from heat. Store in a well-ventilated place. Keep container tightly closed. Ensure adequate ventilation, especially in confined areas. Ground/bond container and receiving equipment. Maintain air gap between stacks/pallets.
- Storage conditions : Protect from moisture. Store in a dry place. Store in a closed container. Keep cool. Protect from sunlight. Keep away from ignition sources. Store away from other materials. Store in a well-ventilated place.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 National occupational exposure and biological limit values

Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)	
Germany - Biological limit values (TRGS 903)	
Local name	Aluminium
Biological limit value	50 µg/g creatinine Parameter: Aluminium - Untersuchungsmaterial: U = Urin - Probenahmezeitpunkt: c) bei Langzeitexposition: am Schichtende nach mehreren vorangegangenen Schichten - Festlegung/Begründung: 11/2018 DFG
Regulatory reference	TRGS 903
Spain - Occupational Exposure Limits	
Local name	Aluminio

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Ti-6Al-4V Grade 5, Grade 23 (Coarse, EBM powder)	
VLA-ED (OEL TWA) [1]	1 mg/m ³ Fracción respirable
Remark	d (Véase UNE EN 481: Atmósferas en los puestos de trabajo. Definición de las fracciones por el tamaño de las partículas para la medición de aerosoles).
Regulatory reference	Límites de Exposición Profesional para Agentes Químicos en España 2022. INSHT
USA - ACGIH - Occupational Exposure Limits	
Local name	Aluminum metal and insoluble compounds
ACGIH OEL TWA	1 mg/m ³ (R - Respirable particulate matter)
Remark (ACGIH)	TLV® Basis: Pneumoconiosis; LRT irr; neurotoxicity. Notations: A4 (Not classifiable as a Human Carcinogen)
Regulatory reference	ACGIH 2022
titanium, powder, dry, slightly self-heating (7440-32-6)	
Bulgaria - Occupational Exposure Limits	
Local name	Титан
OEL TWA	1 mg/m ³
Regulatory reference	Наредба № 13 от 30.12.2003 г. за защита на работещите от рискове, свързани с експозиция на химични агенти при работа (изм. и доп. ДВ. бр. 47 от 2021 г., в сила от 04.06.2021 г.)
Latvia - Occupational Exposure Limits	
Local name	Titāns
OEL TWA	10 mg/m ³
Regulatory reference	Ministru kabineta 2007. gada 15. maija noteikumiem Nr. 325
Poland - Occupational Exposure Limits	
Local name	Tytan i jego związki
NDS (OEL TWA)	10 mg/m ³
NDSch (OEL STEL)	30 mg/m ³
Regulatory reference	Dz. U. 2018 poz. 1286
Romania - Occupational Exposure Limits	
Local name	Titan
OEL TWA	10 mg/m ³
OEL STEL	15 mg/m ³
Regulatory reference	Hotărârea Guvernului nr. 1.218/2006 (Hotărârea nr. 53/2021)
vanadium (7440-62-2)	
Austria - Occupational Exposure Limits	
Local name	Vanadium
MAK (OEL TWA)	0.5 mg/m ³ (inhalable fraction)
MAK (OEL STEL)	1 mg/m ³ (inhalable fraction)
Regulatory reference	BGBl. II Nr. 156/2021

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vanadium (7440-62-2)	
Belgium - Occupational Exposure Limits	
OEL TWA	0.03 mg/m ³
Czech Republic - Occupational Exposure Limits	
Local name	Vanad a anorganické sloučeniny jako V
PEL (OEL TWA)	0.05 mg/m ³ (dust)
NPK-P (OEL C)	0.15 mg/m ³ (prach)
Remark	V - vdechovatelná frakce aerosolu.
Regulatory reference	Nařízení vlády č. 361/2007 Sb. (Předpis 195/2021 Sb.)
France - Occupational Exposure Limits	
VME (OEL TWA)	0.05 mg/m ³
OEL chemical category	Mutagen categories 1A, 1B, 2, Reproductive Toxin categories 1A, 1B, 2
Latvia - Occupational Exposure Limits	
Local name	Vanādijs un tā savienojumi (ferrovanādijs (pēc vanādijs))
OEL TWA	1 mg/m ³
Regulatory reference	Ministru kabineta 2007. gada 15. maija noteikumiem Nr. 325 (Grozījumi Ministru kabineta 2011. gada 1. februārī noteikumiem Nr. 92)
Romania - Occupational Exposure Limits	
OEL TWA	0.05 mg/m ³ (fume) 0.1 mg/m ³ (dust)
OEL STEL	0.1 mg/m ³ (V2O5 fume)
Norway - Occupational Exposure Limits	
Local name	Vanadium
Grønseverdi (OEL TWA) [1]	0.2 mg/m ³ (dust)
Korttidsverdi (OEL STEL)	0.6 mg/m ³ (dust)
Takverdi (OEL C) [1]	0.05 mg/m ³ (fume)
Regulatory reference	FOR-2021-06-28-2248
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Austria - Occupational Exposure Limits	
Local name	Aluminium (als Metall)
MAK (OEL TWA)	10 mg/m ³ inhalable fraction
MAK (OEL STEL)	20 mg/m ³ inhalable fraction
Regulatory reference	BGBl. II Nr. 156/2021
Austria - Biological limit values	
Local name	Aluminium-haltige Stäube und Rauche
BLV	60 µg/g creatinine Parameter: Aluminium - Untersuchungsmaterial: Harn

