Appendix G – Regulatory Framework

Dubai Municipality Regulatory Framework

DM Local Order No. 61 of 1991 on the Environment Protection Regulations in the Emirate of Dubai

In 1991, Dubai Municipality issued Local Order No. 61 of 1991 dealing with environment protection regulations in the Emirate of Dubai. This Local Order consists of 91 articles, which provide regulations concerning the following:

- Reuse and land disposal of wastewater and sewage sludge
- Disposal of wastewater into the marine waters
- Air pollution control from stationary sources
- Occupational health and safety
- Swimming pool safety
- Safety of toys
- Noise control
- Protected Areas (Wildlife Sanctuaries
- General provisions on penalty and fines for non-compliances.

DM Administrative Order No. 211 of 1991 on the Issue of Executive Regulations for the Local Order No. 61 of 1991 on the Environment Protection Regulation in the Emirate of Dubai

This Administrative Order was enacted in line with the Local Order No. 61 (1991) on the Environment Protection Regulations in the Emirate of Dubai. Specific requirements of this regulation include:

- On wastewater and sludge reuse and disposal:
  - Permit for the reuse and land disposal of wastewater and sewage sludge shall be obtained from the Environment and Health Departments of DM
  - The quality of wastewater and sludge proposed to be reused should comply with the DM allowable limits
- On noise control:
  - Level of noise from premises should not exceed 55 dB(A) during the period from 7:00 am to 8:00 pm, and 45 dB(A) from 8:00 pm to 7:00 am except during holidays, official and popular celebrations
  - The limits for the exposure period for a worker (occupational exposure) in a noisy place are also provided

Local Order No. 11 of 2003 Concerning Public Health and Safety of the Society in the Emirate of Dubai

Local Order No. 11 of 2003 aims to ensure protection of public health and community safety in the Emirate of Dubai through provision of specific requirements for the following, which may be relevant to the Project:

- Health Hazard
- Drinking Water;
- Fighting of Public Health Pest

- Public Safety
- Smoke Control
- Health and Safety of Buildings
- Public Cleanliness

This Local Order stipulates conditions for penalties in cases of violations.

Information Bulletin No. 2

The Information Bulletin No. 2 features a quick reference of the various Environmental Standards and Allowable Limits of Pollutants on Land, Water and Environment (May 2003) as provided in Table 1, Table 2 and Table 3.

Table 1 Dubai wastewater discharge limits

Indicators	Units	Maximum allowable limits for discharge to		
		Sewerage system	Land Irrigation	
			Drip	Spray
Physico-chemical				
Biochemical Oxygen Demand (BOD)	mg/l	1000	20	10
Chemical Oxygen Demand (COD)	mg/l	3000	100	50
Chlorides	mg/l	-	500	350
Chlorine residual	mg/l	10	Not less than 0.5 mg/l after 30 minutes contact time	
Cyanides as CN	mg/l	1	0.05	0.05
Detergents	mg/l	30	-	-
Fluorides	mg/l	-	1	1
Nitrogen, ammoniacal	mg/l	40	5	1
Nitrogen, organic (Kjeldhal)	mg/l	-	10	5
Nitrogen, total	mg/l	-	50	30
Oil & Grease, emulsified	mg/l	150	-	-
Oil & Grease, free oil	mg/l	50	5	5
pH (range)	mg/l	6–10	6.0–8.0	6.0–8.0
Pesticides, non-chlorinated	mg/l	5	-	-
Phenols	mg/l	50	0.1	0.1
Phosphorus (P)	mg/l	30	20	20
Sulfates, total	mg/l	500	200	200

Indicators	Units	Maximum allowable limits for discharge to		
		Sewerage system	Land Irrigation	
			Drip	Spray
Sulfides as S	mg/l	10	0.05	0.05
Surfactants	mg/l	-	-	-
Suspended Solids (SS)	mg/l	500	50	10
Temperature	ºC	45 or >5 of ambient	-	-
Total Dissolved Solids (TDS)	mg/l	3000	1500	1000
Metals				
Total metals	mg/l	10	-	-
Aluminium (Al)	mg/l	-	2	2
Arsenic (As)	mg/l	0.50	0.05	0.05
Barium (Ba)	mg/l	-	1	1
Beryllium (Be)	mg/l	-	0.1	0.1
Boron (B)	mg/l	2.0	2.0	2.0
Cadmium (Cd)	mg/l	0.3	0.01	0.01
Chromium (Cr)	mg/l	1.0	0.1	0.1
Cobalt (Co)	mg/l	-	0.1	0.1
Copper (Cu)	mg/l	1.0	0.2	0.2
Iron (Fe)	mg/l	-	2.0	2.0
Lead (Pb)	mg/l	1.0	0.5	0.5
Magnesium (Mg)	mg/l	-	100	100
Manganese (Mn)	mg/l	1.0	0.2	0.2
Mercury (Hg)	mg/l	0.01	0.001	0.001
Molybdenum (Mo)	mg/l	-	0.01	0.01
Nickel (Ni)	mg/l	1.0	0.2	0.2
Selenium (Se)	mg/l	-	0.02	0.02
Silver (Ag)	mg/l	1.0	-	-
Sodium (Na)	mg/l	-	500	200

Indicators	Units	Maximum allowable limits for discharge to		
		Sewerage system	Land Irrigation	
			Drip	Spray
Zinc (Zn)	mg/l	2.0	0.5	0.2
Bacteriological				
Fecal Coliforms	MPN / 100 ml	500	20	-

Source: DM-ED, 2003

Table 2 Land contamination indicators

Indicator	Concentration * (mg/kg)
Arsenic (As)	50
Barium (Ba)	400
Cadmium (Cd)	5
Chromium (Cr)	250
Copper (Cu)	100
Lead (Pb)	200
Manganese (Mn)	700
Mercury (Hg)	2
Selenium (Se)	2
Zinc (Zn)	500
Pesticides (total)	2
Cyanide (CN)	10
Fluoride (F)	500
Phenol	1
Benzene	1
BTEX (total)	100
Chlorinated hydrocarbons	1
Polychlorinated biphenyls	0.5
Total Petroleum Hydrocarbons (TPH)	
< C9	1000

Indicator	Concentration * (mg/kg)
> C9	10,000

* *Depending on the souce, location and intended land use, the DM-EPSS may specify stringent level where the health of expecte receptors will be at risk or to maintain the background quality of the site.*

Source: DM-ED, 2003

Table 3 Allowable emission limits from stationary sources

Parameter	Sources to which limit is applicable	Emission limits *	Notes
Visible emissions	Combustion sources	Ringlemen 1 or 20% opacity	Does not apply to emissions of water vapour and a reasonable period for cold start-up, shutdown or emergency operation
	Other sources	No visible emission	As above
Total Particulate Matter (TPM)	All combustion sources	0.25 g/Nm^3	Gas volumes calculated to 12% CO_2
	Large sources	0.1 g/Nm^3	As above
Sulfuric acid mist and sulphur trioxide	All sources	0.1 g/Nm^3 as SO_3	-
Sulfur dioxide	All fuel burning sources	0.50 g/Nm^3	-
Hydrogen sulfide	All sources	5 mg/Nm^3	-
Oxides of nitrogen	Fuel burning units having a gross heat input above 100,000 MJ, excluding glass furnaces	0.35 g/Nm^3 for gaseous fuels $^{0.5}$ g/Nm^3 for liquid fuels	@7% O_2 reference
	Gas turbines for power generation	0.07 g/Nm^3 for gaseous fuels	Not applicable to small units less than 30 MW and @ 15% O_2 reference
	Power generation by other fuels	0.15 g/Nm^3	
Carbon monoxide	All stationary sources	1.5 g/Nm^3	-
Lead as its compounds	All stationary sources	10 mg/ Nm^3 as Pb	-
Fluorine compounds	Aluminium smelters	0.02 g/Nm^3	-

Parameter	Sources to which limit is applicable	Emission limits *	Notes
	All other sources	0.0.5 g/Nm^3	-
Chlorine & Chlorine compouonds	All stationary sources	0.2 g/Nm^3 as Cl_2	-
Metal fumes in total	All stationary sources	10 mg/Nm^3	Exluding iron oxide fume
Iron oxide fume	Iron and stell foundries	0.1 g/Nm^3	-

* *As may be required by DM-EPSS, all proponents and/or owners of emission sources are required to carry out air quality mathematical modelling study. The scope of the study varies according to source and on case basis. Based on the result of the modelling, EPSS then will specify the allowable emission limits of the source being studied.*

Source: DM-ED, 2003

Technical Guidelines issued by DM-EPSS

DM-EPSS has issued a number of TGs to supplement the Local Order No. 61 of 1991. Key requirements of DM-EPSS that are applicable to the Project are as follows:

- *TG No. 1 Environmental Impact Assessment* (January 2017). This TG was issued for obtaining 'Environmental Clearnace' for any Project in Dubai through the EIA.
- *TG No. 2 EIA for Land Development, Infrastructure and Utility Projects* (January 2017). This TG is applicable to any project or activity under Category "A" and should be used in conjunction with TG No. 1.
- *TG No. 7 Policy on the Control of Ozone Depleting Substances* (December 2014). This TG was issued to promote systematic approach in controlling ODS and encouraging cooperation between the industries, workforce and community to achieve the timely and orderly phase out of ODS.
- *TG No. 08: Requirements for the Discharge of Waste Gases, Fumes and Particulates to the Atmosphere* (April 2011). This TG specifies the proper design and installation of chimner or stack, which creates a serious air pollution problem in its surroundings. This TG applies to industrial processes, power generating stations and specific commercial establishments such as dry cleaning, bakeries and restaurants with kitchens that generate waste gases, fumes and fine particulates.
- *TG No. 09: Requirements for the Reduction of Construction and Demolition Noise* (April 2011). Specifies an incremental allowable noise level that may be implemented when the background noise at a sensitive receptor already exceeds the allowable noise limit on the receptor area zone. The incremental allowable noise that may be implemented shall not exceed the sliding scale incremental noise level detailed in Table 4.

Table 4 Allowable incremental noise level

Measured average noise level, dB(A)	Allowable increase, dB(A)
50 – 60	5
61 – 65	4

Measured average noise level, dB(A)	Allowable increase, dB(A)
66 – 70	3
71 – 75	2
76 – 80	1
81 and higher	0

Source: DM-EPSS, 2011

- *TG No. 08 Management of Recyclable Waste Material* (December 2014). This TG is issued in reference to the "Waste Acceptabce and Disposal Plicy in the Emirate of Dubai" (2013) as an instrument in implementing the 3R (reduce, reuse and recycle) of waste management.
- *TG No. 10: Waste Minimisation* (December 2014). This TG provides guidance on the implementation of waste minimisation plan, which include commissioning of licensed or authorised waste recycling companies.

Other Sections in Environment Department

Other sections in DM-ED issued a number of TGs that are applicable to the Project, as follows:

- *TG No. 1 Disposal of Hazardous Waste* (May 2017) issued by ECS:
  - Hazardous waste generator shall apply for hazardous waste disposal permit online via the DM Waste Disposal Service system. The application shall be supported with documents including waste analysis report, and / or Material Safety Data Sheet (MSDS) such as in the case of expired chemicals.
  - All permitted waste shall be disposed of into the designated site within 60 days from date of approval / Waste Disposal Service permit.
  - Hazardous waste generator shall provide the transporter with a copy of the Waste Disposal Service permit.
- *TG No. 6 Bunding and Storage Tanks and Transfer Facilities* (June 2011) issued by ECS:
  - Materials used for bunds (floor slab and bund walls) shall be impervious and compatible with the liquids to be contained.
  - The bund shall be constructed with drainage and collection.
  - For tank storage, the gross capacity of the bunded area shall be 110% of the biggest tank capacity, or 25% of the total capacity of all tanks stored within the bund, whichever is greater. Wall type bunds at tank storage facility shall be 0.5 m to 1.5 m high. A minimum distance of 1 m between the tank and bund walls shall be maintained.
  - For drum storage, the gross capacity of bunded area shall be of sufficient capacity to contain at least 25% of the total volume of drums stored up to 10 kL plus 10% of any volume in excess thereof.
  - The capacity of bunded area for tank vehicle loading shall be at least 100% of the largest compartment of any tank vehicle using the filling facility and the maximum quantity capable of being discharged from the filling point with full flow during a period of 2 minutes.
  - Bunded areas without any cover (roof) shall be at least 150 mm high.

  - Stormwater collected from bunded area may be contaminated and as such may require disposal permit via the DM Waste Disposal Service system.
  - Suitable fire precautions shall be out in place where there is risk of fire.
- *TG No. 7 Development of Emergency Response Procedures for Incidents Involving Dangerous Goods* (June 2011) issued by ECS:
  - Risk assessment to be undertaken and form the basis for planning emergency response procedures, resources and equipment.
  - Records of MSDS / manifests shall be maintained and kept updated and readily accessible.
  - Roles and responsibilities shall be clearly defined and communicated.
  - Incident specific response procedure shall be developed.
  - Emergency response equipment (e.g. fire extinguishers and spill kits) shall be made available, kept in good condition and inspected on a regular basis.
- *TG No. 10 Guidelines for the Disposal and Reuse of Used Chemical Containers* (June 2011) issued by ECS:
  - Any disposal of used chemical containers shall require prior approval from the DM Environmental Control Section;
  - Wastewater generated from washing contaminated containers is considered hazardous waste and shall be managed in accordance with Environmental Control Section TG No. 1.
- *Green Building Regulations and Specifications in the Emirate of Dubai*: As stated in the Regulation itself, the primary purpose of the Green Building Regulations and Specifications in the Emirate of Dubai is *'to improve the performance of buildings in Dubai by reducing the consumption of energy, water and materials, improving public health, safety and general welfare and by enhancing the planning, design, construction and operation of buildings to create an excellent city that provides the essence of success and comfort of living.'* The Regulation applies to all new buildings in the Emirate of Dubai; hence is considered directly relevant to the Project. The Regulation provides specific requirements with regard to:
  - Ecology and planning: access and mobility; ecology and landscaping; neighbourhood pollution; microclimate and outdoor comfort; responsible construction; and environmental impact assessment.
  - Building Vitality: ventilation and air quality; thermal comfort; acoustic comfort; hazardous materials; day lighting and visual comfort; and water auality.
  - Resource Effectiveness: energy conservation and efficiency - building fabric; conservation and efficiency - building systems; commissioning and management; on-site systems - generation & renewable energy.
  - Resource Effectiveness: water conservation and efficiency; commissioning and management; and on-site systems - recovery and treatment.
  - Resource Effectiveness: materials and waste - materials and resources; and waste management.
  - Where possible, the requirements applicable / relevant to the Project have been incorporated in the mitigation measures.

Technical Guidelines on Health and Safety

DM guidelines relevant to health and safety during the construction and operation phases of the Project are provided in Table 5.

Table 5 Health and safety technical guidelines issued by DM

Technical Guidelines No.	Name of the Technical Guidelines	Applicability	
		Construction Phase	Operation Phase
DM-PH&SD-P7-TG07	Rope Access Work	--	Y
-	Indoor air quality requirement within green building Regulations & Specifications	--	Y
-	Guideline for the control of legionella in water systems	--	Y
DM-PH&SD-P7-TG01	Guidelines for Swimming Pool Safety	--	--
DM-PH&SD-P7-TG02	Guidelines for Approval of Swimming Pool Plans	--	--
DM-PH&SD-P7-TG04	Requirements for the Control of Entertainment Noise	--	Y
DM-PH&SD-P7-TG06	Guidelines for Emergency Preparedness	Y	Y
DM-PH&SD-P4-TG01	Technical Guidelines for Industrial Compressed Gas Cylinders	Y	Y
DM-PH&SD-P4-TG02	Guidelines for Safety Audit Reports	Y	Y
DM-PH&SD-P4-TG03	Guidelines for Heat Stress at Work	Y	Y
DM-PH&SD-P4-TG04	Guidelines for Entry into Confined Spaces	Y	Y
DM-PH&SD-P4-TG05	Guidelines for Electrical Safety at Work	Y	Y
DM-PH&SD-P4-TG06	Guidelines for Guarding of Dangerous Machinery	Y	Y
DM-PH&SD-P4-TG07	Technical Guidelines for Paint Spray Booths	--	--
DM-PH&SD-P4-TG08	Guidelines for Personal Protective Equipment-Head Protection	Y	Y
DM-PH&SD-P4-TG09	Guidelines for Personal Protective Equipment-Eye and face Protection	Y	Y
DM-PH&SD-P4-TG10	Guidelines for Personal Protective Equipment-Hearing Protection	Y	Y
DM-PH&SD-P4-TG11	Guidelines for Personal Protective Equipment-Protective Clothing	Y	Y
DM-PH&SD-P4-TG12	Guidelines for Personal Protective Equipment-Hand Protection	Y	Y
DM-PH&SD-P4-TG13	Guidelines for Personal Protective Equipment-Foot Protection	Y	Y
DM-PH&SD-P4-TG14	Guidelines for Personal Protective Equipment-Fall Protection-Safety Lines	Y	Y

Technical Guidelines No.	Name of the Technical Guidelines	Applicability	
		Construction Phase	Operation Phase
DM-PH&SD-P4-TG15	Guidelines for Personal Protective Equipment-Respiratory Protection	Y	Y
DM-PH&SD-P4-TG16	Guidelines for Safe use of Industrial Organic Solvents	Y	Y
DM-PH&SD-P4-TG17	Guidelines for First-Aid Requirement	Y	Y
DM-PH&SD-P4-TG19	Guidelines for Health & Safety in Kitchens & Food Preparation Areas	--	Y
DM-PH&SD-P4-TG20	Guidelines for Examination and Certification of Boilers and Pressure Vessels	--	Y
DM-PH&SD-P4-TG21	Guidelines for Examination and Certification of Cranes, Hoists, Lifts and other Lifting Appliances	Y	Y
DM-PH&SD-P4-TG22	Guidelines for Acetylene Generators	Y	Y
DM-PH&SD-P4-TG24	Guidelines for Safety in Handling Asbestos	Y	Y
DM-PH&SD-P4-TG25	Guidelines for Development of Emergency Response Procedure for Accidents Involving Dangerous Goods	Y	Y
DM-PH&SD-P4-TG26	Safety and Health Requirements for Laundry Operations	--	Y
DM-PH&SD-P4-TG27	Guidelines for Liquefied Petroleum Gas Cylinders	Y	Y
DM-PH&SD-P7-WI02	Health Requirements for Labor Accommodation	Y	--
DM-PH&SD-P7-WI01	Health Requirements for Massage Centres and Spa	--	--
DM-PH&SD-P7-WI03	Health Requirements for Hotels & Furnished Apartments	--	--
DM-PH&SD-P7-WI04	Health Requirements for Barber Shops	--	--
DM-PH&SD-P7-WI05	Health Requirements for Beauty Saloons	--	--
DM-PH&SD-P7-WI06	Health Requirements for Health clubs	--	--
DM-PH&SD-P7-WI08	Health Requirements for Private Clinics	--	Y
DM-PH&SD-P7-WI12	Health Requirements for Construction Sites	Y	--
DM-PH&SD-P7-WI14	Health Requirements for Shopping Malls & Centers	--	Y
DM-PH&SD-P7-WI16	Health Requirements for Temporary Labor Accommodation	Y	--