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aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Remark	Eignung mit vorzeitiger Folgeuntersuchung: Bei Überschreiten des Grenzwertes für Aluminium im Harn. Bei Vorliegen einer wesentlichen Beeinträchtigung der Lungenfunktion. Diese liegt vor, wenn nach mehrmaliger Messung der beste gemessene Wert den für den/die Untersuchte/n maßgebenden Sollwert um 20% unterschreitet, bzw. den MEF50-Sollwert um 50% unterschreitet. Eine vorzeitige Folgeuntersuchung ist jedoch nicht erforderlich, wenn im Vergleich zu Vorbefunden der altersabhängige physiologische Abfall der 1 Sekundenkapazität (FEV1) von 40 ml/Jahr nicht überschritten wird oder aus der Beurteilung des Kurvenverlaufes der Forcierten Vitalkapazität (FVC) eine eingeschränkte Mitarbeit des Untersuchten/der Untersuchten ersichtlich ist. Der Zeitabstand zwischen den Untersuchungen beträgt bei Eignung: ein Jahr; bei Eignung mit vorzeitiger Folgeuntersuchung: sechs Monate.
Regulatory reference	Verordnung über die Gesundheitsüberwachung am Arbeitsplatz 2017 (VGÜ 2017)
Belgium - Occupational Exposure Limits	
Local name	Aluminium # Aluminium
OEL TWA	1 mg/m ³
Regulatory reference	Koninklijk besluit/Arrêté royal 11/05/2021
Bulgaria - Occupational Exposure Limits	
Local name	Алуминий
OEL TWA	10 mg/m ³ (metal dust) 1.5 mg/m ³ (respirable fraction)
Regulatory reference	Наредба № 13 от 30.12.2003 г. за защита на работещите от рискове, свързани с експозиция на химични агенти при работа (изм. и доп. ДВ. бр. 47 от 2021 г., в сила от 04.06.2021 г.)
Croatia - Occupational Exposure Limits	
Local name	Aluminij
GVI (OEL TWA) [1]	10 mg/m ³ (total dust) 4 mg/m ³ (respirable dust)
Regulatory reference	Pravilnik o zaštiti radnika od izloženosti opasnim kemikalijama na radu, graničnim vrijednostima izloženosti i biološkim graničnim vrijednostima (NN 1/2021)
Croatia - Biological limit values	
Local name	Aluminij
BLV	200 mg/l (Biological Exposure Indices - BEI: Medium: Urine - Time: no restrictions - Parameter: Aluminium)
Regulatory reference	Pravilnik o zaštiti radnika od izloženosti opasnim kemikalijama na radu, graničnim vrijednostima izloženosti i biološkim graničnim vrijednostima (NN 91/2018)
Czech Republic - Occupational Exposure Limits	
Local name	Hliník a jeho oxidy (s výjimkou gama Al2O3)
PEL (OEL TWA)	10 mg/m ³ (dust)
Remark	Prachy s převážně nespecifickým účinkem.
Regulatory reference	Nariadení vlády č. 361/2007 Sb. (Předpis 195/2021 Sb.)
Denmark - Occupational Exposure Limits	
Local name	Aluminium, pulver og støv