Technical Guidelines No.	Name of the Technical Guidelines	Applicability	
		Construction Phase	Operation Phase
DM-PH&SD-P7-WI18	Health Requirements for the services Provided inside the Labours Accommodations	Y	--
DM-PH&SD-P7-WI24	Health Requirements for Kids Saloon	--	--

Technical Guidelines on Labour Accommodation

The Project will comply with the guidelines issued by DM Public Health and Safety Department on labour accommodation:

- DM-PH&SD-P7-WI18: Health Requirements for the Services Provided inside Labour Accommodation (2011)
- DM-PH&SD-P7-WI16: Health Requirements for Temporary Labour Accommodation (2011)
- DM-PH&SD-P7-WI02: Health Requirements for Permanent Labour Accommodation (2011)

UAE Federal Regulatory Framework

Federal Law No. (24) of 1999 – Protection and Development of the Environment

Federal Law 24 of 1999 relates to the protection of the environment, the preservation of its diversity and natural equilibrium, and the prevention of all forms of pollution. This law aims to achieve the following goals:

2 Protection and conservation of the quality and natural balance of the environment

3 Control of all forms of pollution and avoidance of any immediate or long-term harmful effects resulting from economic, agricultural, industrial, development or other programmes aiming at improving life standards and co-ordination among the Agency, Competent Authorities and Parties concerned with the protection of the environment and conservation of the quality, natural balance and consolidation of environmental awareness and principles of pollution control

4 Development of natural resources and conservation of biological diversity in the region of the state and the exploitation of such resources with consideration of present and future generations

5 Protection of society, human health and the health of other living creatures from activities and acts, which are environmentally harmful or impede authorized use of the environmental setting

6 Protection of the State environment from the harmful effects of activities undertaken outside the region of the State

7 Compliance with international and regional agreements ratified or approved by the State regarding environmental protection, control of pollution and conservation of natural resources

In line with the above objectives, this Law provides 101 articles dealing with the following environmental aspects:

1. EIA of projects and establishments applying for licence
2. Sustainable development

3. Combat to environmental disasters
4. Protection of water environment
5. Protection of soil
6. Protection of air from pollution
7. Handling of hazardous substances and hazardous wastes
8. Establishment of natural reserves
9. Liability and compensation for environmental damages

Executive Order issued by Council of Ministers Decree No. (37) of 2001 – Regulation concerning Environmental Impact Assessment Projects

In line with objectives of Federal Law No. 24 of 1999, all projects with the potential to impact on the environment are required to perform appropriate EIA. The EIA forms the basis for the issuance of environmental permits from regulatory agencies (e.g. Environment Agency Abu Dhabi (EAD), Dubai Municipality (DM), Sharjah Municipality (SM)).

Ministerial Order No. (12) of 2006 regarding Regulation Concerning Protection of Air from Pollution

This regulation provides the maximum allowable limits of air pollutants emitted from different source installations, in work areas and in the ambient air. It also specified the allowable ambient noise levels for different types of land uses such as residential, commercial and industrial.

The maximum allowable emission of pollutants emitted from stationary sources and ambient air quality standards are provided in Table 6, Table 7 and Table 8 while noise standards are shown in Table 9.

Table 6 Maximum allowable emission limits of air pollutants emitted from stationary sources in the UAE

Substance	Symbol	Sources	Maximum allowable emission limits (mg/Nm^3)
Visible Emissions		Combustion sources Other sources	250 none
Carbone Monoxide	CO	All sources	500
Nitrogen Oxides (expressed as nitrogen dioxide	NOx	Combustion sources Material producing industries Other sources	See Annex (2) 1500 200
Sulphur Dioxide	SO_2	Combustion sources Material producing industries Other sources	500 2000 1000
Sulphur Trioxide including Sulphuric Acid Mist (expressed as Sulphur Trioxide)	SO_3	Material producing industries Other sources	150 50

Substance	Symbol	Sources	Maximum allowable emission limits (mg/Nm^3)
Total Suspended Particles	TSP	Combustion sources Cement industry Other sources	250 50 150
Ammonia and Ammonium Compounds (expressed as ammonia)	NH_3	Material producing industries Other sources	50 10
Benzene	C_6H_6	All sources	5
Iron	Fe	Iron and steel foundries	100
Zinc and its compounds (expressed as Zinc)	Zn	Electroplating, galvanizing industries	10
Lead and its compounds (expressed as Lead)	Pb	All sources	5
Antimony and its compounds (expressed as antimony)	Sb	Material producing industries Other sources	5 1
Arsenic and its compounds (expressed as Arsenic)	As	All sources	1
Cadmium and its compounds (expressed as Cadmium)	Cd	All sources	1
Mercury and its compounds (expressed as Mercury)	Hg	All sources	0.5
Nickel and its compounds (expressed as Nickel)	Ni	All sources	1
Copper and its compounds (expressed as Copper)	Cu	All sources	5
Hydrogen Sulphide	H_2S	All sources	5
Chloride	Cl-	Chlorine works Other sources	200 10
Hydrogen Chloride	HCl-	Chlorine works Other sources	200 20
Hydrogen Fluoride	HF	All sources	2
Silicon Fluoride	SiF_4	All sources	10
Fluoride and its compounds including HF and $SiF4$ (expressed as fluoride)	F-	Aluminium smelters Other sources	20 50

Substance	Symbol	Sources	Maximum allowable emission limits (mg/Nm^3)
Formaldehyde	CH_2O	Material producing industries Other sources	20 2
Carbon	C	Odes production Waste incineration	250 50
Total Volatile Organic Compounds (expressed as total organic carbon (TOC))	VOC	All sources	20
Dioxin and Furans		All sources	1 ($ng\ TEQ/m^3$)

Source: Regulation concerning Protection of Air from Pollution
Notes:

1. *The concentration of any substance specified in the first column emitted from any source specified in the third column shall not at any point before admixture with air, smoke or other gases, exceed the limits specified in the fourth column.*
2. *''mg'' means milligram.*
3. *'ng'' means nanogram.*
4. *''Nm^3'' means normal cubic meter, being that amount of gas which when dry, occupies a cubic meter at a temperature of 25 degree Centigrade and at an absolute pressure of 760 millimeters of mercury (1 atm).*
5. *The limit of "Visible Emission" does not apply to emission of water vapor and a reasonable period for cold start-up, shutdown or emergency operation.*
6. *The measurement for "Total Suspended Particles (TSP)" emitted from combustion sources should be @ 12% reference CO_2.*
7. *The total concentration of the heavy metals (Pb, Cd, Ni, Hg, Cu, As & Sb) must not exceed 5 mg/Nm^3.*
8. *VOC limit is for unburned hydrocarbons (uncontrolled).*
9. *The emission limits for all the substances exclude "Dioxins and Furans" are conducted as a daily average value.*
10. *"Dioxins and Furans": Average values shall be measured over a sample period of a minimum of 6 hours and a maximum of 8 hours. The emission limit value refers to the total concentration of dioxins and furans are calculated using the concept of toxic equivalence in accordance with Annex 5.*

Table 7 UAE Federal ambient air quality standards

Substance	Symbol	Maximum allowable limits ($\mu g/Nm^3$)	Average time
Sulphur Dioxide	SO_2	350	1-hour
		150	24-hour
		60	1 year
Carbon Monoxide	CO	30	1-hour
		10	8-hour
Nitrogen Dioxide	NO_2	400	1-hour
		150	24-hour
Ozone	O_3	200	1-hour
		120	8-hour

Substance	Symbol	Maximum allowable limits (µg/Nm^3)	Average time
Total Suspended Particulates	TSP	230	24-hour
		90	1 year
Particulate Matter (with 10 microns or less in diameter)	PM_{10}	150	24-hour
Lead	Pb	1	1 year

Source: Regulation concerning Protection of Air from Pollution

Notes:

1. *"mg" means milligram.*
2. *"µg" means microgram.*
3. *"Nm^3" means normal cubic meter, being that amount of gas which when dry, occupies a cubic meter at a temperature of 25 degrees Centigrade and at an absolute pressure of 760 millimeters of mercury (1 atm).*

Table 8 Maximum allowable emission limits of air pollution emitted from Solid Waste Incinerators

Parameter	Maximum allowable emission limits (mg/Nm^3)	
	Incinerator capacity (less than 3 ton / hour)	Incinerator capacity (3 ton/hour)
Total Suspended Particles (TSP)	100	30
Carbon Monoxide (CO)	100	100
Nitrogen Oxides (expressed as NO_2)	350	300
Sulphur Dioxide (SO_2)	500	300
Hydrogen Chloride (HCl)	30	20
Hydrogen Fluoride (HF)	4	2
Total Volatile Organic Compounds (expressed as TOC)	20	20
Nickel and its compounds (expressed as Ni) Arsenic and its compounds (expressed as As)	total (1)	total (1)
Cadmium and its compounds (expressed as Cd) Mercury and its compounds (expressed as Hg)	total (0.2)	total (0.1)
Lead and its compounds (expressed as Pb) Chrome and its compounds (expressed as Cr) Copper and its compounds (expressed as Cu) Manganese and its compounds (expressed as Mn)	total (5)	total (1)

Parameter	Maximum allowable emission limits (mg/Nm^3)	
	Incinerator capacity (less than 3 ton / hour)	Incinerator capacity (3 ton/hour)
Dioxins and Furans	0.1 (ng TEQ/m^3)	0.1 (ng TEQ/m^3)

Notes:

1. *The concentration of any substance specified in the first column emitted from the incinerator shall not at any point before admixture with air, smoke or gases exceed the specified limits.*
2. *'Nm^3' means normal cubit meter, being that amount of gas which when dry, occupies a cubic meter at a temperature of 25 degree Centrigrade and at an absolute pressure of 760 millimeter at mercury (1 atm).*
3. *'mg' means milligram*
4. *'ng' means nanogram.*
5. *Exclude 'Dioxins and Furans' the emission limits for TSP, CO, NOx, SO2, HCl, HF and VOC are conducted as a daily average value, the remain are conducted as an average values over the sample period of a minimum 60 minutes and a maxijum of 8 hours.*
6. *'Dioxins and Furans': Average values shall be measured over a sample period of a minimum of 6 hours and a maximum of 8 hours. The emission limit value refers to the total concentration of dioxin and furans are calculated using the concept of toxic equivalence with Annex 5 (Dioxin and Furans).*

Source: Regulation concerning Protection of Air from Pollution

Table 9 UAE Federal allowable noise limits

Area	Allowable limits dB(A) for day (7 am to 8 pm)	Allowable limits dB(A) for night (8 pm to 7 am)
Residential areas with light traffic	40 – 50	30 – 40
Residential areas in downtown	45 – 55	30 – 45
Residential areas which include some workshops and commercial business or residential areas near highways	50 – 60	40 – 50
Commercial areas and downtown	55 – 65	45 – 55
Industrial areas (heavy industry)	60 – 70	50 – 60

*Note: *dB(A) means decibels adjusted. dB(A) is used for determining the sound exposure to humans.*

Source: Regulation concerning Protection of Air from Pollution

Executive Order issued by Council of Ministers Decree No. (37) of 2001 – Regulation for Handling Hazardous Materials, Hazardous Wastes and Medical Wastes

This Ministers Decree provides the classification categories / criteria for hazardous materials and waste, as well as regulatory requirements on the appropriate storage, management, transport and disposal of hazardous materials and wastes. The following are provisions of this Decree which are relevant to the generation of hazardous waste:

- No import of hazardous materials specified in Schedule 1.1 of Annex 1 is allowed unless a Permit is acquired from the Competent Authority.
- Only licensed contractors should be engaged to collect hazardous and medical waste.
- Entities responsible for the production and handling of waste must take all necessary measures to ensure that no damage to the environment occurs.

- Entities responsible for the production and handling of waste and must keep a registry of all wastes produced, transported and disposed.
- Hazardous wastes cannot be transported via land or sea without a permit from the relevant regulatory agency.
- Hazardous materials and waste are classified in accordance with Schedules 1.1 and 1.2 of Annex 1.
- Segregation requirements are to be maintained when storing hazardous material (Schedule 1.3 of Annex 1).
- Burial of hazardous wastes in special equipped burial holes isolated from other environment elements.

Federal Law No. (12) of 1986 concerning Regulations on Labour Relations or the UAE Labour Law

This Federal Law governs the regulations on labour in the UAE. This Law provides the Federal requirements with regards to the following:

- Employment of workers and youth and women labour
- Employment contracts, records and wages
- Working hours and leaves
- Workers' safety, protection, health and social care
- Disciplinary rules
- Termination of employment contract and end of service gratuity
- Compensation for occupational injuries and diseases
- Collective labour disputes
- Labour inspection

UAE Ministry of Human Resources and Emiratisation (MOHRE)

The Project will comply with the following resolutions issued by MOHRE:

1 Ministerial Resolution No. (46/1) for 1980 AD on Employment of juveniles and women

2 Ministerial Resolution No. (49/1) for 1980 AD on Determining the jobs where work must continue without halting and how to give the workers breaks for rest, food and prayer

3 Ministerial Resolution No. (4/1) for 1981 AD on Occupational Safety and Health

4 Ministerial Resolution No. (307) for 2003 AD on Labour disputes

5 Ministerial Resolution No. (788) for 2009 on Wage protection

6 Ministerial Resolution No. (401) of 2015 Concerning the determination of midday working hours

7 Ministerial Resolution No. (765) of 2015 on Rules and conditions for the termination of employment relations

8 Ministerial Resolution No. (291) of 2016 Concerning the commitment of establishments to provide accommodation to their workers

9 Ministerial Resolution No. (711) of 2016 Concerning Occupational Health and Safety Officers at the Construction and Industrial Sector

10 Ministerial Resolution No. (713) of 2016 Concerning the employment and training of students

International Conventions and Protocols

Dutch Circular on Target Values and Intervention Values for Soil Remediation (2009)

Local or regional standards are currently not available for the assessment of soil and groundwater. As such, the Dutch Soil Remediation Circular (2009) will be adopted for the soil and groundwater baseline data and impact assessment, if required by SM.

The Dutch Circular provides the following guideline values:

- Groundwater Target Values, which provide an indication of the benchmark for environmental quality in the long term, assuming that there is a Negligible Risk (NR) for the ecosystem
- Intervention Values for soil remediation, which indicate when the functional properties of the soil for humans, plants, and animals is seriously impaired or is in danger of being so. They are representative of the level of contamination above which a case of soil contamination is deemed to be severe.

Montreal Protocol on Substances that Deplete the Ozone Layer of 1987 & Montreal Amendments (London 1990, Copenhagen 1992, Montreal 1997, Beijing 1999)

On the basis of the Vienna Convention, the Montreal Protocol on Substances that Deplete the Ozone Layer was established to call for Parties to phase out the use of CFCs, halons and other man-made ODSs.

The UAE is a signatory to the Montreal Protocol and operates under Article 5(1). In addition to the enactment of the Federal Decree No. 13 of 1999 and the Ministerial Resolution No. 33 of 2012, the UAE government also initiated the Establishment of a Permanent Committee to Regulate the Imports of ODSs in UAE by virtue of the Decree No. 23 of 1999.

United Nations Framework Convention on Climate Change (1992)

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by global warming and climate change believed to have been caused by industrial and other emissions of carbon dioxide and other greenhouse gases (GHG). The Project provides overall positive benefit from reduced use of fossil fuel as an energy use. As such, the Project supports this Convention.

Under the Convention, governments (IPCC website, 2010):

- Gather and share information on greenhouse gas emissions, national policies and best practices
- Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries
- Cooperate in preparing for adaptation to the impacts of climate change

Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997)

The Kyoto Protocol was developed in line with the objectives and institutions of the Convention on Climate Change. The main difference to the Convention is that the Protocol commits rather than encourage the signatory parties to stabilise their GHG emissions.

Under the Protocol, the Annex I countries have committed to reduce their emissions by an average of 5% against the 1990 levels over the period of 2008 to 2012. As a non-Annex I country, the UAE is not required to reduce its emissions below 1990 levels. However, the UAE ratified the Protocol on January 2005 and has submitted its First and Second Communications to the United Nations Framework Convention on Climate Change in January 2007 and January 2010, respectively. This initial communication presents options and initiatives that the UAE may undertake in order to reduce its GHG emissions.

United Nations (UN) Climate Change Conference – COP21 – CMP11 (Paris)

The 2015 UN Climate Change Conference, or the 21st session of the Conference of the Parties (COP21) negotiated the Paris Agreement, a global agreement on the reduction of climate change from 30 November to 12 December 2015. The Paris agreement is due to take effect in 2020.

The UAE decided to ratify the Paris agreement in September 2016 as they aim to combat global warming. Countries that have ratified the agreement are committed to limiting the rise in global average temperatures to 1.5 °C above pre-industrial levels. In response to this commitment, the UAE developed the UAE Vision 2021 National Agenda, which is a strategy to slow the growth in energy consumption and diversify supply sources. By establishing the proposed WtE plant, almost 450,000 tonnes of CO_2-equivalent will be displaced per year.

Vienna Convention for the Protection of the Ozone Layer (1985)

The Vienna Convention established mechanisms for international co-operation in research into the ozone layer and the effects of ozone depleting chemicals (ODCs). This convention seeks to protect human health and the environment against adverse effects that impact on and modify the ozone layer.

Convention on Biological Diversity (1992)

The UAE signed this Convention in 1992 and subsequently ratified this in 2000.

The Convention on Biological Diversity (CBD) promotes the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources.

In April 2002, the Parties to the Convention committed themselves to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level.

European Regulations/Industrial Emissions Directive (Directive 2010/75/EU) (2010)

The Directive provides rules on integrated prevention and control of pollution arising from industrial activities. It also includes rules designed to prevent or, where is not practicable, to reduce emissions into air, water and land. In addition, it provides rules to prevent the generation of waste in order to protect the environment.

The WtE facility will be in compliance with Directive 2010/75/EU regarding air emission and ash quality.

Appendix H – Technical Process Description

Project Number	YE-3256
Project Name	Dubai Waste Management Center

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Customer:

بلدية دبي
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Rev	Author (Name, Date, Signature)	Reviewer (Name, Date, Signature)	Approver (Name, Date, Signature)	Short description of change
2.0	Jean-Luc Julien 29.07.2019	Claudia Einsporn 08.08.2019		
3.0				
4.0				
5.0				
6.0				

Doc Name	DWE-AOF-HZI	Doc No _ Rev	50091361_0.0

IBA Maturation Area Coverage Minimum Functional Requirement

Table of Content

1 General

According to the latest development in the Dubai project it may become very likely we will receive soon the request from Dubai Environmental Department to cover the 12 weeks IBA maturation area on site to mitigate dust dispersion outside the building in addition to the moistening already considered.