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aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
OEL TWA [1]	5 mg/m ³ (dust, fume and powder, total) - Limit Values (Prolonged) ("Grænseværdie(langvarig)") 2 mg/m ³ (dust and powder, respirable) - Limit Values (Prolonged) ("Grænseværdie(langvarig)")
Regulatory reference	BEK nr 1054 af 28/06/2022
Estonia - Occupational Exposure Limits	
Local name	Alumiinium, metalliline ja oksiidid
OEL TWA	10 mg/m ³ (total dust) 4 mg/m ³ (respirable dust)
Remark	1 (Peentolm koosneb alla 2,5-mikromeetrise läbimõõduga osakestest, mis võivad jõuda koos sissehingatava õhuga kopsu alveoolidesse (respireeritav fraktsioon))
Regulatory reference	Vabariigi Valitsuse 20. märtsi 2001. a määruse nr 105 (RT I, 15.05.2021, 1)
Finland - Occupational Exposure Limits	
HTP (OEL TWA) [1]	1.5 mg/m ³
France - Occupational Exposure Limits	
Local name	Aluminium
VME (OEL TWA)	10 mg/m ³ 5 mg/m ³
Remark	VME conditions: 10 mg/m ³ - metal; 5 mg/m ³ - dust
Regulatory reference	Circulaire du Ministère du travail (réf.: INRS ED 984, 2016)
Germany - Occupational Exposure Limits (TRGS 900)	
AGW (OEL TWA) [1]	3 mg/m ³ (dust, fume and powder, total)
AGW (OEL TWA) [2]	1 mg/m ³ (dust and powder, respirable)
Germany - Biological limit values (TRGS 903)	
Local name	Aluminium
Biological limit value	50 µg/g creatinine Parameter: Aluminium - Untersuchungsmaterial: U = Urin - Probenahmezeitpunkt: c) bei Langzeitexposition: am Schichtende nach mehreren vorangegangenen Schichten - Festlegung/Begründung: 11/2018 DFG
Regulatory reference	TRGS 903
Greece - Occupational Exposure Limits	
Local name	Αργίλιο μεταλλικό & οξειδίο του αργιλίου
OEL TWA	10 mg/m ³ (inhalable fraction) 5 mg/m ³ (respirable fraction)
Regulatory reference	Π.Δ. 90/1999 - Προστασία της υγείας των εργαζομένων που εκτίθενται σε ορισμένους χημικούς παράγοντες κατά τη διάρκεια της εργασίας τους
Hungary - Occupational Exposure Limits	
Local name	ALUMINIUM (oldható, AL-ra számolva)
AK (OEL TWA)	6 mg/m ³ (respirable dust)
Remark	N (Irritáló anyagok, egyszerű fojtógázok, csekély egészségkárosító hatással bíró anyagok)

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aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Regulatory reference	5/2020. (II. 6.) ITM rendelet - A kémiai kóroki tényezők hatásának kitett munkavállalók egészségének és biztonságának védelméről
Hungary - Biological Exposure Indices	
Local name	Alumínium
BEI	0.06 mg/g creatinine Biológiai expozíciós (hatás) mutató: alumínium - Biológiai minta: vizeletben - Mintavétel ideje: n.k. (nem kritikus) 0.25 µmol/mmol Creatinine Biológiai expozíciós (hatás) mutató: alumínium - Biológiai minta: vizeletben - Mintavétel ideje: n.k. (nem kritikus)
Remark	A foglalkozási vegyi expozíció esetén ajánlott biológiai expozíciós és hatásmutatók határértékei
Regulatory reference	5/2020. (II. 6.) ITM rendelet - A kémiai kóroki tényezők hatásának kitett munkavállalók egészségének és biztonságának védelméről
Ireland - Occupational Exposure Limits	
Local name	Aluminium metal
OEL TWA [1]	1 mg/m ³ (respirable dust)
OEL STEL	3 mg/m ³ (calculated - respirable dust)
Regulatory reference	Chemical Agents Code of Practice 2021
Latvia - Occupational Exposure Limits	
Local name	Alumīnijs un tā sakausējumi (pēc alumīnija)
OEL TWA	2 mg/m ³
Regulatory reference	Ministru kabineta 2007. gada 15. maija noteikumiem Nr. 325 (Grozījumi Ministru kabineta 2011. gada 1. februārī noteikumiem Nr. 92)
Lithuania - Occupational Exposure Limits	
IPRV (OEL TWA)	5 mg/m ³ (inhalable fraction) 2 mg/m ³ (respirable fraction) 1 mg/m ³
Netherlands - Occupational Exposure Limits	
TGG-8u (OEL TWA)	0.05 mg/m ³
Poland - Occupational Exposure Limits	
Local name	Glin metaliczny, glin proszek (niestabilizowany)
NDS (OEL TWA)	2.5 mg/m ³ (inhalable fraction) 1.2 mg/m ³ (respirable fraction)
Remark	Frakcja wdychalna – frakcja aerozolu wnika jąca przez nos i usta, która po zdeponowaniu w drogach oddechowych stwarza zagrożenie dla zdrowia. Frakcja respirabilna – frakcja aerozolu wnika jąca do dróg oddechowych, która stwarza zagrożenie dla zdrowia po zdeponowaniu w obszarze wymiany gazowej.
Regulatory reference	Dz. U. 2018 poz. 1286
Portugal - Occupational Exposure Limits	
Local name	Alumínio e compostos insolúveis, expresso em Al
OEL TWA	10 mg/m ³ (dust, fume and powder, total) 5 mg/m ³ (dust and powder, respirable)