The purpose of this document is to define the Minimum Functional Requirement with regards to the coverage of the IBA maturation area from a process and operation point of view, only in order to allow our civil partner Besix to proceed with a design / cost estimate / drawing with the following aims:

- Satisfy Environmental Department to achieve Environmental Permit
- Low CAPEX
- Suitable for O&M – low OPEX
- Constructability
- Compliance with local regulations and best practice

The initial purpose and associated design requirements of the IBA maturation area remain.

2 Operational input No 1 – Dust Control & Retention

- The purpose of the coverage of the IBA maturation area is to mitigate the risk of dust dispersion outside the building. Industrial fabric tissue can be considered from a functional point of view.
- As per sketch chapter 6, Side wall (height = 6m - Concrete wall on North, East and South side remain unchanged), Side walls (height = 6m - Concrete wall) are added on the West side of the building. Roof supporting structure on top of the surrounding 6-metre wall can remain open.
- The coverage of the IBA maturation area does note replace the moistening already considered. Minimum six process water interface points at the slab level should be considered to cover the full area.

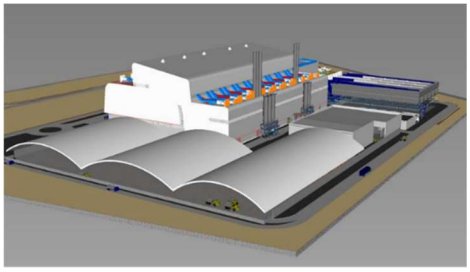
3 Operational input No 2 – Wheel loader and truck traffic

- 8-metres free clearance between the slab and roof including supporting structure must be considered
- If intermediate columns are needed, a minimum clearance of 40 metres must be considered between column to column, column to wall or column to opening (west side)

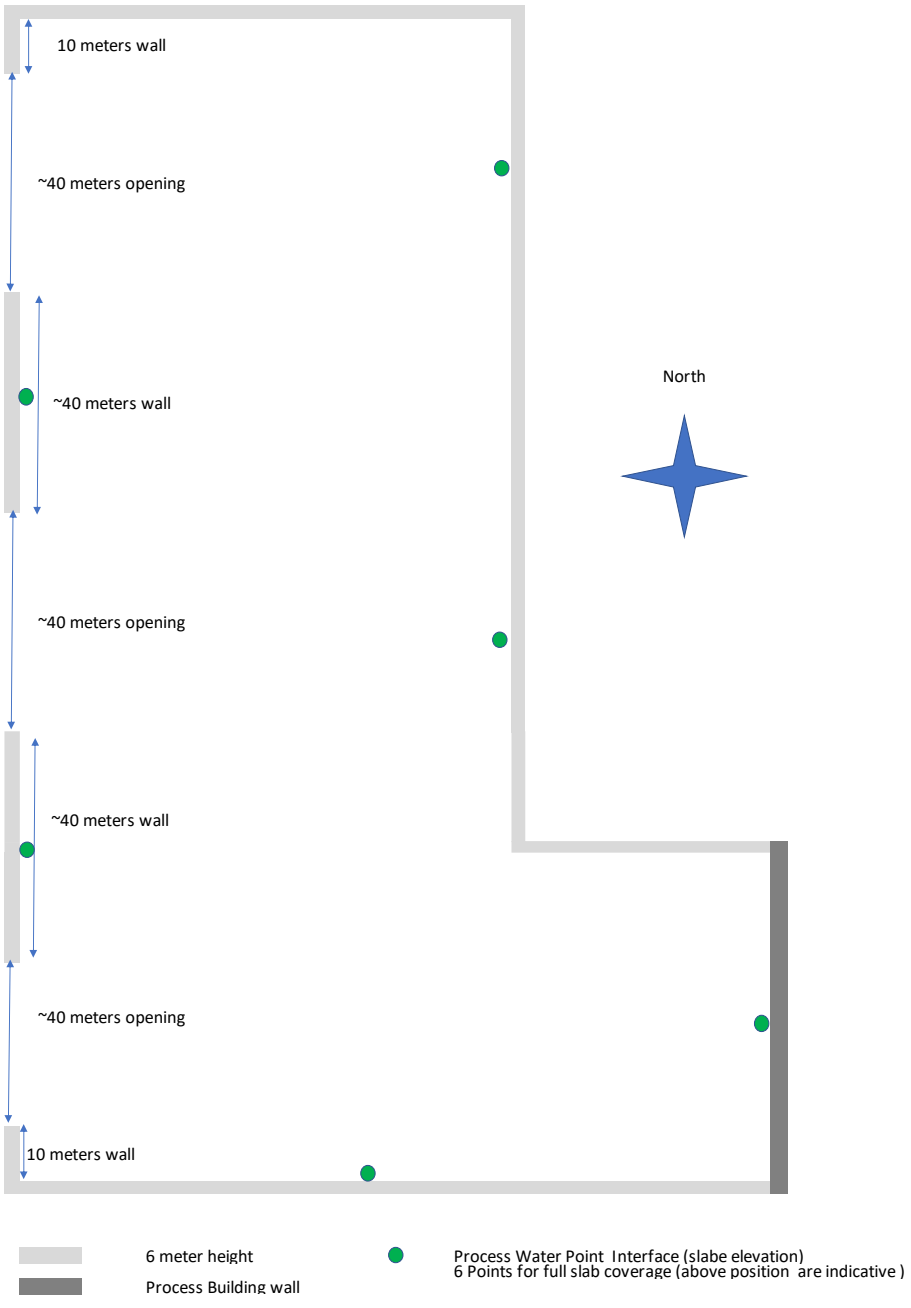
4 Operational input No 3 – Other

- No other fire hazard than the one generated by the vehicles such as truck, wheel loaders, working inside the building should be considered.
- Minimum Lighting should be considered (no night shift planned in the area)
- Corrosion protection should be designed in relation to the material stored in the area
- No specific ventilation in relation to the dust hazard is required

5 Typical Picture/3D view



6 IBA Maturation Area – Surrounding walls



Design waste bunker dimensions

Hitachi Zosen INOVA

Project :	**Dubai**
Project N° :	**YE-3256**
HZI doc. N° :	50071808

	Date	Name
Prepared :	08.03.18	Stlu
Checked :		
Approved :		

Prog. No. : CSP-124 / V2.5

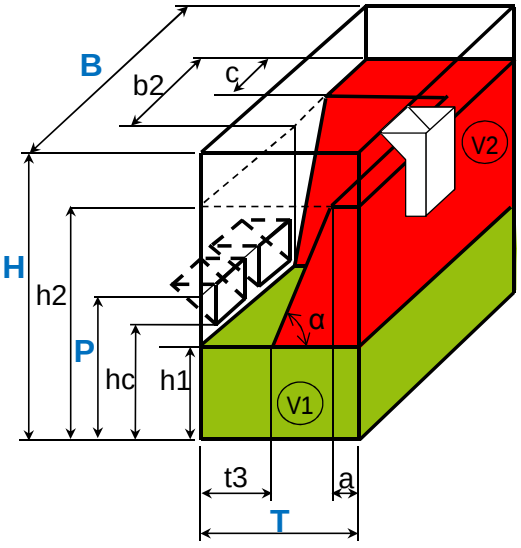
R:\VRU-SP\Angebotsprojekte\YE-3256 Dubai WtE BOT\13 Prozess\04 Auslegungsdaten\BOS\08 Bunker Sizing (Waste & Ash)\[PDE-HZI-50071808_1.0_Design Bunker_2Lines.xlsm]Calc_DataDiagram

Rev.	Date	Description
0	29.01.18	First Issue - Bunker für 2 Linien /LPN=46.237 - basis Dubai 3 Linien
1	08.03.18	Lowering of Bunker- and Tippinghallfloor by 5m
2		

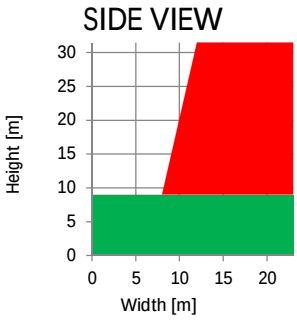
Remarks

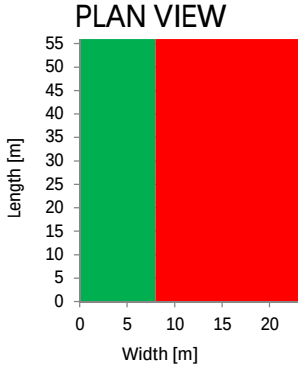
Input data from :	Doc. No.	Rev.	Date
Input layout planning	-	-	-

						Remarks
number of lines				2		
waste density in bunker				350	kg/m3	acc. meeting EIC 31.01.2018
load point for calculation				LP N		acc. meeting EIC 31.01.2018
waste throughtput	per line			46.2	t/h	
	total			92.5	t/h	
Waste Crane Size				18	m³	
Waste Crane width open				6.65	m	
Crane control mode				**Manual**		
Dimensions waste bunker						
Bunker	**width**		**B**	**56.0**	**m**	EIC 08.030.201 8Lowering of Bunker- and Tippinghallfloor by 5m
	height		**H**	**33.0**	**m**	Höhe Feedhopperlevel / Bunkerboden
	depth		**T**	**23.0**	**m**	≥ 3 x width of grab (semiautomatic), ≥ 4 x width of grab (fully automatic)
	volume			**42'504**	**m3**	
tipping hall floor	**height**		**P**	**9.0**	**m**	
tipping bay chute				**no**		
chute angel				**50.0**	**°**	
volume up to waterline				11'592	m3	
volume fraction of bunker				27%		
Waste Volume			**V1**			
dropping zone	height		**h1**	9.0	m	ohne chute h1 = hc = P / mit chute = min. 5m unterhalb schurre / ab 15m³ Greifervolume
waste volume				11'592	m3	
volume fraction of bunker				27%		
storage capacity		at LP N		1.83	d	
Waste Volume			**V2**			
width			**b2**	0.0	m	
start incline			**t3**	8.7	m	ca. ≥ 1.3 x diameter of grab (open)
Waste stacking height			**h2**	31.5	m	H ≥ h2
angle of respose			**α**	80.0	°	Standard 80° (halbautomatisch), 70° (fully automatic)
			a	10.3	m	ca. ≥ 1.3 x diameter of grab (open)
			c	-	m	ca. ≥ 1.3 x diameter of grab (open)
waste volume				15'519	m3	
volume fraction of bunker				37%		
storage capacity		at LP N		2.45	d	
Total Waste Volume			**V1 + V2**			
waste volume				27'111	m3	
volume fraction of bunker				64%		
storage capacity		**at LP N**		**4.3**	**d**	



Diagrams up to date.





print date: 08.03.2018

Project Number	YE-3256
Project Name	Dubai Waste to Energy BOT GS003

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SPV

Rev	Author (Name, Date, Signature)	Reviewer (Name, Date, Signature)	Approver (Name, Date, Signature)	Short description of change
1.1	C. Einsporn 08.10.2018			Changes (silo storage capacity, IBA)
2.0				
3.0				
4.0				

DocType	AOF	Doc No _ Rev	50056872-1.0E
Contractor	HZI	EPC Management Summary (Excerpt)	
Contractor	BESIX		

Table of Content

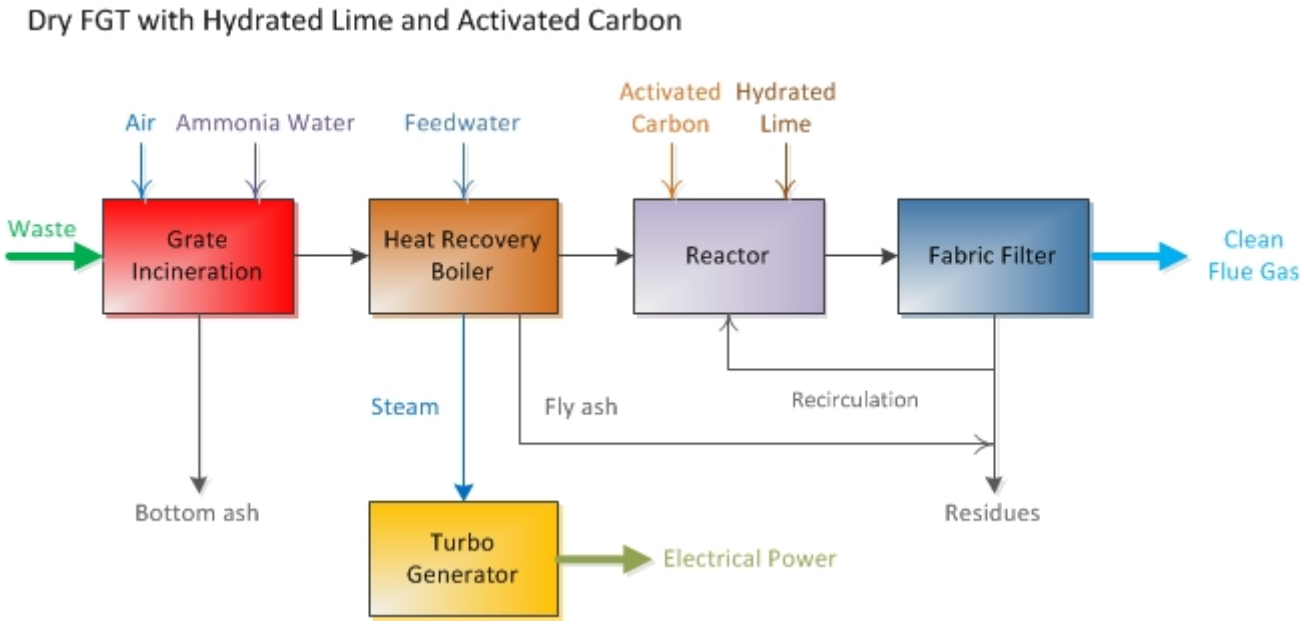
1 General Concept and Plant Design

This proposal is based on the most reliable and continuously improved technology our firms can offer. The proposed solution complies with all legal requirements, allows for economically and ecologically optimised operation, and provides for maximum flexibility.

The single line unit proposed comprises a furnace equipped with the SNCR process for NO_x control, a HZI 4-pass heat recovery boiler, the HZI- dry flue gas treatment system and for all five units a common water-steam-cycle with an effective turbine-generator set for the heat utilisation.

The following principal stages are integrated:

- Waste handling
- Thermal treatment
- Heat utilisation
- Flue gas treatment
- Residue handling



Picture 1: Block diagram of incineration-boiler and dry flue gas treatment system

Years of experience in engineering, construction and operation of energy from waste plants by HZI form the basis for the concept of the offered plant considering the following objectives:

- Economical concept regarding investment- and operation costs
- Ecologically sustainable waste treatment methods
- Compliance with all regulations
- Competitive treatment cost
- High flexibility to accommodate changing future demands
- Highly efficient power generation
- Proven technology

1.1 Cooperation, Integration and Main Features

Hitachi Zosen Inova AG (HZI) has at its disposal a wide array of treatment technologies to choose from. HZI prides itself in its abilities to select the treatment methods most suited for the application at hand. Years of experience in integration of these technologies into the design of energy from waste solutions make the firm uniquely qualified to meet all the needs of this project. HZI combines the skills of all the professional disciplines that are required to coordinate, construct, install and commission a project of this complexity. HZI and Besix therefore offer a turn-key solution for the chute-to-stack project, inclusive of all civil work, rather than a selection of individual lots.

In particular, we would like to draw attention to the following **main features** that we consider to be of utmost importance reflecting Dubai Municipality' requirements:

- The equipment offered has been selected on the basis of quality and reliability.
- Steam parameters have been selected to achieve an optimal mix of investment and power production / efficiency.
- Flue gas treatment and combustion have been designed to come up with low emission values for clean gas according to the EU limits.
- Layout and process are ready to substitute hydrated lime with sodium bicarbonate as additive with some physical modifications of the flue gas treatment plant and additive handling. Activated carbon is used as adsorbent for polychlorinated biphenyl.
- HZI can offer site-support beyond hand over of the plant.
- The overall plant performance offered is fully supported by documentation and operating experience with existing waste to energy plants that encompass HZI technology throughout the world.

1.2 References

Worldwide more than 510 Waste to Energy (or EfW) plants with HZI technology are in operation.

All of the offered components of the plant are well proven and have successfully demonstrated their reliability in many years of operation in numerous of the above mentioned reference plants.

Newly developed systems for improved combustion or flue gas treatment performance have been tested in reference plants prior to being offered to the market.

- The **air cooled grate**, our most reliable grate system, has a long and successful history all over the world. The grate can also be equipped with several water cooled zones for high calorific waste respectively modified from the air cooled to the water cooled design.
- The **flow optimised swirl injection of secondary air** has been in operation since 1996 at the MSWI-plant Darmstadt (Germany). Today this system has become a standard in all new plants.
- The **DeNOx - SNCR-system** was first installed by HZI in 1987 and is now in use in more than 40 trains in thermal waste treatment plants. HZI has further improved the system in 2009 down to residual NOx of 100 mg/Nm^3 under the trade name **DyNOR®**
- Addition of **activated carbon** was first applied by HZI in 1988 for adsorption of organic compounds and mercury in the flue gas of the MSWI-plant St. Gallen (Switzerland). This system has been continuously optimised and is now in operation in various thermal waste treatment plants throughout the world.
- The **additive dosing (hydrated lime or sodium bicarbonate and lignite coke or activated carbon)** in powder form is used for all HZI dry and semi-dry pro-cesses.

1.3 Project specific Reference Plants (Example)

The following reference plants have similarities (in **bold** letters) to the Dubai WtE project:

Table 1: HZI Reference plants with similarities to Dubai WtE project

Plant	Country	Capacity	System	Status
Riverside 1	GB	3 x 79.5 MW	**4-pass boiler**, **steam: 427°C / 72 bar(a), SNCR, HZI** Semi-dry	In operation since 2011
Roosendaal	NL	2 x 62.1 MW	5-pass boiler, **steam: 422°C / 60 bar(a)**, **dry FGT,** SCR with HOK and BICAR	In operation since 2011
Cleveland 4&5	GB	2 x 45.8 MW	4-pass boiler, steam: 410°C / 50 bar(a), **DyNOR-SNCR,** HZI Semi-dry	In operation since 2014
Buckinghamshire	GB	1 x **102 MW**	5-pass boiler, steam: 402°C / 52 bar(a), **DyNOR-SNCR,** HZI Semi-dry	In operation since 2015
Ferrybridge 1	GB	2 x **117.4 MW**	**4-pass boiler**, **steam: 430°C / 72 bar(a)**, **DyNOR-SNCR,** HZI Semi-dry	In operation since 2015
Lucerne	CH	2 x 47 MW	**4-pass boiler, steam: 420°C / 50 bar(a)**, **DyNOR-SNCR, HZI Xerosorp with Lime**, Lignite coke and BICAR	In operation since 2015
Poznan	PL	2 x 31.5 MW	**4-pass boiler, steam: 422°C / 61.5 bar(a)**, **DyNOR-SNCR,** HZI Semi-dry	In operation since 2016
Severnside	GB	2 x 62.6 MW	5-pass boiler, **steam: 422°C / 61.5 bar(a)**, **DyNOR-SNCR,** HZI Semi-dry	In operation since 2016
Dublin	IE	2 x **102.5 MW**	**4-pass boiler**, **steam: 443°C / 62 bar(a), DyNOR-SNCR,** HZI Semi-dry plus scrubber	In operation since 2017
Istanbul	TR	3 x **86.8 MW**	5-pass boiler, **steam: 426°C / 72 bar(a)**, **SNCR, HZI Xerosorp with Lime and PAC**	Under construction

1.4 Deliverability

The joint venture company is fully aware of the need for on budget and on time delivery in order to ensure a bankable value for money solution for the SPV. With their excellent track record of project delivery due to several measures being applied for close project monitoring, the SPV can rely on Hitachi Zosen Inova and BESIX as a trustworthy partner for this project. Our references are the evidence of our commitment and compliance.

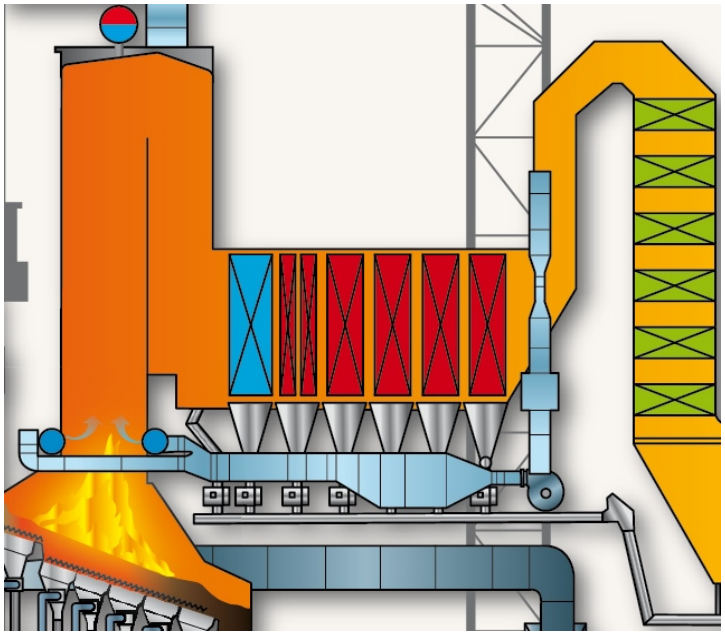
1.5 Health & Safety & Environment

As for all projects, Hitachi Zosen Inova only offers solutions that fully acknowledge the importance of Health & Safety & Environment. This is reflected by Hitachi Zosen Inova's track record of safe project management. Please refer for detailed information also to Section 05 of this proposal including ISO 14001 and ISO 18001 Certificates and Policies.

2 Conceptual and Technical Features – Thermal Treatment

2.1 Incineration and Boiler

The air cooled grate, combined with the 4-pass tail end heat recovery boiler form the basis for this project. This configuration has been chosen by many of HZI's clients on the extensive experience of HZI in the area of thermal municipal waste treatment.

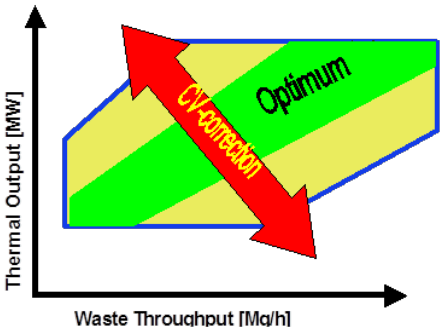


Picture 2: Generic grate and 4-pass horizontal boiler layout

2.2 Combustion Control System

The combustion control is fully automatic. The operator only selects the desired steam output and all other parameters (waste feeding, grate speed, amount of combustion air etc.) are handled by the control system itself. This secures that the plant operates at all time at an optimum regarding efficiency, environmental protection and life expectancy of the equipment.

However, large variations of the calorific value (CV) require an adaptation of the parameters of the different control loops. The adaptation of all control parameters is executed manually by the adjustment of **only one single setting**. This is the so called "CV-correction".

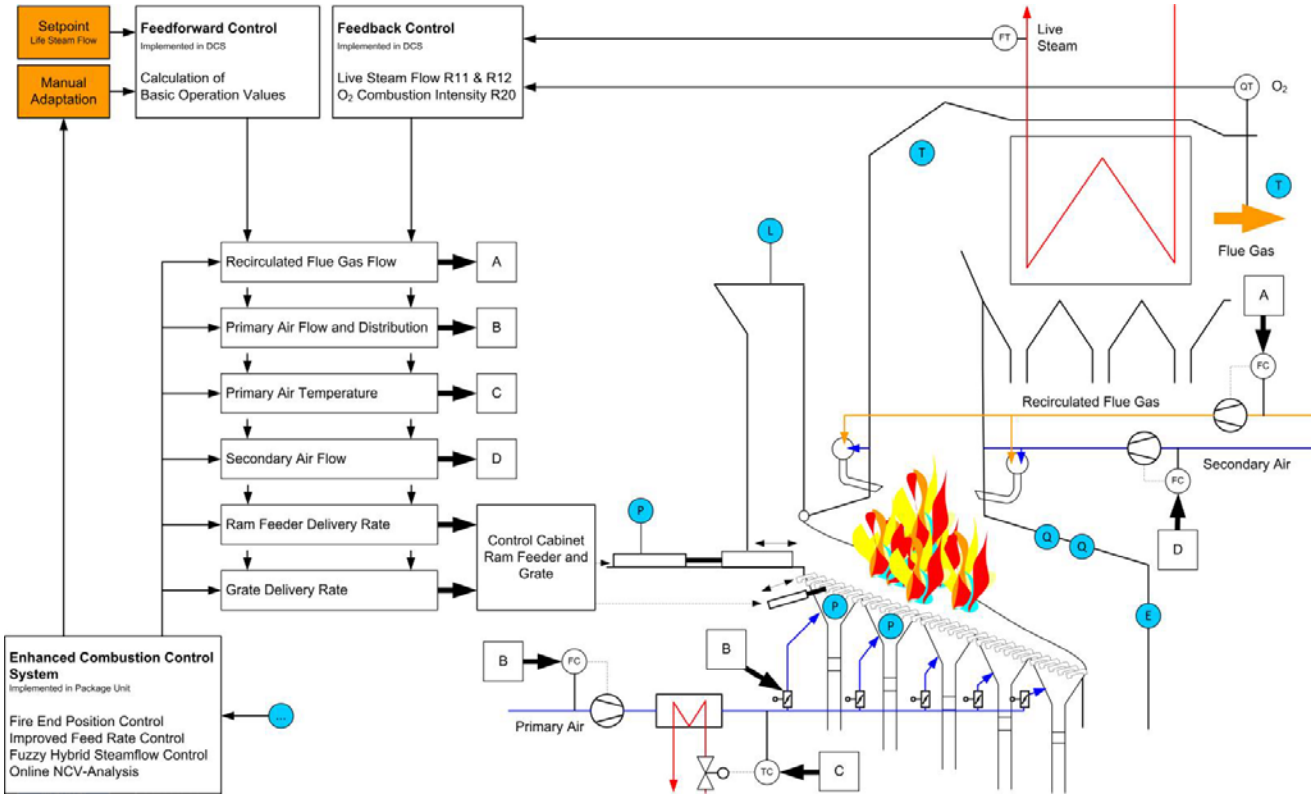


2.3 Incineration Design

The incineration system grate is designed primarily for municipal waste, but can handle easily also industrial and commercial waste with similar characteristics. The grate specific thermal and mechanical loads are important design parameters of an incineration unit, which is expected to demonstrate low wear and long life expectancy. For the given calorific values the HZI air cooled grate serves best with its well proven design.

The furnace is designed for continuous waste combustion in the range between 70 and 100% of the thermal design load. Short-term control oscillation peaks caused by the non-homogeneity of the waste are absorbed by the system up to 110% of the design load. The area of operation is shown in the Combustion Diagram (included in Section 04 of this proposal). The boiler will be certified for a maximum allowed steam production of about 107% of the steam production reached at the design thermal load.

In case the temperature in the secondary combustion chamber drops below the legal permit limit, oil fired support burners automatically start operation. Experience shows that such activation occurs very rarely. Predominantly the burners remain in a stand-by position and are cooled by cooling air fans. The burners are, however, routinely used for start-up and shut down of the plant.

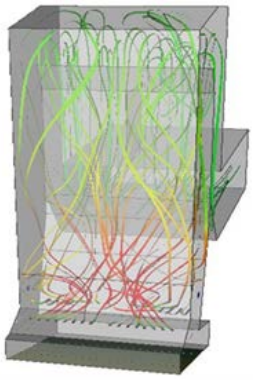


Picture 3: Combustion Control System (CCS+) overview for five grate zones with recirculated flue gas

2.4 Flow optimised SCC with Swirl Injection

The geometry of the secondary combustion chamber (SCC) is designed for optimal flow conditions. In addition, a further improvement is accomplished by the arrangement of the secondary air and flue gas recirculation nozzles which create a swirl in the SCC. Due to this swirl the flow is homogenised with respect to temperature, velocity and concentrations. Peaks in temperature, velocity and concentrations are minimised in order to:

- Improve burn-out of the flue gas
- Provide a uniform temperature profile across the secondary combustion chamber
- Reduce CO-concentrations
- Minimise risk of corrosion of unprotected heating surfaces
- Improve burn-out of fly ash
- Reduce the amount of fly ash



Picture 4: Swirl injection

- Reduce the formation of dioxins

The swirl injection has been applied with great success in all recent HZI plants.

2.5 Corrosion Prevention

Corrosion is effectively minimised in the first boiler pass due to:

- Optimal temperature distribution, good burn-out, low CO-concentration as a consequence of the swirl injection
- Homogeneous temperature, concentration and velocity distribution by optimised mixing of flue gas with secondary air and flue gas recirculation. Optimised mixing is achieved by specific alignment of the air jets and thus tangential jet stream.
- Refractory lining protection up to the roof of the first pass with rear ventilated plates and protection of the lower portion of the combustion chamber with high thermal conductivity mortared tiles.
- Other parts of the first pass (e.g. roof, ignition roof, burnout roof etc.) are protected with Inconel overlay. Also the second pass in the hotter area is protected with cladding.
- Flue gas temperature at the end of the cladding after 8'000h operation time at 100% thermal load: approx. 815°C
- On-line cleaning of passes one and two by means of a wet cleaning system, which allows maintaining a low flue gas temperature at the inlet of pass three.
- First convective heat exchanger designed as protective evaporator with large cross pitching.
- Final superheater built as co-current flow heat exchanger with a maximum flue gas temperature at the inlet of less than 580°C, thanks to the configuration of the superheater banks: the first cold superheater is installed upstream of the final superheater acting as additional protective bundle. This minimises the corrosion risk.
- Design with conservative flue gas velocities in all sections of the boiler
- Calculation of pipe wall thicknesses with high corrosion allowance

2.6 Boiler Design and Energy Utilisation

The boiler is designed in accordance with HZI's extensive experience. The rather conservative design with spacious heat exchange surfaces allows for a long-lasting service. Broad alleys between the convective bundles provide comfortable access for maintenance work.

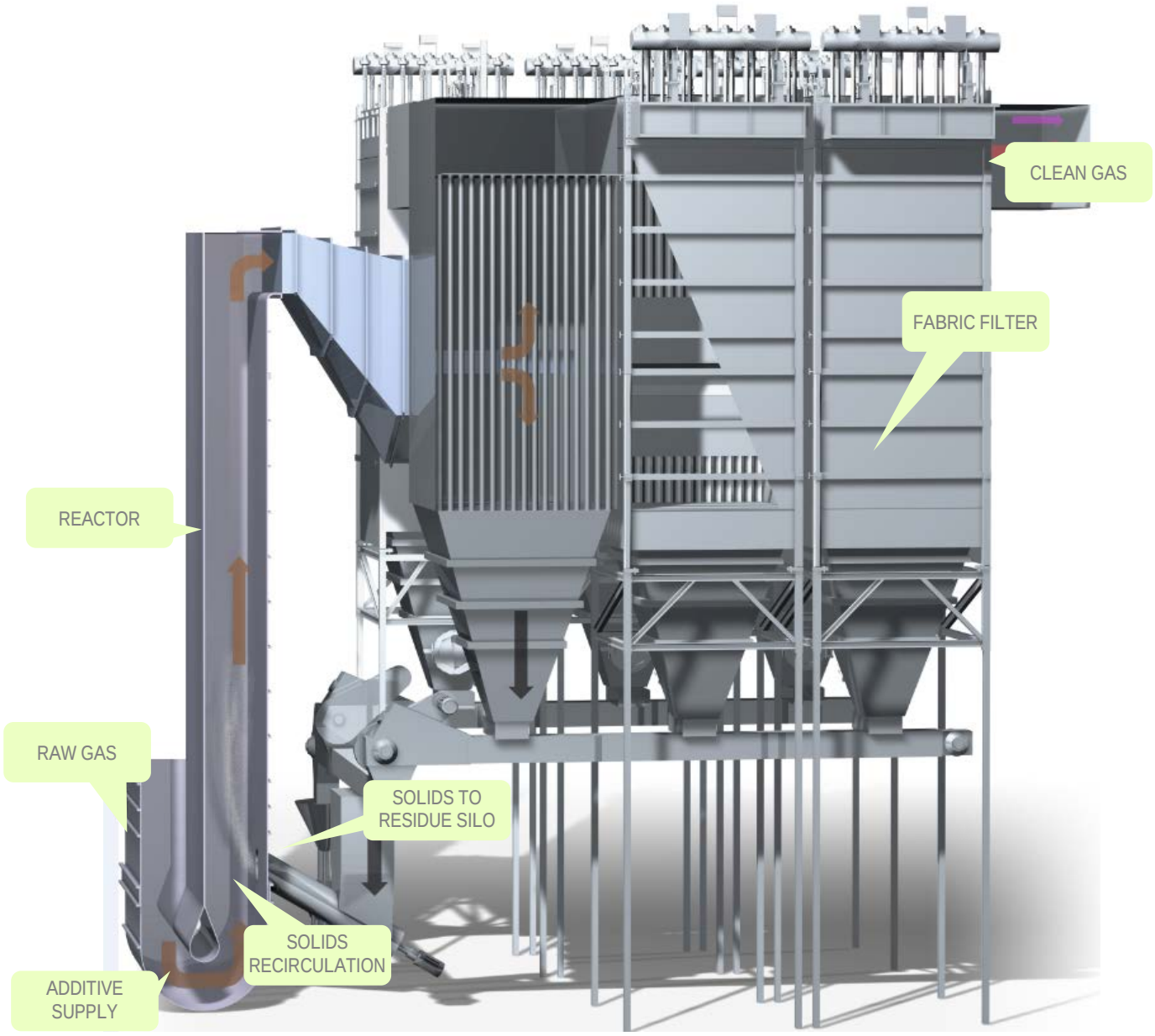
The boiler is optimised for best thermal efficiency and minimum heat loss. The flue gas outlet temperature is controlled via an economiser bypass. The multi-stage desuperheating system allows for optimum adjustment of the steam temperature within the operational range.

The primary combustion air is preheated using low pressure steam, medium pressure steam and, if necessary, saturated steam extracted directly from the boiler drum. The condensate of the primary air preheater will be returned into the condensate system.

3 Conceptual and Technical Features - Flue Gas Cleaning

3.1 Dry flue gas treatment

The HZI dry process - Xerosorp® can be operated with a variety of alkaline reagents. Popular additives are hydrated lime or sodium bicarbonate.



Picture 5: Principle of HZI Dry process - Xerosorp® with hydrated lime and activated carbon

The plant is designed for the use of hydrated lime since the present market situation allows for most economic operation.

The HZI Dry flue gas cleaning process is designed to remove all dust particles, most of the acidic gaseous contaminants by neutralisation with hydrated lime and organic pollutants (PCDD/F) as well as mercury and other heavy metals by adsorption on activated carbon.

The system consists of a reactor with additive injection, fabric filter for solid-gas separation and residue recirculation. To achieve the best adsorption performance with minimum additive consumption, solids from the fabric filter are recirculated into the reactor.

The Xerosorp® flue gas treatment process is characterised by the following features:

- Simple design of the reactor ensures high availability, low maintenance and operation costs
- Reduction in residue costs and additive amount due to residue circulation
- High energy efficiency thanks to dry injection of additives and low pressure drop over reactor
- Dry injection of additives enables adsorption without waste water
- Recirculated solid injection in addition to fresh additives enables to smooth emission peaks and low stoichiometric ratio

3.2 SNCR Process

NO_x reduction occurs in the combustion zone where an aqueous solution of ammonia is injected into the flue gas stream leaving the grate and reacts selectively with the NO_x in the combustion chamber.

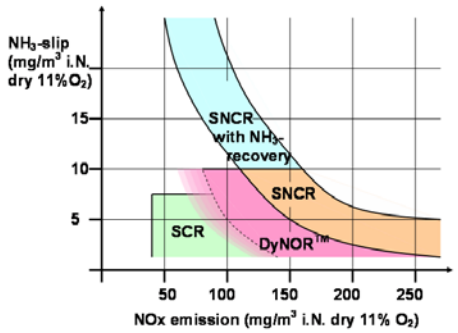
Due to the optimised flue gas flow and well-designed distribution of reagent solution a high removal efficiency of NO_x and low excess of ammonia is achieved.

The results are:

- Well controlled emissions of NO_x
- Optimised consumption of ammonia solution

3.3 DyNOR™ – Advanced SNCR

The DyNOR™ system is an advanced SNCR - Selective Non Catalytic Reduction - system which has been developed by HZI with the objective to meet new European NO_x standards with a SNCR-system (German regulations already ask today for emission limits of 100 mg/m³ NO_x). With today's SNCR-systems the limits set by the EU-directive can be easily met with a minimum ammonia slip. If lower NO_x limits are requested either a SNCR-system combined with a wet flue gas cleaning system and an ammonia recovery from the waste water or a SCR-system - Selective Catalytic Reduction - is required. Both alternatives cause much higher internal consumption of power and heat.