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aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Remark	A4 (Agente não classificável como carcinogénico no Homem)
Regulatory reference	Norma Portuguesa NP 1796:2014
Romania - Occupational Exposure Limits	
OEL TWA	3 mg/m ³ (dust) 1 mg/m ³ (inhalable fraction)
OEL STEL	10 mg/m ³ (powder) 3 mg/m ³ (fume)
Romania - Biological limit values	
BLV	200 µg/l (Medium: urine - Time: no restrictions - Parameter: Aluminium)
Remark	Biological Exposure Index
Slovakia - Occupational Exposure Limits	
Local name	Hliník kovový
NPHV (OEL TWA) [1]	6 mg/m ³ (total aerosol) 1.5 mg/m ³ (metal)
Regulatory reference	Nariadenie vlády č. 355/2006 Z. z. (236/2020 Z. z.)
Slovakia - Biological limit values	
Local name	Hliník
BLV	60 µg/g creatinine (Medium: urine - Time: no restrictions - Parameter: Aluminium)
Regulatory reference	Nariadenie vlády č. 355/2006 Z. z. (Zmena: 471/2011 Z.z.)
Slovenia - Biological limit values	
Local name	aluminij
BLV	50 µg/l Parameter: aluminij - Biološki vzorec: urin - Čas vzorčenja: ob koncu delovne izmene ob koncu delovne izmene, pri dolgotrajni izpostavljenosti: ob koncu delovne izmene po več zaporednih delavnikih
Regulatory reference	Uradni list RS, št. 72/2021 z dne 11.5.2021
Spain - Occupational Exposure Limits	
Local name	Aluminio
VLA-ED (OEL TWA) [1]	10 mg/m ³ (dust)
Remark	d (Véase UNE EN 481: Atmósferas en los puestos de trabajo. Definición de las fracciones por el tamaño de las partículas para la medición de aerosoles).
Regulatory reference	Límites de Exposición Profesional para Agentes Químicos en España 2023. INSHT
Sweden - Occupational Exposure Limits	
Local name	Aluminium, metall och oxid (som Al)
NGV (OEL TWA)	5 mg/m ³ (total dust) 2 mg/m ³ (respirable dust)

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aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Remark	3 (Den respirabla fraktionen är de inhalerbara partiklar som når längst ner i luftvägarna, till alveolerna i lungorna. Med totaldamm menas de partiklar (aerosoler) som fastnar på ett filter i den provtagare som beskrivs i Metodserien, Provtagning av totaldamm och respirabelt damm, Metod nr 1010, Arbetskyddsstyrelsen, numera Arbetsmiljöverket. Filterdiametern är normalt 37 mm, men kan även vara 25 mm. Trots sitt namn provtas inte den totala mängden luftburna partiklar med denna metod)
Regulatory reference	Hygieniska gränsvärden (AFS 2018:1)
United Kingdom - Occupational Exposure Limits	
Local name	Aluminium
WEL TWA (OEL TWA) [1]	10 mg/m ³ 4 mg/m ³
Remark	WEL conditions: 10 mg/m ³ - inhalable dust; 4 mg/m ³ - respirable dust
Regulatory reference	EH40/2005 (Fourth edition, 2020). HSE
Norway - Occupational Exposure Limits	
Local name	Aluminiumpulver (pyroteknikk)
Grenseverdi (OEL TWA) [1]	5 mg/m ³ (pyrotechnical-powder)
Korttidsverdi (OEL STEL)	5 mg/m ³ (pyrotechnical-powder)
Regulatory reference	FOR-2021-06-28-2248
Switzerland - Occupational Exposure Limits	
Local name	Aluminium métal / Aluminium (Metall)
MAK (OEL TWA) [1]	3 mg/m ³ (VME, respirable dust)
Critical toxicity	Formel / Formal
Notation	B / B
Remark	NIOSH
Regulatory reference	www.suva.ch, 01.01.2023
Switzerland - BAT	
Local name	Aluminium métal / Aluminium (Metall)
BAT	60 µg/g creatinine (Medium: urine - Time: no restrictions - Parameter: Aluminium)
Regulatory reference	Ordonnance 832.30 (OPA), article 50 al. 3, www.suva.ch/valeurs-limites / Verordnung 832.30 (VUV), Art. 50 Abs. 3, www.suva.ch/grenzwerte
USA - ACGIH - Occupational Exposure Limits	
Local name	Aluminum metal and insoluble compounds
ACGIH OEL TWA	1 mg/m ³ (Respirable fraction)
Remark (ACGIH)	TLV: 1 mg/m ³ ; OSHA PEL (TWA): 15 mg/m ³ (total dust) & 5 mg/m ³ (respirable fraction); NIOSH REL (TWA): 10 mg/m ³ (total dust) & 5 mg/m ³ (respirable dust)
Regulatory reference	ACGIH 2023

8.1.2. Recommended monitoring procedures

No additional information available

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8.1.3. Air contaminants formed

No additional information available

8.1.4. DNEL and PNEC

No additional information available

8.1.5. Control banding

No additional information available

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Appropriate engineering controls:

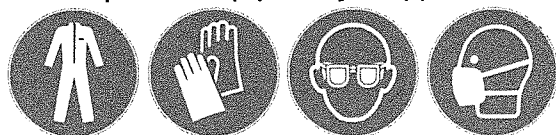
Ensure good ventilation of the work station.

8.2.2. Personal protection equipment

Personal protective equipment:

Dustproof clothing. Gloves. Safety glasses. Dust production: dust mask with filter type P1.

Personal protective equipment symbol(s):



8.2.2.1. Eye and face protection

Eye protection:

Safety glasses

8.2.2.2. Skin protection

No additional information available

8.2.2.3. Respiratory protection

Respiratory protection:

Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the material, and the safe working limits of the selected respirator. Recommendation: Filter P3 or N95 or P100 based on exposure level.

8.2.2.4. Thermal hazards

Thermal hazard protection:

Wear fire/flammable resistant/retardant clothing.

8.2.3. Environmental exposure controls

Environmental exposure controls:

Install and operate general and/or local exhaust ventilation systems of sufficient power to maintain airborne concentration below the defined or recommended limit. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the material, and the safe working limits of the selected respirator. Avoid release to the environment.

Consumer exposure controls:

Comply with applicable regulations. Keep in a cool, well-ventilated place away from heat. Store in a well-ventilated place. Keep container tightly closed. Ensure adequate ventilation, especially in confined areas.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid
Colour : Grey.

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Appearance	: Metal powder.
Odour	: Odourless.
Odour threshold	: Not available
Melting point	: 1605 – 1660 °C
Freezing point	: Not applicable
Boiling point	: Not available
Flammability	: ≈ 325 °C Layer (5 mm) ignition temperature (LIT)
Explosive properties	: Very fine dust clouds (0-15 microns) may form weak explosive mixtures with air, the measured maximum pressure of a dust cloud explosion (Pmax) and the speed of the pressure rise (KSt) are 3.9(bar) and 22(bar.m/s) respectively. Fine dust clouds may form explosive mixtures with air. Risk of explosion if heated under confinement.
Oxidising properties	: not expected.
Explosive limits	: Not applicable
Lower explosion limit	: Not applicable
Upper explosion limit	: Not applicable
Flash point	: Not applicable
Auto-ignition temperature	: ≈ 493 °C Minimum (dust cloud) ignition temperature (MIT)
Decomposition temperature	: Not available
pH	: Not available
pH solution	: Not available
Viscosity, kinematic	: Not applicable
Solubility	: Insoluble.
Partition coefficient n-octanol/water (Log Kow)	: Not available
Vapour pressure	: Not available
Vapour pressure at 50°C	: Not available
Density	: ≈ 4.43 g/cm ³
Relative density	: Not available
Relative vapour density at 20°C	: Not applicable
Particle size	: Not available
Particle shape	: Spherical
Particle aspect ratio	: Highly spherical