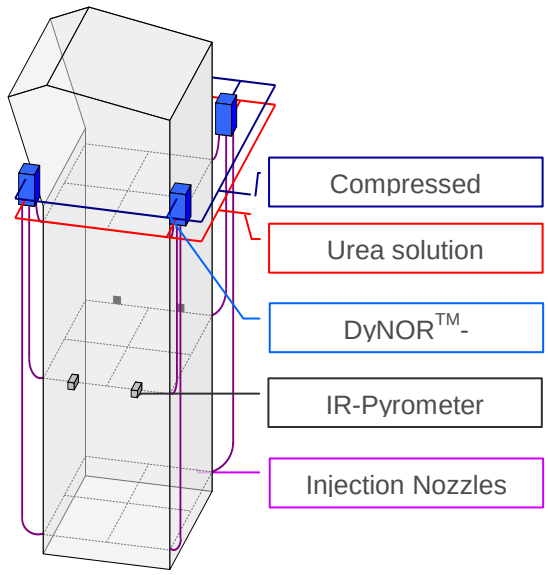


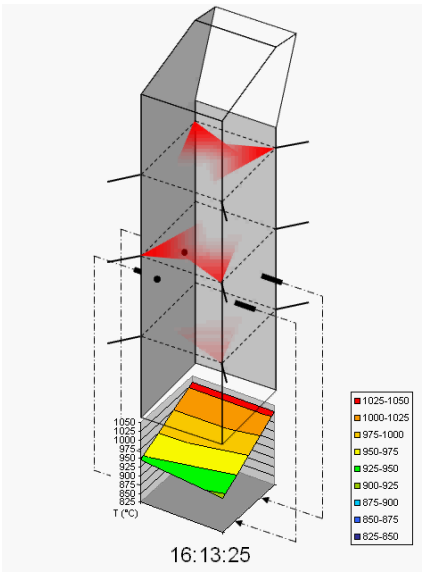
The essential measures for an advanced SNCR-system are:

- Quick temperature measurement
- Precise and fast-acting distribution of reagent injection

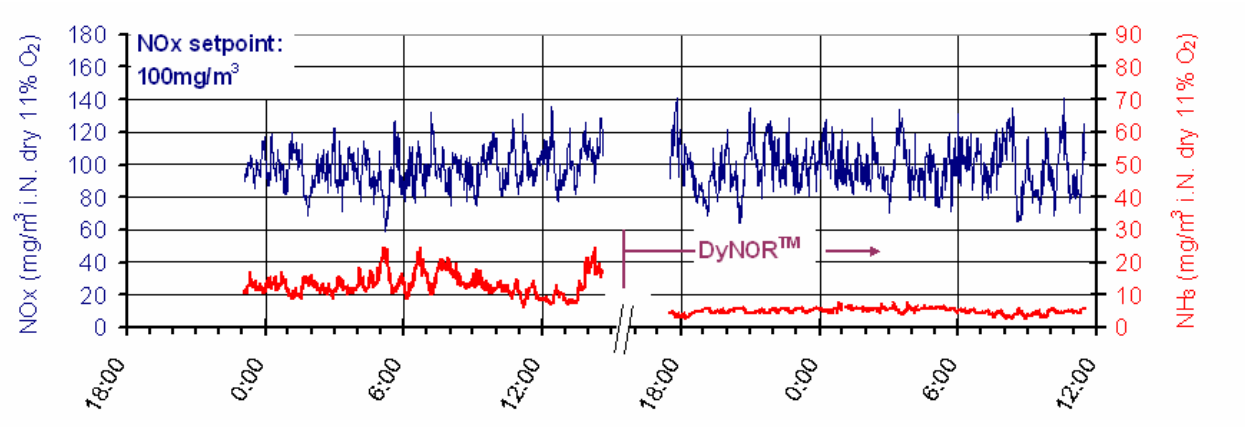
- Virtual segmentation of the boiler

Urea solution is injected into the secondary combustion chamber depending on the temperature profile exactly on the level where the best reaction is expected. It is injected simultaneously on one or more levels.





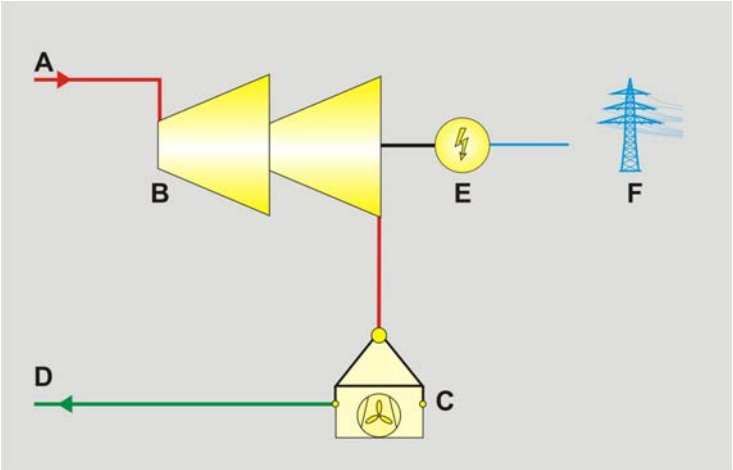
The measurements comparing the operation with the regular SNCR-system and the advanced SNCR-system DyNOR™ in the same EfW-plant show a significant improvement.



4 Conceptual and Technical Features – Turbine and Water-Steam Cycle

4.1 Steam Turbine

The produced steam is supplied to a steam turbine turbo set. The turbo set generates electrical energy for the needs of the complete plant as well as for the supply to the external electrical grid.



Picture 6: Steam turbine turbo set generating electricity

By means of several bleeds at the turbine, low pressure steam is taken for internal consumers in the plant.

After the steam turbine the expanded steam is condensed in an air-cooled turbine condenser. The condensate is returned to the feed water tank.

Picture 7: Steam turbine turbo set

Picture 8: Air cooled condenser

Also part of this cycle are general steam and condensate systems, water treatment and feed water preparation systems as well as a closed-loop cooling system for all general cooling purposes of the plant.

5 Buildings and Civil Works

Picture 9: Impression of the entrance of the Dubai WtE plant as proposed by HZI and Besix

The EfW plant design chosen has been developed in order to provide a clear and proven arrangement to meet all requirements for necessary access, proper operation and economic maintenance. The plant design contains sufficient space and allows for easy access to all technical plant areas, workshops and offices by office personnel and operating staff.

The energy from waste plant is arranged from north to south, encircled by a one-way road system, with separate access for personnel and visitors. The waste fuel handling, combustion and steam production processes as well as the flue gas treatment are located inside the buildings. Large planted areas are formed around the buildings.

The administration and visitor building containing offices, meeting and demonstration rooms, a canteen, changing rooms and sanitary installations, is located perpendicular to the plant. It is connected to the plant by a gateway in the axis of the plant control room.

In a separate technical block adjacent to the boiler and turbine hall a mechanical and electrical workshop with respective spare parts warehouses for the frequent plant maintenance, the laboratory, electrical rooms as well as facilities for the operating personnel like prayer room, lockers, toilets and canteen are foreseen.

The gateway starting in the administration building and continuing into the plant main control room will enable visitors a close view into the waste management of the plant as well as giving the operating and maintenance

personnel safe access to the facilities. The administration building, the social and the prayer's rooms, as well as the control room, the electrical rooms and the laboratory will be designed air conditioned.

Although the process is fairly automated and requires only periodical checks by the operators during their inspection tours, the process plant buildings will be ventilated in order to achieve reasonable indoor temperatures.

4 days storage capacity for the waste fuel is realised by means of a waste bunker. The proposed solution assumes a fuel delivery to the bunker by trucks. The crane operator's cabin within the main control room area is located at such elevation to allow for a good visual observation of the waste bunker. The silo storage capacity for the flue gas treatment consumables is designed for 3 days (e.g. $Ca(OH)_2$), 5 days (e.g. CaO), 30 days (e.g. PAC) and the FGT residues is designed for 4 days of operation.

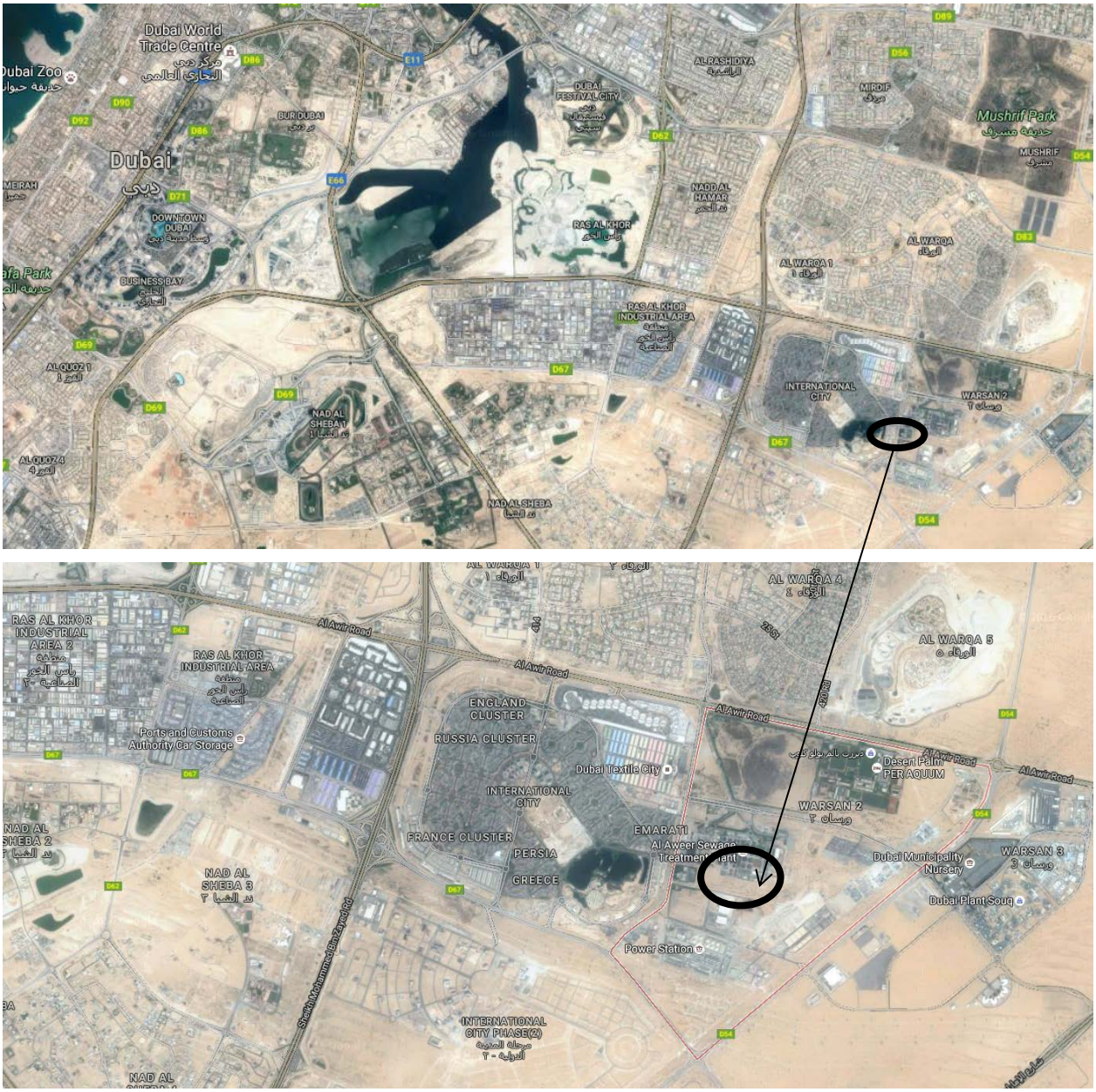
The deliveries of operating chemicals and the removal of residues occur in a dedicated truck lane. The air cooled condenser as well as the site substation are located as close as possible to the turbine building.

The civil works will provide the structural elements of the Waste to Energy project. This can basically be summarised into the following main elements:

- Substructure:
  - Concrete raft foundation (for every proposed building/structure);
  - Concrete columns and footings below the raft foundation for the tipping floor;
- Superstructure:
  - Steel superstructure for:
    - Tipping bays;
    - Waste bunker;
    - Boiler hall;
    - Flue gas treatment / Stack;
    - Turbine Hall;
    - Bottom Ash Storage / Loading;
  - Concrete superstructure for:
    - Waste bunker,
    - Water treatment plant,
    - Technical Block,
    - Labour housing,
    - Administration building,
    - Substation building and
    - Bottom Ash Storage / Loading.

5.1 Location of the plant

The proposed site is located on Plot no. 622-146 at Al Warsan Second, Dubai. The site is close to the existing sanitary landfill for Municipal Solid Waste (MSW) and to the Al Aweer Sewerage Treatment Plant. As shown below, the site is located in a mostly undeveloped desert area.



Picture 10: Aerial pictures of the proposed Dubai WtE site

6 Key data of the Proposed WtE plant

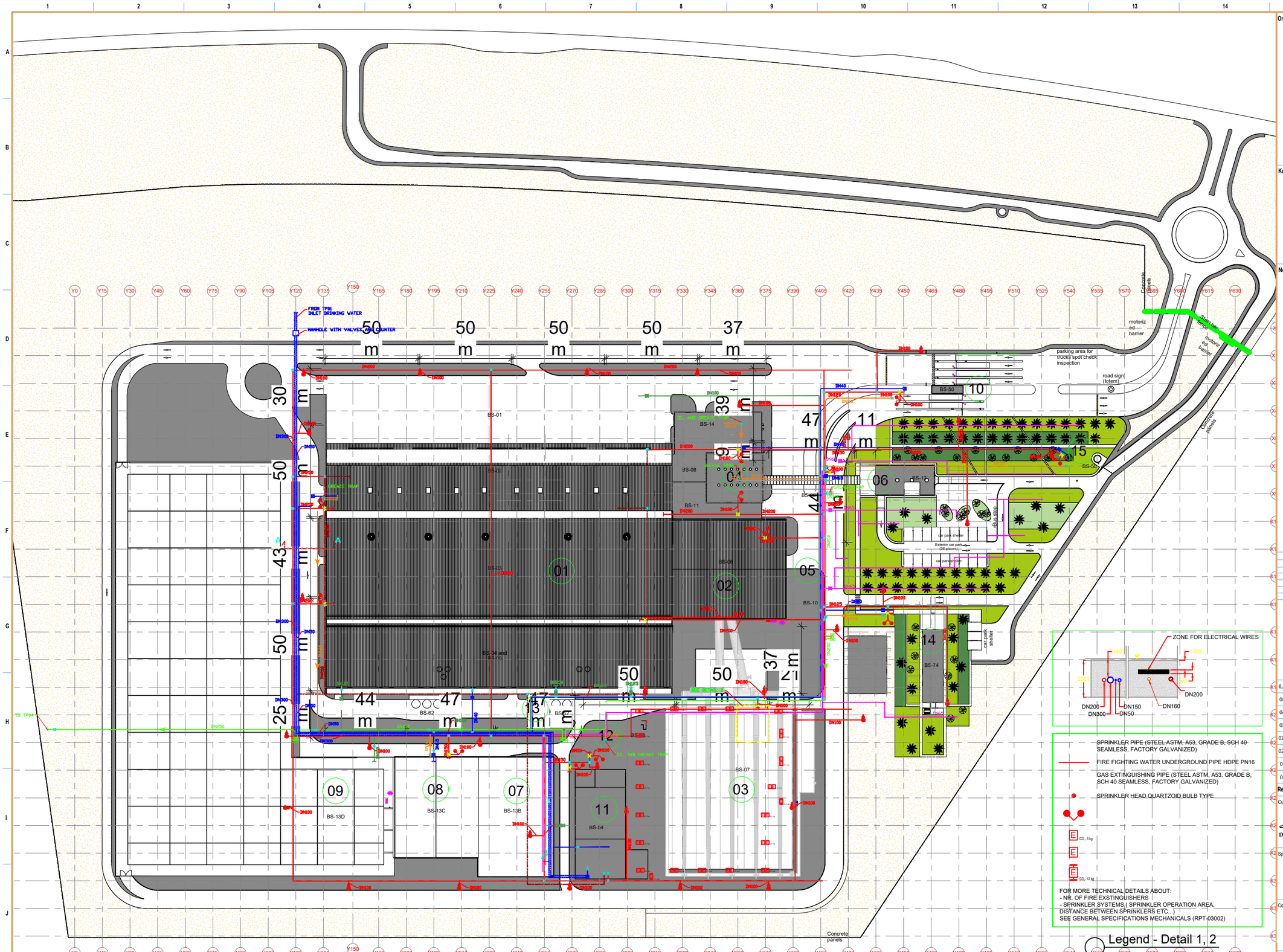
6.1 Plant performance

The produced electrical energy shall be exported to the electrical grid of DEWA located approx. 3 km away from the plant. The next-door located Al Aweer Sewerage Treatment Plant provides for treated sewage effluent (TSE) as the raw water source of any process water of the WtE plant.