9.2. Other information

9.2.1. Information with regard to physical hazard classes

No additional information available

9.2.2. Other safety characteristics

Other properties	: Typical data for Ti-6Al-4V 20-63 microns powder (D10 - 31 µm / D50 - 45 µm / D90 - 61 µm) and for 45-106 microns powder (D10 - 53 µm / D50 - 74 µm / D90 - 103 µm)
Minimum Ignition Energy (MIE) 20-63 µm	: 10 - 25 mJ (without inductance)
Explosion severity (20 litres sphere) 20-63 µm	: > Pmax = 6.1 bar (@ 750 g/m ³)
(dP/dt) _{max} 20-63 µm	: 100 bar/s (@ 600 g/m ³)
Explosive limits - Limiting Oxygen Concentration (LOC) 20-63 µm	: 15 – 17 vol %
Lower explosive limit (LEL) - Minimum Explosive Concentration (MEC) 20-63 µm	: 90 – 100 g/m ³
Dust deflagration index 20-63 µm	: 27 bar·m/s (Kst)
Minimum Ignition Energy (MIE) 45-106 µm	: > 1000 mJ (without inductance)
Explosion severity (20 litres sphere) 45-106 µm	: 2.8 bar (@3000 g/m ³)
(dP/dt) _{max} 45-106 µm	: 22 bar/s (@ 3000 g/m ³)
Lower explosive limit (LEL) - Minimum Explosive Concentration (MEC) 45-106 µm	: 800 g/m ³
Explosive limits - Limiting Oxygen Concentration (LOC) 45-106 µm	: 15 - 16 vol %
Dust explosion category 45-106 µm	: St 1 (Weak explosion)
Dust deflagration index 45-106 µm	: 6 bar·m/s (Kst)

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SECTION 10: Stability and reactivity

10.1. Reactivity

Heating may cause a fire or explosion.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use. When burning, contact with water releases flammable gas.

10.4. Conditions to avoid

Dust clouds may form weak explosive mixtures with air. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking, static discharge.

10.5. Incompatible materials

Combustible materials. Acids. Oxidizing agent. Halogenated hydrocarbons. Strong acids. Strong bases.

10.6. Hazardous decomposition products

No hazardous decomposition products known at room temperature.

SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Not classified

titanium, powder, dry, slightly self-heating (7440-32-6)	
LD50 oral rat	> 5000 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 425 (Acute Oral Toxicity: Up-and-Down Procedure), Guideline: EPA OPPTS 870.1100 (Acute Oral Toxicity)

vanadium (7440-62-2)	
LD50 oral rat	> 2000 mg/kg bodyweight (OECD 423: Acute Oral Toxicity – Acute Toxic Class Method, Rat, Female, Experimental value, Oral, 14 day(s))
LC50 Inhalation - Rat	> 5.05 mg/l (OECD 436: Acute inhalation toxicity-acute toxic class method, 4 h, Rat, Male / female, Read-across, Inhalation (dust), 14 day(s))

aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
LD50 oral rat	> 15900 mg/kg bodyweight (Equivalent or similar to OECD 401, Rat, Male / female, Read-across, Oral, 14 day(s))
LC50 Inhalation - Rat	> 0.89 mg/l air (Equivalent or similar to OECD 403, 4 h, Rat, Male, Experimental value, Inhalation (aerosol), 14 day(s))
LC50 Inhalation - Rat (Dust/Mist)	> 0.888 mg/l Source: ECHA

Skin corrosion/irritation : Not classified

aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
pH	No data available in the literature

Serious eye damage/irritation : Not classified

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aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
pH	No data available in the literature
Respiratory or skin sensitisation	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
NOAEL (animal/male, F0/P)	1000 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)
STOT-single exposure	: Not classified
STOT-repeated exposure	: Not classified
vanadium (7440-62-2)	
LOAEC (inhalation, rat,dust/mist/fume, 90 days)	0.25 mg/l air Animal: rat, Guideline: OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study)
NOAEL (oral, rat, 90 days)	≥ 1000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 407 (Repeated Dose 28-Day Oral Toxicity in Rodents)
NOAEC (inhalation, rat, dust/mist/fume, 90 days)	0.022 mg/l air Animal: rat, Guideline: OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study)
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
LOAEC (inhalation, rat,dust/mist/fume, 90 days)	0.05 mg/l air Animal: rat, Guideline: OECD Guideline 413 (Subchronic Inhalation Toxicity: 90-Day Study)
NOAEL (subchronic, oral, animal/male, 90 days)	1034 mg/kg bodyweight Animal: dog, Animal sex: male, Guideline: OECD Guideline 409 (Repeated Dose 90-Day Oral Toxicity Study in Non-Rodents)
NOAEL (subchronic, oral, animal/female, 90 days)	1087 mg/kg bodyweight Animal: dog, Animal sex: female, Guideline: OECD Guideline 409 (Repeated Dose 90-Day Oral Toxicity Study in Non-Rodents)
Aspiration hazard	: Not classified
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Viscosity, kinematic	Not applicable
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Viscosity, kinematic	Not applicable (solid)