Table 2: Key performance data of the Dubai WtE plant

Performance Data	Unit	Per 1 line	Per 5 lines
Design waste throughput capacity (LP N)	t / h	46.3	231.5
Daily design waste throughput capacity (LP N)	t / d	1111	5555
Thermal power	MW	122	610
Steam parameters (boiler outlet)	°C / bara (a)	432 / 77	
Net power production @ 31°C and 5 lines at LP N (export to DEWA)	MW	Min. 183	
Wet bottom ash production	t / d	190	950

Appendix I – Drawings



1 General Layout
1 : 1000

Legend - General

- INLET SERVICE WATER UNDERGROUND PIPE, HDPE PN16
- INLET DEWA DOMESTIC DRINKING WATER UNDERGROUND PIPE, DN50 HDPE PN16
- INLET DEWA NON-DOMESTIC DRINKING WATER UNDERGROUND PIPE, DN300 HDPE PN16
- SERVICE WATER UNDERGROUND PIPE, HDPE PN16
- DRINKING WATER UNDERGROUND PIPE, HDPE PN16
- FIRE FIGHTING WATER UNDERGROUND PIPE HDPE PN16, DN200
- FIRE FIGHTING WATER FOR BUNKER HALL UNDERGROUND HDPE PIPE, DN200 PN16
- SANITARY WASTE WATER UNDERGROUND PIPE, HDPE PN16
- SANITARY WASTE WATER UNDERGROUND PVC PIPE
- IRRIGATION SYSTEM UNDERGROUND HDPE PIPE
- 2 HOSE CONNECTIONS OUTDOOR HYDRANT (PILLAR-TYPE)
- MANHOLE WITH VALVES
- SANITARY SEWAGE PUMP
- IRRIGATION CONTROL SYSTEM
- INSPECTION PIT FOR PIPE WITH SHUT OFF VALVE WITH AUTOMATIC STOP
- SERVICE WATER SYSTEM
- INSPECTION MANHOLE FOR SANITARY WASTE SYSTEM
- INSPECTION MANHOLE FOR BUILDING FIRE FIGHTING INLET WITH SHUT OFF VALVE AND BREECHING INLET ATTACH
- 2 WAY BREECHING INLET
- AREA COVERED BY AUTOMATIC IRRIGATION SYSTEM THE IRRIGATION SYSTEM WILL BE ALSO PROVIDED FOR 60 PALMS

Legend - Detail 1, 2

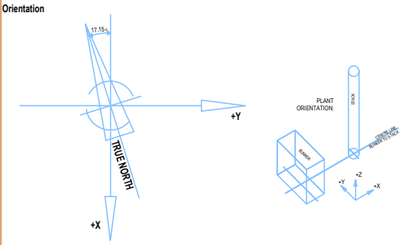
ZONE FOR ELECTRICAL WIRES
DN200 DN300 DN150 DN50 DN160

- SPRINKLER PIPE (STEEL ASTM, A53, GRADE B, SCH 40 SEAMLESS, FACTORY GALVANIZED)
- FIRE FIGHTING WATER UNDERGROUND PIPE HDPE PN16
- GAS EXTINGUISHING PIPE (STEEL ASTM, A53, GRADE B, SCH 40 SEAMLESS, FACTORY GALVANIZED)
- SPRINKLER HEAD QUARTZOID BULB TYPE

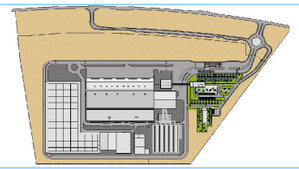
CO2 5 kg
CO2 12 kg

FOR MORE TECHNICAL DETAILS ABOUT:
- NR. OF FIRE EXSTINGUISHERS
- SPRINKLER SYSTEMS (SPRINKLER OPERATION AREA, DISTANCE BETWEEN SPRINKLERS ETC...)
SEE GENERAL SPECIFICATIONS MECHANICALS (RPT-03002)

Orientation



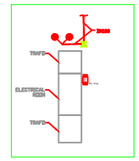
Keyplan



Note

ER: ELCTRICAL ROOM
MV: MEDIUM VOLTAGE
LV: LOW VOLTAGE
DB: DISTRIBUTION BOARD
SMDB: MAIN DISTRIBUTION BOARD
MVDB: MEDIUM VOLTAGE DISTRIBUTION BOARD
LVDB: LOW VOLTAGE DISTRIBUTION BOARD

DETAIL 2
ELECTRICAL ROOM AT ACC PLANS



RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

Rev.	Modification	Drawn	Checked	Approved
6,0	EPC SUBMISSION	AHM 22/07/2019	GCH 22/07/2019	GCH 22/07/2019
05	AS PER OPTIMISE DESIGN	PR 13/12/2018	PMR	BME
04	AS PER WORKSHOP	AMS 06/12/2018	PMR	BME
03	AS PER WORKSHOP	AMS 14/06/2018	PMR	BME
02B	AS PER WORKSHOP	AMS 07/06/2018	PMR	BME
02A	AS PER WORKSHOP	AMS 22/05/2018	PMR	BME
01	REVIEWED CONCEPT DESIGN	AMS 11/05/2018	PMR	BME
00	CONCEPT DESIGN ISSUED FOR REVIEW	AMS 30/04/2018	PMR	BME

Customer
DUBAI MUNICIPALITY

DUBAI WASTE MANAGEMENT CENTER

Sponsors

Contractor
Hitachi Zosen INOVA
Six Construct

Consultant

Pro	DWE	Origin	DSG	Building Section
Activity	MEC	Doc	DWG	GENERAL LAYOUT
Sub-trade		Zone	ALL	Drawing Title: EXTERNAL MECHANICAL LAYOUT
Level		Status		
AIC		Weight		Drawing Subtitle
Scale	1:500	Size	A1	

DocType	Supplier	Drawing-No.	Sheet	Revision.
DWG	BESIX	03004	01	6.0

ID	From	To
TP-01	DEWA Potable Water Supply	Meter Cabinet, Drinking Water Tank WTP
TP-02	DS167 (OUT)	Ser□ice Water Tank WPT Buffer Tank (IN)
TP-04	Sanitary WTE □aste Water Discharges, storm □ater discharge WTE □ Process □ater o□erflo□ (OUT)	Inlet Chamber of STP at Al A□eer (IN)
TP-06	Po□er Export □ Import	DM Substation
TP-07	Single Fiber Optic Cable interchanges □ith DEWA	DM Substation
TP-08	Telecommunication at WTE	Nearest Etisalat Telecom Box
TP-09	Access Road	Site Access
TP-10	Emergency Exit Road	Site Access

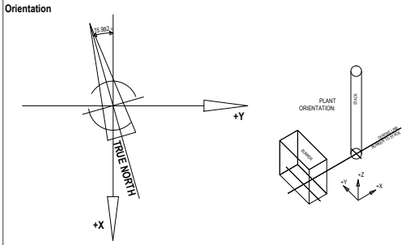
Supply □Installation □O□nership □Maintenance by EPC □O□M

Supply □Installation □O□nership □Maintenance by Other (DM)

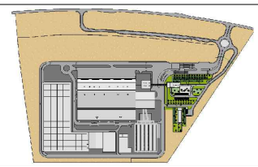
Physical Interface

Notes:
1. The presented routings are indicati□e only
2. Physical Interface coordinates to be confirmed by DM except for TP-01

Orientation



Keyplan



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SMDB: MAIN DISTRIBUTION BOARD
MVDB: MEDIUM VOLTAGE DISTRIBUTION BOARD
LVDB: LOW VOLTAGE DISTRIBUTION BOARD

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

Rev.	Modification	Drawn	Checked	Approved
8.2	TP-11 CANCELLED, HV ROUTING AROUND LAYDOWN	PR 06.02.2020	GCH	BME
8.1	UPDATED TP-06 □ TP-07 ROUTING (NEW DM SS)	PR 05.02.2020	GCH	BME
8.0	UPDATED TP-06 AND TP-07 ROUTING	PR 16.10.2019	GCH	BME
7.0	UPDATED INTERFACE POINTS	PR 01.10.2019	GCH	BME
6.0	UPDATED TP-06 AND TP-07 ROUTING	PR 16.09.2019	GCH	BME
5.0	UPDATED TP-06 AND TP-07 TO WARSAN S:S	PR 06.08.2019	GCH	BME
4.0	UPDATED TP-06 AND TP-11	PR 09.07.2019	GCH	BME
3.0	ADDED STP CONNECTION TP-11	PR 13.06.2019	GCH	BME

Customer

DUBAI MUNICIPALITY

DUBAI WASTE MANAGEMENT CENTER

Sponsors

Contractor: Hitachi Zosen INOVA; Six Construct

Consultant: ACE

Pro	DWE	Origin	BSS	Building Section: Site Location
Activity	MEP	Doc	DWG	
Sub-trade		Zone		Drawing Title: Mechanical and Electrical External Connections
Level		Status		
AIC		Weight		Drawing Subtitle
Scale		Size	A1	

DocType	Supplier	Drawing-No.	Sheet	Revision.
DWG	BESIX	03005	01	8.2

PC
Boiler Flue Gas Side
90107002

Flue Gas
Boiler Flue Gas Side
90107002

Compressed Air
Auxiliary Systems

Instrument Air
Auxiliary Systems

Water
Water System Process
90107012

Calcium Hydroxide
Dry Lime Slaking
90107018

Calcium Hydroxide
Description

Adsorbent
Description

Nitrogen
Inertgas storage

SILO TRUCK WITH COMPRESSOR

SA
PDS+S-
FABRIC BAG FILTER
CHAMBER 1
CHAMBER 3
CHAMBER 5
CHAMBER 7
CHAMBER 9
CHAMBER 11
CHAMBER 2
CHAMBER 4
CHAMBER 6
CHAMBER 8
CHAMBER 10
CHAMBER 12
BIG BAG
Collecting container
PNEUMATIC CONVEYING VESSEL
PNEUMATIC CONVEYING VESSEL Line 2
INDUCED DRAUGHT FAN
AUXILARY ID FAN MOTOR
SILENCER
EMISSION MEASUREMENT
QRC HCl
QRC SO2
QRC NOx
QR CO
QR O2
MR H2O
QR Dust
FR Flow
STACK
Flue Gas
Thermal Treatment
90107001

IA
EXHAUST FILTER
TA+
WI
ADSORBENT SILO Line 1/2
Line 2
FSL
SILO CALCIUM HYDROXIDE Line 1
SILO CALCIUM HYDROXIDE Line 2
STAND-BY
RESIDUE SILO Line 1
RESIDUE SILO Line 2
WEIGHING SCREW CONVEYOR
RESIDUE MOISTENING

SUPPLY LIMITS
others
Hitachi Zosen INOVA

Status: In Work
Revision: -
Last change: 14.03.2018 / Adrian Kaspar

Rev	Modification	Created	Checked	Approved
Project No. Y-3256	Project Name: Dubai WtE BOT	Flue gas treatment		
AIC 14HA**	Weight —			
Scale %	Status IU	Format A	Sheet 1/1	Doc.Type EVB
Supplier	Drawing No. 90107029	Revision		
Replaced by:	Replaced for:			

Hitachi Zosen INOVA

KAS / 15.03.2018 / 07:54

Appendix J – Emergency Plan

01 – Environmental Emergency Management Plan Framework (5 pages)

02 – Framework Fugitive Emissions Management Plan (13 pages, Rev 0.0) Document No. 50084534-0.0

03 – Fire, Emergency and Self-Protection Plan (8 pages, Rev 0.0) Document No. 99000003-0.0

04 – Design Basis Fire and Life Safety Strategy (32 pages, Rev 02), including:

- Main Hall and Turbine Hall Plans – Means of Egress
- Staff Facilities Building Plans – Means of Egress
- Administration Building Plans – Means of Egress

1.1 Preparation

Prior to start up operations, a review will be carried to determine all possible environmental emergencies, including spill scenarios and appropriate responses. This shall include spills of different chemicals due to be present on site (lime, ammonia, activated carbon, diesel etc.) such as:

- During refuelling / tank filling
- Rupture of tanks (due to accident, fire etc.)
- Leaks onto site roads during transportation on site
- Handling firewater contaminated with chemicals

It shall also include other environmental emergency scenarios, such failure of the FGT system or dust filters leading to uncontrolled releases of ash (from the process or storage areas) and spillages of waste being brought onto site to be used as fuel for the operating plan.

The review shall also consider the results of any Aspects and Impacts Workshops and design Hazard and Operability Studies.

An Emergency Response Plan shall then be developed to consider responses to these scenarios. The Emergency Response Plan shall include:

- Detailed plan of site drainage, including shutdown valves
- Map showing location of sensitive receptors in proximity to site
- Plan showing location of chemical storage areas and tanks
- Plan showing location of Spill Kits

The Plan will comprehensively cover all aspects required under Dubai Municipality's requirements and those required under Federal and Local Authorities' HSE Legislation and Regulations and Project Requirements.

The full Emergency Response Plan will be developed and agreed with the Dubai Municipality 6 months prior to the Services Commencement Date.

Safety Data Sheets (SDS) and chemical assessments shall be procured for each chemical retained on site and shall be kept at the Site HSE office. A copy of SDS shall also be kept in site first aid room.

1.2 Emergency Response Team

The Operator shall appoint an Emergency Response Team (ERT) to immediately respond in cases of emergencies. All incidents shall be reported as soon as possible after their occurrence to the Emergency number. The Emergency Responder on the Emergency Number shall then mobilise resources as required.

Appropriate spill training shall be given to the ERT and other Operations staff.

A programme of emergency drills (include scenario of a large spill) at 6 monthly intervals shall be developed.

1.3 Reporting and Investigation of Incidents

The Operator will define the requirements for reporting environmentally-related incidents in the Emergency Response Plan.

In any event of emergency, immediate notification will be given to the ERT Lead / Site Security, who shall mobilise internal or external resources as required.

In the event of an externally reportable emergency, the ERT Lead or delegate shall be responsible for ensuring external agencies are notified within the required time limits.

Agency / Person	Contact details	
Site Personnel		
Emergency Response Team Lead	Tel No.	INSERT
Site Security Coordinator	Name / Tel No.	INSERT
External Emergency Contacts		
Ambulance	Tel No.	INSERT
Fire Brigade	Tel No.	INSERT
Police	Tel No.	INSERT
Specialist (External) Spill Response Team	Tel No.	INSERT
Regulators		
Dubai Municipality	Tel No.	INSERT
Regulator	Tel No.	INSERT

1.4 Spill Response Procedure

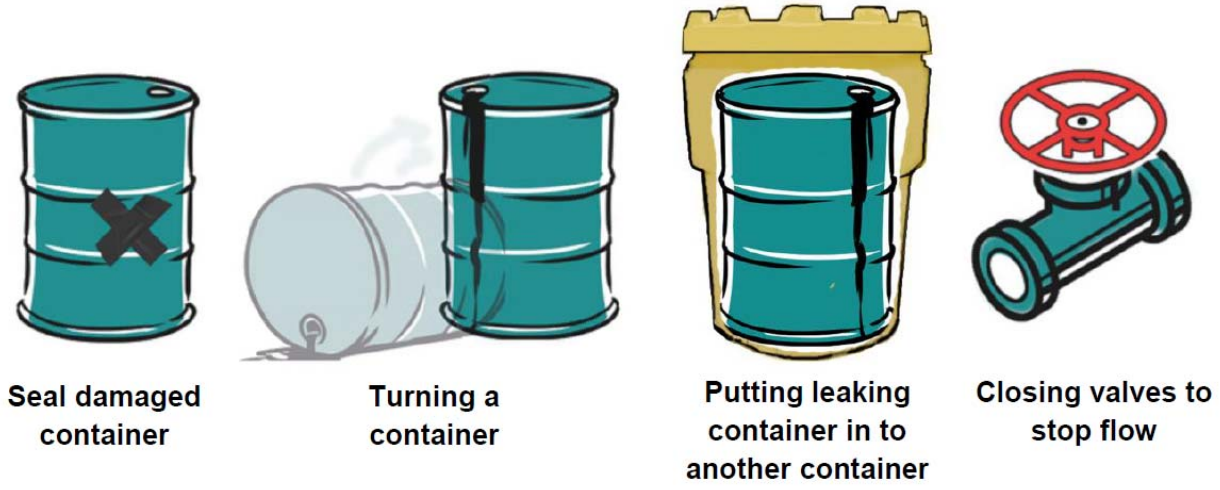
All spill response procedures are based around the principle of 'stop and contain (if safe to do so), notify, clean up and investigate'. The ERT Lead, once able to access the situation shall decide whether the spill requires an external spill responder to mobilise or not. External spill responders will typically be required for larger or complex spills e.g. spills over plant or equipment, or spills that have migrated to the drains.

The standard response procedure for spills shall be as follows:

a. **Person identified spill to Stop what they are doing and make sure they and any other persons in the area are safe.** If potentially large spill or hazardous to others in the area (e.g. lime) activate emergency alarm. If safe to do so (e.g. if wearing the appropriate PPE and sufficiently qualified) they should try to contain the spill (see Step b).

b. **Contain pollution at source** by i.e. sealing or isolating the damaged container or pipework, sealing a storage tank (e.g. using Leak Sealer Putty), turning a container, putting the leaking container into another secure container, close any valves on pipework to stop material flow.

Figure 1: Examples of how to Control a Liquid spill at the Source

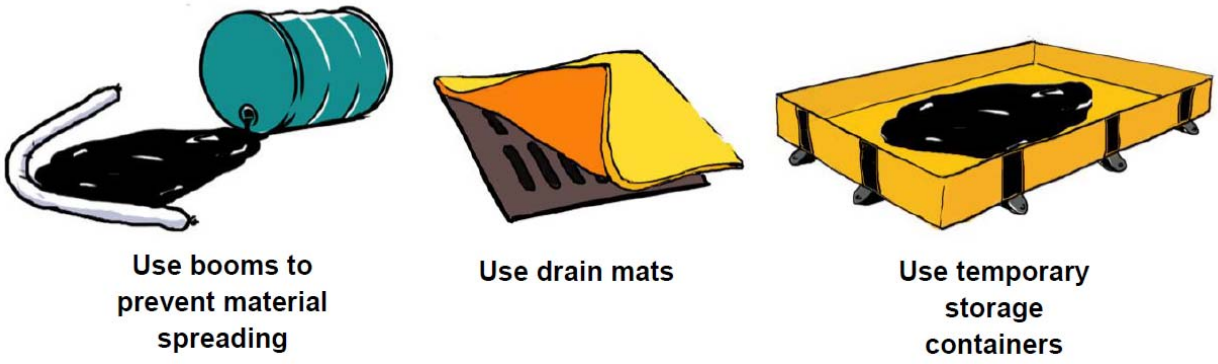


c. Containing close to source by i.e. using spill kit soak up the spilt substance, use spill kit (typically sock or cushion) to block ensuring pathways to surface water (e.g. ditches, drains, gullies), use drain mats to cover surface drain openings and manhole covers, use pads or sorbent products to soak up the spill. For spills of powders or ash, prevent from being blown away by dampening and catching any run off.

Figure 2: Examples of how to Control a Liquid Spill Close to the Source

d. **Contain on the Surface** If the spill is spreading and you can't safely or effectively contain it near to its source, aim to stop the material getting into the drainage system or onto any unsurfaced ground. This can be through use of booms (either plastic or sorbent), drain mats to cover surface drain openings and manhole covers, and use of temporary containers to prevent leaking reaching the environment.

Figure 3: Examples of how to Contain a Liquid Spill on the Surface



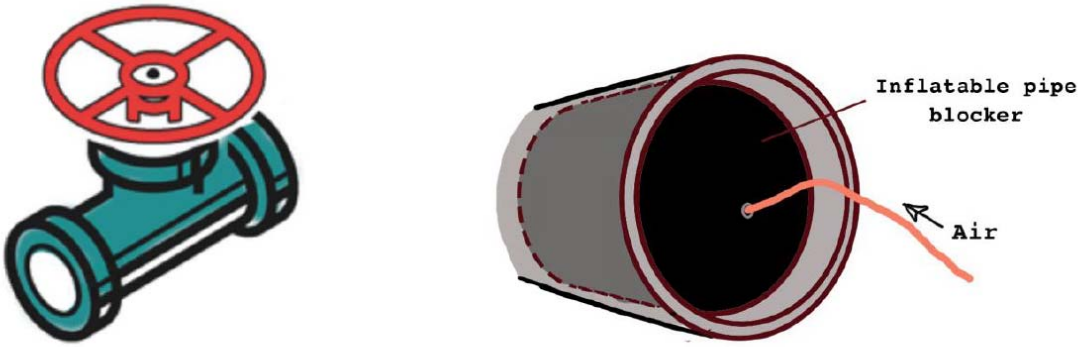
Use booms to prevent material spreading

Use drain mats

Use temporary storage containers

e. **Contain Liquid in the drainage system** by i.e. closing oil separators, closing penstock valves or pollution control valves in the drainage system (as indicated on the construction site drainage plan), or use pipe lockers.

Figure 4: Containing Liquid Spill in Drainage System



Close valves to contain the spill in the drainage system / oil separator

Use pipe blockers

f. Minimise spread on water i.e. using booms or a dam to prevent the material spreading on puddles or water.

Once the immediate containment steps have been taken, and the ERT Lead notified, the following shall be carried out:

1. The site of the spill shall be barriered off to prevent people or vehicles inadvertently spreading contamination. Where spillage has occurred on areas of open mesh flooring, the corresponding areas on all lower floors shall be taped off until decontamination has been completed.
2. In the event of rain and the contamination is at risk of spreading in the rain, the area should be covered with a tarp or similar if possible until the clear up is complete;

3. Should the spillage result in hydrocarbon, chemicals or ash entering the site drainage system the contents of the drainage channels and inceptors shall be analysed and the appropriate clean up and disposal route employed (mobilising an external contractor as required);
4. The Regulator shall be contacted as soon as possible if there is an accidental discharge affecting off site.

1.5 Hazardous Waste

All spill kit, PPE or other materials contaminated with chemicals or hydrocarbons shall be treated as hazardous waste.

Contaminated absorbent material, drain covers, dams, recovered liquids etc. shall be placed into suitable sealed plastic sacks / containers and stored in an area or in a receptacle providing adequate secondary containment to be treated as hazardous waste. Hazardous wastes shall not be co-mingled.

The facility shall have a hazardous waste storage area as follows:

- Containers engineered to contain the specific type of waste;
- Containers clearly labelled with their intended contents;
- Containers checked regularly to ensure that containers are not corroded, worn out or damaged.
- All liquid wastes shall have secondary containment;
- Stored in covered area, away from sensitive receptors and away from the risk of damage by site traffic.

In the event of large amounts of hazardous waste, temporary storage may be required, that should fit the requirements details above. The hazardous waste shall be collected by a licensed waste carrier appointed by the project, as soon as practicable.

Details of documentation required and duty of care verification arrangements shall be detailed in a Site Waste Management Plan.

1.6 Other Information

Following any hydrocarbon or flammable chemical spillage incident all hot work permits shall be withdrawn immediately.

1.7 Follow Up

After the area has been made safe and clean up is underway, an investigation shall be undertaken in line with the Incident Investigation and Reporting Procedure (AA 426 04), appropriate to the size of the spill, and lessons learned shall be incorporated into project documentation / training.

Site stores shall be notified of replacement spill kit required to replenish stocks to that defined within the Emergency Response Plan.

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2.0				

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Contractor	HZI	Framework Fugitive Emissions Management Plan	
Contractor	Besix		

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1.0 General

1.1 Scope

Fugitive source air emissions are emissions that are distributed spatially over a wide area and not confined to a specific discharge point. This framework plan, will describe how fugitive emissions, particularly Total Solid Particles, Particulate Matter and odour, shall be managed during the construction and operations of the Dubai Municipality Waste to Energy Project. Combustion Emissions are outside the scope of this plan. This draft of the plan is a framework to be submitted with the Project Environmental Impact Assessment (EIA).

This shall be developed and read in conjunction with other site documents, notably the Site HSE Plan. Sections of other plans such as the Erosion Control Plan and the Community Health and Safety Plan may cross refer to this plan. Any scenarios involving fugitive emissions that have the potential to cause significant impact off-site or on-site will be addressed and managed under the Site Emergency Response Plan.

1.2 Revision

This is a framework plan. Prior to both construction and at annual intervals thereafter, an Environmental Aspects and Impacts review will be carried out as per ISO14001 requirements, to determine possible fugitive emissions scenarios and appropriate responses. The results of the Aspects Review will be incorporated into this plan as applicable.

This plan shall be reviewed at regular intervals during the project to make sure it reflects changes in the project as well as results of any Hazard and Operability Studies, incidents or lessons learned.

1.3 Legal and Other Compliance Requirements

Legal and other compliance requirements relating to fugitive emissions relevant to the project include:

- Cabinet Decree 12 of 2006_Air and Noise (Annex 8)
- IFC Performance Standard 4: Community Health and Safety
- WB General EHS Guidelines
- EIA Commitments

2.0 Baseline Background and Sensitive Receptors

2.1 Sensitive Off-Site Receptors

The site is located within an industrial area. The EIA identified limited environmental flora and fauna values, and no wetlands or waterways present on site. Although there are no existing communities residing with the site limits, the nearest residential area is located approximately 300m north from the proposed site boundary (Desert Palm Polo Club and Hotel). Directly to the west, south and south east of the site are industrial facilities; however individuals accessing the commercial and office facilities within the surrounding industrial and commercial areas may potentially be affected. To the east is a plant nursery.

Further detail on existing and planned receptors within a 5km radius of site is given in the EIA, Table 4.3.

2.2 Baseline

The EIA notes that air pollution has been stated as the primary environmental threat to public health in the UAE and ambient air quality has been recorded to be steadily deteriorating.

Ambient concentrations of airborne particulates (PM_{10}) throughout the UAE are commonly recorded in higher concentrations than the World Health Organization (WHO) limit of 20 $\mu g/m^3$. This is largely attributable to the prevalence of dry sandy soils inherent in the desert environment. Anthropogenic activities such as the large-scale construction projects, industrial discharges, increased number of vehicles on the roads, the removal of natural vegetation and increases in off-road driving activities all contribute to elevated ambient levels of airborne particulates in the UAE.

A two-week ambient air monitoring program was undertaken at three sites in the vicinity of the Project site in 2018. The results show that they were compliant with the ambient air quality standards for all parameters specified by the UAE Federal Law and Dubai Municipality, except for PM_{10} at one of the monitoring stations, which exceeded limits.

It was noted in the EIA that the PM_{10} / dust levels vary seasonally and are highly dependent on the prevailing winds and sand storm occurrences.

3.0 Roles and Responsibilities

This section shall detail the key persons responsible for this plan. This includes:

3.1 Construction Manager (Construction) or General Manager (Operations)

The Construction Manager or General Manager has overall responsibility for ensuring Company HSE Management Systems are maintained, reviewed and implemented on site and ensures that HSE hazards, including those in this plan, are eliminated or mitigated to the extent practicable

3.2 Site HSE Manager

The Site HSE Manager shall develop, maintain and implements the Site HSE Management System in line with company, project and external certification requirements. The Site HSE Manager is the owner of this Fugitive Emissions Plan and shall together with site resources as required, implement this plan and update as required to ensure all fugitive emissions are managed.

The Site HSE Manager or delegate shall review and approve Contractor Risk Assessment Method Statements (RAMS), and shall ensure that the mitigations listed in this plan, are included in the RAMS as applicable and practicable.

3.3 Site Civils Manager

The Site Civils Manager and team, shall ensure the mitigations relating to excavations and dust are considered in the planning and layouts stage, and that the mitigations are implemented on site.

4.0 Fugitive Emissions Impacts and Mitigations

4.1 Impacts

Fugitive emissions have the potential to cause nuisance and potential health impacts to nearby sensitive receptors and workers on the Project site.

The most significant potential fugitive emissions during construction identified during the EIA process is dust caused principally from mechanical disturbance (e.g. excavations) and wind erosion leading to dust emissions from exposed and disturbed soil surfaces and stockpiles during high winds. More minor sources during construction were from the circulation of heavy machinery and plant. Sources of fugitives during operations were identified as odour (from waste fuel), ash (during the process or in process of being taken off site) and litter from waste refuse trucks.

A general list of potential dust, fugitive particulate and odour mitigations are given in the tables below. Once mitigations are in place, the EIA ranked the significance of dust during construction phase as medium (likely to happen but minor consequence), and for other construction phase and operations phase fugitives as low or negligible.

This shall be reviewed prior to mobilisation to site (Section 4.2) and prior to operations (Section 4.3) and applied as necessary.

4.2 Mitigations (Construction)

Activity	Potential Mitigation Measures
General Earthmoving and Vehicle Movement (on Site)	Erect hoarding / barriers along the site boundary and/or areas where dusty activities are performed to minimise off-site dispersion of dust.
	Locate the dust generating activities, haulage routes, stockpiles and dusty materials away from the sensitive receivers as far as possible (taking the predominant wind direction into consideration).
	Provide surfacing and / or compaction of site access roads to minimise dust generated by vehicle movements on-site. Provide hard surface and / or compaction of unsurfaced areas as soon as possible once earthworks are complete to minimise areas susceptible to wind erosion.
	Dusty materials on site or being transported (within and outside the site) are to be covered to prevent dispersion by wind
	Designate haul routes on site to minimise traffic on unsurfaced areas. Do not allow driving off designated routes.

	Apply a maximum speed limit of 20 km/h on site to minimise the emission of dust on unsurfaced roads
	Undertake dust suppression through water spraying on unsurfaced areas as required
	Minimise drop heights from conveyors, loading shovels, hoppers, loading or handling equipment and use water sprays on such equipment / work areas where possible.
	Enclose chutes and conveyors and cover skips to prevent suspension of dust.
	Suspend dusty works during periods of high wind speed, where possible.
	Implement a construction logistic plan and construction traffic management plan to manage the sustainable deliveries of machinery, materials, workers and staff members.
Dust from traffic / roads (off site)	Traffic management plan to be developed with approved routes to site
	All loads offsite to be covered
	National speed limit restrictions off site
	Undertake wheel washing as required at site exits to minimise dust and soil on wheels being transferred off-site.
Dust from Stockpiles	Minimize stockpiles onsite (e.g. immediate removal of excavated materials requiring offsite disposal).
	Stabilise stockpiled materials with one of the following: – Apply water to at least 80 percent of stockpile surface areas on a daily basis when there is evidence of wind driven fugitive dust. – Provide impervious cover to stockpiles of all dusty materials (i.e. sand, cement). – Construct a three-sided enclosure around stockpiled material with walls of no more than 50 percent porosity to the height of the stockpile.
	Limit the height and slope of stockpiles and locate away from sensitive receptors
	Locate stockpiles away from site drains
	Align stockpiles along their main axis in the direction of prevailing winds to ensure minimal cross-section exposure to prevailing winds, whenever possible.
	Stockpiles within 100 meters of buildings/offices must be below two meters in height
	When stockpiling or unloading dusty/friable material, ensure that the loader bucket is close to the truck so that drop height is below three meters.
Particulate Emissions from Powered Equipment and Site Activities	Idling of equipment and vehicles will be prohibited, equipment and vehicles to be turned off when not in use
	Use low sulphur diesel, ultra-low sulphur diesel or bio-diesel to minimise the emission of sulphur dioxide, where practical
	Use equipment fitted with pollution control devices (e.g. diesel particulate matter filter), where possible.

	Maintain equipment and vehicles as per manufacturer recommendations and remove any malfunctioning or sub-standard equipment and vehicles from service, particularly if observed to be emitting black smoke.
	Open burning on site will be prohibited.
	Minimise dust from cutting, grinding, sawing etc. with dust extractors at source where possible or dust suppression through water spraying
Control of VOC Emissions	Storage of fuel, paints and other volatile materials: – Provide a designated and well ventilated storage facilities of volatile organic materials. – The storage area should be located away from on-site and off-site sensitive receptors (with consideration of the predominant wind direction). – The quantity of volatile materials to be stored on-site should be kept to minimum and containers holding the volatile materials should be kept closed when not in use.
	Ventilation is to be provided where volatile organic materials are stored to protect workers and staff members from exposure.

4.3 Mitigations (Operations)

This section covers fugitives identified as potentially significant impacts during operations. This does not cover point source emissions (e.g. stack emissions).

Activity	Potential Mitigation Measures
Waste Fuel Delivery Trucks	Dubai Municipality registered waste hauliers only permitted
	Sealed roads on site
	Traffic management plan detailing approved routes to site
	Speed limits on site
	All waste fuel delivery trucks required to cover loads to prevent dust / litter escaping to / from site
Odour	Roller shutter door on entrance / exit to tipping hall
	Negative back pressure drawing air through tipping hall, waste bunker into combustion process and maintaining normal operations of 4 out of 5 lines at any one time
	Restrictions on the amount of time waste can be stored in bunker after shutdown
	Washing programme for company owned waste collection and transfer containers
Ash	Design of ash storage areas to prevent migration of ash
	Enclosed conveyors
	Maintenance procedures to prevent migration of ash when accessing equipment
	Emergency Management Plan (incorporating Spills Management) and Spills Training
Trucks removing Ash from Site	Traffic management plan detailing approved routes to / from site
	All ash trucks required to be enclosed / securely covered to prevent ash escaping in transit

5.0 Monitoring and Audits

5.1 Ambient Air Quality Monitoring

Details of the formal ambient air quality monitoring required are outlined in the EIA and are summarised below. This shall be updated as the project progresses to reflect any new legislative or other compliance requirements.

If the trigger levels for corrective action are reached, then a review of results shall be carried out to determine if exceedances are associated with the project construction activities on site. If the exceedances are likely due to project, the work causing the exceedance shall be ceased and corrective actions determined.

5.1.1 Construction

Construction Phase – Ambient Air Quality			
Parameter	**Method and Equipment**	**Location, Frequency and Duration**	**Reporting**
PM10 (24-hour) TSP (24-hour)	Title 40, CFR, Chapter 1, subchapter C, Appendix J to Part 50. Reference Method for the Determination of Particulate Matter as PM10 in the atmosphere. Use high volume sampler or equivalent.	One location per month, depending on where construction is taking place. Two measurements shall be taken, one measurement on a weekday and one on a weekend (during construction hours)	- Monthly internal by Contractor to EPC - Quarterly by EPC to Dubai Municipality-ED - Annual to Lenders (if required)
Trigger level for corrective action:	- Exceedance of UAE Federal ambient air quality standard: PM_{10} 150µg/m^3 (24-hour); and TSP 230 µg/m^3 (24-hour) - Visible dust emissions - Community complaints		

5.1.2 Operations

Operations Phase – Ambient Air Quality			
Parameter	**Method**	**Location, Frequency and Duration**	**Reporting**
PM_{10} (24-hour) TSP (24-hour) SO_2 NOx CO	Gravimetric Method / High Volume Sampler Greiss-Saltzman Method / Gas Impinger West and Gaeke method / Gas Impinger	Two locations (AN1 and AN2 as per EIA) at the border of the site. Continuous Air Quality Monitoring: - TSP 24 hour, 1 year - SO_2 1 hour, 24 hour, 1 year - NO_2 1 hour, 24 hour - CO 1 hour, 8 hour - PM_{10} 24 hour	- Monthly Internal Reporting - Annual to Lenders (if required) and Dubai Municipality-ED
Meteorological Conditions	Meteorological parameters (e.g. wind speed, wind direction, humidity, temperature)		
Trigger level for corrective action:	- Exceedance of UAE Federal ambient air quality standard (as per Table 5.3 of EIA) - Community complaints		

5.2 Site Auditing and Inspections

The Site HSE Plan shall detail the general HSE Audit and Inspection Plan. This shall include:

- Monthly General Site Environmental Audits
- Annual Management Plan audits to ensure that this plan is being implemented as intended.

In addition fugitives (particularly visible dust) shall be monitored during daily workarounds by HSE Team.

Odour will be monitored as part of Monthly General Site Environmental Inspections. This shall involve recording whether odour can be detected at site boundary fence, immediately downwind of tipping hall. In the unlikely event odour is detected at the site boundary, actions shall be implemented to investigate why engineered mitigations are not working and corrective actions shall be taken to rectify this.

6.0 Communication

6.1 Training

Information and requirements relating to control of fugitive emissions shall be communicated to the workforce as follows:

- Though the Site HSE Induction
- As part of general Site Environmental Aspects training
- As part of point of work risk assessment (during Construction and Maintenance)
- Periodic Toolbox talks prior at start of work day

6.2 Reporting

HSE performance, including fugitives, shall be reviewed monthly by Site Management Team and any areas of concern raised in monthly report.

Annual reports of environmental monitoring, inspection and auditing results shall be prepared annually and submitted to Project Management for onward distribution to stakeholders as required (e.g. Lenders, Dubai Municipality)

7.0 Records

All records shall be maintained for a minimum of 5 years.

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Contractor	Besix		

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1. Introduction

This section provides a framework for the full emergency plan (Plan) which will be developed and agreed with the Dubai Municipality 6 months prior to the Services Commencement Date.

The Plan will comprehensively cover all aspects required under Dubai Municipality's requirements and those required under Federal and Local Authorities' Health and Safety Legislation and Regulations.

The Plan will also provide detail of how the Facility will be operated under emergency situations to ensure it remains compliant with all appropriate consents and permissions, where possible, including any requirement for the controlled shut down of processes. These operational procedures will, where appropriate, be linked through to the Contingency Plan.

2. Emergency Plan

HZI will ensure that it has the relevant processes and procedures to deal with significant incidents that could occur at the Facility without warning. In such circumstances, it will be vital that appropriate actions are taken immediately to reduce danger to personnel, the environment and the Facility. Hence, these procedures will be made easily accessible and summaries, kept on display at strategic locations around the Facility, kept up to date and regularly communicated to all Personnel employed at the Facility (including as part of the staff induction programme and on-going for updates to the Plan).

The Contractor will prepare a Plan for the Facility and Services to detail appropriate emergency procedures 6 months prior to the Services Commencement Date. The development of this Plan will be completed with the agreement of Dubai Municipality with the draft Plan being provided for review and comment. The objectives of the Plan will be:

- To ensure that at all times the Contractor has provided for adequate emergency measures;
- To provide a clear and suitable means of communication between the Contractor and Dubai Municipality in the event of an Emergency situation;
- To make all reasonable efforts to assist Dubai Municipality and civil emergency planning teams in the development and operations of emergency measures as and when required;
- To ensure that all Personnel are trained and competent in the requirements of the Plan;
- Interface with other plans to ensure all aspects relating to emergency procedures are covered, for example fire safety plan, Contingency Plan, and Programmed Maintenance plan;
- Identify individuals for handling emergencies both in and outside business hours;
- Define management duties and off duty call-out rosters;
- To make all reasonable efforts to assist Dubai Municipality and civil emergency planning teams in the development and operations of Emergency measures as and when required;
- Link through to the Contingency Plan to provide detail on the continuity of the Services provision under Emergency scenarios; and
- Provide detail on how the Facility or Services will be operated under Emergency situations to ensure it remains compliant with all appropriate consents and permissions, including any requirement for the controlled shut down of processes.

The following specific incidents will be covered in the Plan for the Site as follows:

- Major fire, including administration block and visitor centre fire, vehicle fire, refuse bunker fire, propane fire, diesel oil fire, the details of procedures during fire scenarios will be linked through to the fire safety plan;
- Major flooding;
- Earthquake;
- Major ground condition incident;
- Major injury accident;
- Terrorist action;

- Site evacuation;
- Explosion;
- Major spillage of diesel oil;
- Major spillage of hazardous chemicals, including process reagents and residues;
- Handling of contaminated firewater;
- Intruder on Site;
- Serious loss of data or information system failure;
- Unplanned loss of Site electrical supplies; and
- Significant breach of Environmental Permit (including but not limited to emissions to air/ground/waster, noise, dust, odour, vermin, etc.).

In addition, the Plan will detail procedures to deal with the following specific incidents:

- Boiler refuse feed chute fire;
- Rescue of person from the refuse bunker;
- Recovery of a vehicle from the refuse bunker;
- Major spillage of hydrochloric acid;
- Major spillage of sodium hydroxide;
- Major spillage of quicklime;
- Ammonia spillage;
- Major plant failure;
- Rescue of person from a residue bunker; and
- Fire or smouldering load in a Waste delivery vehicle.