11.2. Information on other hazards

No additional information available

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	: The product is not considered harmful to aquatic organisms nor to cause long-term adverse effects in the environment.
Hazardous to the aquatic environment, short-term (acute)	: Not classified
Hazardous to the aquatic environment, long-term (chronic)	: Not classified
Not rapidly degradable	

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titanium, powder, dry, slightly self-heating (7440-32-6)	
EC50 72h - Algae [1]	> 10000 mg/l Test organisms (species): Skeletonema costatum
vanadium (7440-62-2)	
LC50 - Fish [1]	693 µg/l (OECD 203: Fish, Acute Toxicity Test, 96 h, Leuciscus idus, Semi-static system, Fresh water, Read-across, GLP)
ErC50 algae	2907 µg/l (OECD 201: Alga, Growth Inhibition Test, 72 h, Desmodemus subspicatus, Static system, Fresh water, Read-across, GLP)
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
EC50 72h - Algae [1]	1.05 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
EC50 72h - Algae [2]	0.2 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)

12.2. Persistence and degradability

titanium, powder, dry, slightly self-heating (7440-32-6)	
Persistence and degradability	Biodegradability in soil: not applicable. Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable
vanadium (7440-62-2)	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable (inorganic)
ThOD	Not applicable (inorganic)
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable (inorganic)
ThOD	Not applicable (inorganic)

12.3. Bioaccumulative potential

titanium, powder, dry, slightly self-heating (7440-32-6)	
Bioaccumulative potential	No bioaccumulation data available.
vanadium (7440-62-2)	
BCF - Fish [1]	4.5 – 64.3 (70 day(s), Jordanella floridae, Flow-through system, Fresh water, Weight of evidence, Fresh weight)
Partition coefficient n-octanol/water (Log Pow)	0.23 Source: EPI SUITE
Bioaccumulative potential	Low potential for bioaccumulation (BCF < 500).
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Bioaccumulative potential	Not bioaccumulative.

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12.4. Mobility in soil

titanium, powder, dry, slightly self-heating (7440-32-6)	
Mobility in soil	1.582
Ecology - soil	Adsorbs into the soil.
vanadium (7440-62-2)	
Mobility in soil	1.582 Source: EPI SUITE
Ecology - soil	No (test)data on mobility of the substance available.
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	
Surface tension	900 mN/m (700 °C)
Ecology - soil	Adsorbs into the soil.

12.5. Results of PBT and vPvB assessment

Component	
vanadium (7440-62-2)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII
aluminium, powder, uncoated, non pyrophoric, water-reactive (7429-90-5)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Endocrine disrupting properties

No additional information available

12.7. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional legislation (waste)	: Disposal must be done according to environmental protection and waste disposal legislation and any national, regional and local authority requirements. Disposal must be done according to official regulations.
Waste treatment methods	: The generation of waste should be avoided or minimised whenever possible. Dispose of contents/container in accordance with licensed collector's sorting instructions.
Sewage disposal recommendations	: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Disposal must be done according to official regulations.
Product/Packaging disposal recommendations	: a hazardous or special waste collection point. Comply with applicable regulations for solid waste disposal. Disposal must be done according to official regulations. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals.
Ecology - waste materials	: Avoid release to the environment.

SECTION 14: Transport information

In accordance with ADR / IMDG / IATA / ADN / RID

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ADR	IMDG	IATA	ADN	RID
14.1. UN number or ID number				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.2. UN proper shipping name				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.3. Transport hazard class(es)				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.4. Packing group				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.5. Environmental hazards				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
No supplementary information available				

14.6. Special precautions for user

Overland transport

Not regulated

Transport by sea

Not regulated

Air transport

Not regulated

Inland waterway transport

Not regulated

Rail transport

Not regulated

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

REACH Annex XVII (Restriction List)

Contains no substance(s) listed on REACH Annex XVII (Restriction Conditions)

REACH Annex XIV (Authorisation List)

Contains no substance(s) listed on REACH Annex XIV (Authorisation List)

REACH Candidate List (SVHC)

Contains no substance(s) listed on the REACH Candidate List

PIC Regulation (Prior Informed Consent)

Contains no substance(s) listed on the PIC list (Regulation EU 649/2012 concerning the export and import of hazardous chemicals)

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POP Regulation (Persistent Organic Pollutants)

Contains no substance(s) listed on the POP list (Regulation EU 2019/1021 on persistent organic pollutants)

Ozone Regulation (1005/2009)

Contains no substance(s) listed on the Ozone Depletion list (Regulation EU 1005/2009 on substances that deplete the ozone layer)

Explosives Precursors Regulation (2019/1148)

Contains substance(s) listed on the Explosives Precursors list (Regulation EU 2019/1148 on the marketing and use of explosives precursors)

ANNEX II REPORTABLE EXPLOSIVES PRECURSORS

List of substances on their own or in mixtures or in substances for which suspicious transactions and significant disappearances and thefts are to be reported to the relevant national contact point within 24 hours.

Name	CAS-No.	Combined Nomenclature code (CN)	Combined Nomenclature code for mixture without constituents which would determine classification under another CN code
Aluminium, powders	7429-90-5	7603 10 00; ex 7603 20 00	

Please see https://home-affairs.ec.europa.eu/policies/internal-security/counter-terrorism-and-radicalisation/protection/legislation-chemicals-used-home-made-explosives_en

Drug Precursors Regulation (273/2004)

Contains no substance(s) listed on the Drug Precursors list (Regulation EC 273/2004 on the manufacture and the placing on market of certain substances used in the illicit manufacture of narcotic drugs and psychotropic substances)

15.1.2. National regulations

Germany

- Employment restrictions : Observe restrictions according Act on the Protection of Working Mothers (MuSchG).
Observe restrictions according Act on the Protection of Young People in Employment (JArbSchG).
- Water hazard class (WGK) : WGK 3, Highly hazardous to water (Classification according to AwSV, Annex 1).
- Hazardous Incident Ordinance (12. BImSchV) : Is not subject of the Hazardous Incident Ordinance (12. BImSchV)

Netherlands

- ABM category : A(2) - toxic for aquatic organisms, may have longterm hazardous effects in aquatic environment
- SZW-lijst van kankerverwekkende stoffen : None of the components are listed
- SZW-lijst van mutagene stoffen : None of the components are listed
- SZW-lijst van reprotoxische stoffen – Borstvoeding : None of the components are listed
- SZW-lijst van reprotoxische stoffen – Vruchtbaarheid : None of the components are listed
- SZW-lijst van reprotoxische stoffen – Ontwikkeling : None of the components are listed

15.2. Chemical safety assessment

No chemical safety assessment has been carried out

SECTION 16: Other information

Abbreviations and acronyms:	
CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
WGK	Water Hazard Class
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road

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Abbreviations and acronyms:	
ATE	Acute Toxicity Estimate
BCF	Bioconcentration factor
BLV	Biological limit value
BOD	Biochemical oxygen demand (BOD)
COD	Chemical oxygen demand (COD)
DMEL	Derived Minimal Effect level
DNEL	Derived-No Effect Level
EC-No.	European Community number
EC50	Median effective concentration
EN	European Standard
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
LC50	Median lethal concentration
LD50	Median lethal dose
LOAEL	Lowest Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOEC	No-Observed Effect Concentration
OECD	Organisation for Economic Co-operation and Development
OEL	Occupational Exposure Limit
PBT	Persistent Bioaccumulative Toxic
PNEC	Predicted No-Effect Concentration
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
STP	Sewage treatment plant
ThOD	Theoretical oxygen demand (ThOD)
TLM	Median Tolerance Limit
VOC	Volatile Organic Compounds
CAS-No.	Chemical Abstract Service number
N.O.S.	Not Otherwise Specified
vPvB	Very Persistent and Very Bioaccumulative
ED	Endocrine disrupting properties

Full text of H- and EUH-statements:

Flam. Sol. 1	Flammable solids, Category 1
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Full text of H- and EUH-statements:	
H228	Flammable solid.
H261	In contact with water releases flammable gases.
Water-react. 2	Substances and Mixtures which, in contact with water, emit flammable gases, Category 2

The classification complies with : ATP 12

Safety Data Sheet (SDS), EU

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new processed material.