The Plan will detail how the Facility will remain compliant with all appropriate consents and permissions, including any requirement for the controlled shutdown of processes for the above scenarios.

The Plan will take account of the following:

- The Site;
- Whether public and third parties are allowed on Site;
- The technology process employed by the Facility;
- Vehicles using the Site;
- The types of Waste Processed; and
- The proximity of Emergency services.

The Plan will include incident action sheets and a Site evacuation plan detailing specific procedures to cover all Emergency and disaster scenarios identified above. The incident action sheets and Site evacuation plan will be regularly reviewed and / or updated annually as a minimum requirement, with further ad-hoc amendments as appropriate. The Contractor's Representative will be responsible for making sure that all Site Personnel are aware of any change in the procedures which will be relayed via training sessions and summary updates posted at strategic locations around the Facility as appropriate.

In addition training and drills will be carried out against the plan to ensure that the plan remains effective. Debriefs will occur post drill and amendments to the plans will be undertaken if required.

3. Fire Safety Risk Assessment

The Contractor will carry out a detailed fire safety risk assessment of the Facility and operations on the Site utilising HZI form GP426 F53.

The fire risk assessment will take into account health and safety issues, protection of the environment and the requirement for business continuity. This assessment will include a review of best practice and recommendations from fire investigations on similar facilities and other related best practice industry guidance.

HZI will identify and incorporate in the Works a robust fire strategy (which incorporates the output from the detailed fire assessment referred to above) to minimise both the cause of fire occurring and the subsequent impact of any fire.

The fire strategy and related fire design will be submitted by HZI to Dubai Municipality as a reviewable item under the Review Procedure.

The fire risk assessment will form part of the fire plan for the Site. This fire risk assessment and fire plan will be reviewed by HZI regularly so as to keep it up-to-date and, in any event by the date indicated on the last report or at such earlier time due to the following reasons:

- There is reason to suspect that it is no longer valid; or
- There has been a significant change in the matters to which it relates including when the premises, special, technical and organisational measures, or organisation of the work undergo significant changes, extensions, or conversions.

By way of example and without limiting the general statement made above, the fire risk assessment and fire plan will be reviewed by HZI at intervals of no more than twelve months or following:

- Significant changes to work practices or procedures;
- A significant change in the number of people present or the characteristics of the occupants including the presence of people with some form of disability;
- Any significant structural or material changes to the premises (including the internal layout) or to the processes or activities conducted at the premises, including the introduction of new equipment;
- Significant changes to furniture and fixings and/or to displays or quantities of stock;
- The introduction or increase in the storage of hazardous substances;
- Any change in the fire precautions in the premises;
- Any near miss or fire incident; or
- The hazards and/or risks identified in each section of the fire assessment increase the risk to life and/or property safety in and around the areas assessed.

HZI will ensure that the additional fire safety controls, recommendations and actions set out in the fire assessment are undertaken to bring the assessed areas up to a standard that will ensure, so far as is reasonably practicable, the safety of all Personnel, any other person lawfully on the premises or any person in the immediate vicinity of the premises at risk from a fire on the premises.

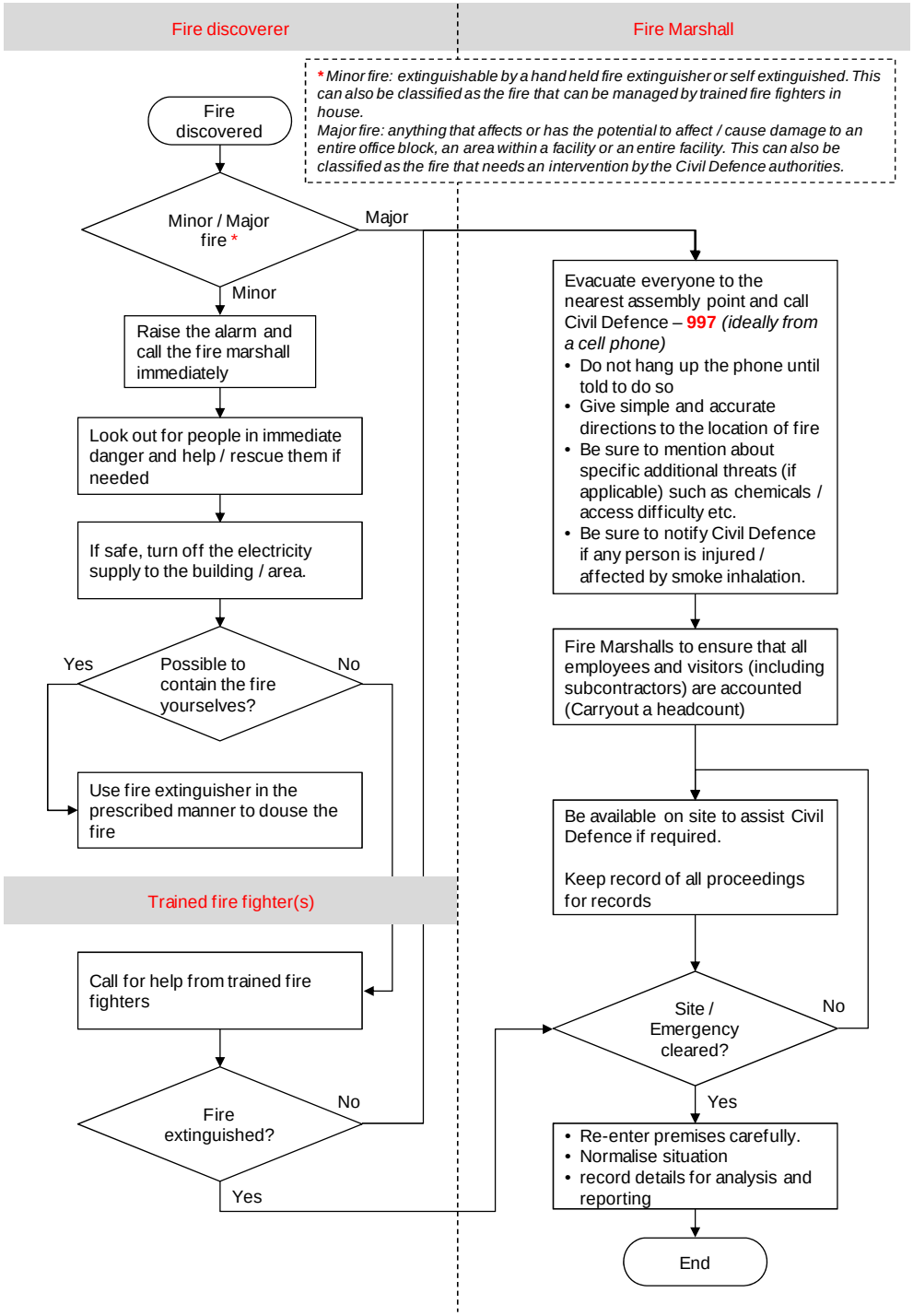
4. Fire Emergency Response Plan

On the occurrence of any fire, the HZI will act in accordance with the adopted fire plan. Example actions to be undertaken will be as follows:

- Assess seriousness of fire and risk to personnel, environment and plant;
- Sound Site fire alarm where applicable (if not already sounding automatically);
- Summon Fire Brigade as necessary;
- Summon Ambulance Service if required;
- If the fire alarm is sounded the Incident Controller shall arrange for the immediate opening of vehicle access gates;
- Start fire pump manually if not already in service unlock dry riser, if necessary;
- Arrange for emergency vehicles to be admitted via main gate. (Ensure route to fire is unobstructed and clear directions to fire are available);
- Direct fire fighting and rescue operations, without personal risk;
- Assess actual or potential effect on plant operation and instruct any necessary actions to minimise risks;

- Co-ordinate with Fire Brigade senior officer on their arrival, ensuring that they are aware of special risks (e.g. chemicals, electrical supplies, diesel, propane, gas cylinders and high pressure/temperature systems);
- Carry out “Site Evacuation” procedure when fire alarm has sounded.

An example of a Fire Emergency Response is given below:



5. Plan Review Procedures

The Plan will be considered an active or ‘live’ document which will be reviewed and updated annually and as a priority as required after changes to Facility design or operation which may impact the Plan in

any way. The Plan will also be subject to annual review according to the company's business management system procedures and improvement plan. Dubai Municipality will be informed of any required updates and agreement sought.

6. Key Roles and Chain of Command

HZI's training plan will ensure that Personnel receive appropriate training to deal with foreseeable incidents contained within the Plan. Training will be included during the staff induction programme and after updates to the Plan.

All incidents will be communicated and managed internally as per HZI Procedure AA 426 04.

HZI define an Emergency as an unforeseen or sudden occurrence which has the capability of posing an immediate threat of pollution of the environment or harm to human health, or both.

HZI will ensure that a trained incident controller is identified at the Site (Incident Controller). This person will be responsible for co-ordinating the actions of the Personnel dealing with the incident. This will usually be the site manager, or in the absence of the site manager, the HSE manager or equivalent.

The Plan will ensure that individuals will be identified to provide cover for Emergencies inside and outside Business Hours. This will include defined via off duty rosters which clearly identify individuals, roles and responsibilities during emergency scenarios. HZI Personnel would be the 24 hour contact in the case of Emergencies.

In the event of an Emergency arising, without prejudice to the actions necessary to manage the Emergency, the Incident Controller will be informed of the situation as soon as it is practicable to do so by operational Personnel. Civil emergency services will be informed as soon as practicable by either the HZI Site manager. HZI will ensure that all Emergency and disaster incidents are notified to Dubai Municipality's Representative as soon as is reasonably practicable, in accordance with Dubai Municipality's requirements.

Following or during an incident where it is considered that a proactive media release should be prepared this must be authorised by the Contractor's Representative in conjunction with Dubai Municipality's Representative. Where it is considered that regulatory bodies should be informed of the Emergency, this will be the Contractor's Representative's responsibility.

All escalations of incidents will be managed as per HZ procedure AA 426 04.

Where management is required to carry out any of the above actions it is essential that in their absence a deputy is nominated and is made aware of the responsibilities included in this procedure. The name of the nominated deputy will be communicated to line management.

As soon as possible after the Emergency situation the Plan performance will be assessed to determine if it performed as required. Based on this assessment and if relevant the Contractor will provide an updated Plan to Dubai Municipality in accordance with the Review Procedure.

7. Reporting and Recording Disasters

Using the business management system the Contractor will set up management systems to register all data related to Services management and performance monitoring, including Facility management, maintenance and incident reporting.

As part of Monthly Services Reports and Annual Services Reports, the Contractor will regularly make all incident data available to Dubai Municipality. The improvement plan included in Annual Services Reports will include the following:

- Details of all incidents that occurred in the relevant period;
- Actions that have been undertaken and compliance with procedures in place;

- Consequences on the Services provision; and
- Proposals for future improvement of health and safety and proposals.

All Emergency procedures will be updated and will take account of the analysis provided in the improvement plan.

GOVERNMENT OF DUBAI

DUBAI MUNICIPALITY

WtE: WASTE TO ENERGY PROJECT

Design Basis Fire and Life Safety Strategy

CONTRACTOR: BESIX | Hitachi Zosen INOVA

PROJECT	-	ORIGIN	-	ACTIVITY	-	Doc Type	-	NUMBER	-	REVISION	-	TRADE	-	PART	-	LEVEL
DWE	-	CRW	-	ARC	-	RPT	-	02995	-	02	-		-		-	

Revision	Date	Description
02	30/05/2018	Reviewed Concept Design
01	18/05/2018	Reviewed Concept Design
00	23/04/2018	Concept Design Issued for Review

Content

1 SCOPE OF WORK

This report sets out the methodology and the key design principles which will be adopted in developing the fire safety strategy for each of the relevant aspects of the design.

2 LEGAL REQUIREMENTS

The main requirements in terms of fire and life safety to be fulfilled are included below, in the following order of priority:

- NFPA 850, *Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations*, 2015 Ed.;
- NFPA 101, *Life Safety Code*, 2012 Ed.;

3 CLIENT REQUIREMENTS

The Client's requirements have been obtained from the Tender Documentation listed below:

- B0_General_Specification;
- B11_Auxiliary_Systems;
- LAA-HZI-50056473_5.0_Room List
- HZI-VZA-50073596_0.0_Building Section Requirements
- Energy from Waste (EfW) / Waste To Energy (WtE) Fire Protection Requirements, ACE group - Technical Risks

4 FIRE SAFETY PROVISIONS

4.1 CLASSIFICATION OF BUILDING OCCUPANCY TYPE AND HAZARD CONTENTS

In accordance with NFPA 850, in terms of life safety the following classifications are considered:

- General areas should be considered as special purpose industrial occupancies;
- Coal preparation and handling facilities (e.g., enclosed crusher houses, transfer houses, and conveyors) and scrubber buildings should be considered special-purpose industrial occupancies;
- General office structures should be considered as business occupancies;
- Warehouses should be considered as storage occupancies;
- Open structures and underground structures should be considered as occupancies in special structures. Temporary occupancies and means of egress inside the structures and piers of large "bulb" hydroelectric units should be evaluated based on occupancies in special structures

4.1.1 ATEX ZONES

For the ATEX zones location refer to Annex (1) containing the ATEX zones layout drawing by Hitachi.

In terms of building occupancy type ATEX zones should be considered as high hazard occupancies.

For the ATEX zones located in the special purpose industrial occupancy the assumption in accordance with NFPA 101 sec 40.1.1.5 is that Incidental high hazard operations protected in accordance with Section 8.7 and 40.3.2 in occupancies containing low or ordinary hazard contents shall not be the basis for high hazard industrial occupancy classification.

In other words the ATEX zones high hazard occupancy is considered incidental to the main occupancy if the following conditions are verified in accordance with NFPA 101 sec 8.7 and sec 40.3.2:

- NFPA 101 sec. 8.7:

- *8.7.1.1 Protection from any area having a degree of hazard greater than that normal to the general occupancy of the building or structure shall be provided by one of the following means:*
  - *Enclosing the area with a fire barrier without windows that has a 1-hour fire resistance rating*

- *Protecting the area with automatic extinguishing systems*
- *Applying both 8.7.1.1(1) and (2) where the hazard is severe or where otherwise specified by Chapters 11 through 43*

- *8.7.1.2 In new construction, where protection is provided with automatic extinguishing systems without fire-resistive separation, the space protected shall be enclosed with smoke, unless otherwise permitted by one of the following conditions:*
  - *Where hazardous areas in industrial occupancies are protected by automatic extinguishing systems in accordance with 40.3.2*
  - *(….)*
- *8.7.2 Explosion Protection. Where hazardous processes or storage is of such a character as to introduce an explosion potential an explosion venting system or an explosion suppression system specifically designed for the hazard involved shall be provided.*
- *8.7.3.1 The storage and handling of flammable liquids or gases shall be in accordance with the following applicable standards: NFPA 30, Flammable and Combustible Liquids Code NFPA 54, National Fuel Gas Code NFPA 58, Liquefied Petroleum Gas Code*
- *8.7.3.2 No storage or handling of flammable liquids or gases shall be permitted in any location where such storage would jeopardize egress from the structure, unless otherwise permittedby 8.7.3.1.*

➢ NFPA 101 sec. 40.3.2

- *40.3.2.1 All high hazard industrial occupancies, operations, or processes shall have approved, supervised automatic extinguishing systems in accordance with Section 9.7 or other protection appropriate to the particular hazard, such as explosion venting or suppression.*
- *40.3.2.2 Protection in accordance with 40.3.2.1 shall be provided for any area subject to an explosion hazard in order to minimize danger to occupants in case of fire or other emergency before they have time to use exits to escape.*
- *40.3.2.3 Activation of the fire-extinguishing or suppression system required by 40.3.2.1 shall initiate the required building fire alarm system in accordance with 40.3.4.3.4.*
- *40.3.2.4 Hazardous areas in industrial occupancies protected by approved automatic extinguishing systems in accordance with Section 9.7 shall be exempt from the smoke resisting enclosure requirement of 8.7.1.2.*

ATEX zones are enclosed in fire barriers (where feasible), protected with automatic extinguishing system and in general treated in order to comply with clauses above to avoid the classification of all the main building as high hazard industrial occupancy.

4.2 CONSTRUCTION AND COMPARTMENTALIZATION

4.2.1 FIRE AREAS

For the identification of the main Fire compartments of the plant refer to Annex 2

Fire areas should be separated from each other by fire barriers, spatial separation or other approved means.

As per NFPA 850 sec. 5.1.1.3, it is recommended that fire area boundaries be provided to separate the following[1]:

(1) Cable spreading room(s), and cable tunnel(s) and high voltage lead shafts from adjacent areas

(2) Control room, computer room, or combined control/computer room from adjacent areas

(3) Rooms with major concentrations of electrical equipment, such as a switchgear room or relay room, from adjacent areas

(4) Battery rooms from associated battery chargers, equipment, and adjacent areas

(5) Maintenance shop(s) from adjacent areas

(6) Main fire pump(s) from reserve fire pump(s) where these pumps provide the only source of fire protection water

(7) Fire pumps from adjacent areas

(8) Warehouses from adjacent areas

(9) Emergency generators from each other and from adjacent areas

(10) Fossil fuel–fired auxiliary boiler(s) from adjacent areas

(11) Fuel oil pumping, fuel oil heating facilities, or both, used for continuous firing of the boiler from adjacent areas

(NOTE: fuel system for generators i.e. fuel oil and ammonia storage are present in the plant in the southern area of the main building in open space)

(12) Storage areas for flammable and combustible liquid tanks and containers from adjacent areas

(13) Office buildings from adjacent areas

(14) Telecommunication rooms, supervisory control and data acquisition (SCADA) rooms, and remote terminal unit (RTU) rooms from adjacent areas

(15) Adjacent turbine generators beneath the underside of the operating floor

[1]Unless consideration of the factors of NFPA 850 sec. 5.1.1.2 indicates otherwise or if adequate spatial separation is provided as permitted in 5.1.1.5

(16) Between the boiler house and the areas of the coal handling system above the bin, bunker, or silo

(NOTE: a fire "shutter" or similar fire compartmentation will be studied in according with the process functionality)

(17) Fan rooms and plenum chambers from adjacent areas

(18) Switchgear area and sulfur hexafluoride switch yard area from adjacent areas

In addition to the applicable requirements above, as per NFPA 850 sec. 9.4.2.1, it is recommended that, as a minimum, fire area boundaries be provided to separate the following:

(1) The tipping floor (including the MSW storage)

(2) The processing area

(3) RDF (refuse derived fuels) storage

4.2.2 FIRE BARRIER

As per NFPA 850 sec. 5.1.1.4, fire barriers separating fire areas should be a minimum of 2-hour fire resistance rating.

Where not specifically contained in the international codes (such as NFPA 850 and NFPA 5000), the general principle for the fire resistance rating / fire protection rating will follow the same principles as in large scale international WTE projects (e.g. in the UK).

4.2.3 OPENINGS IN FIRE BARRIER

As per NFPA 850 sec. 5.1.2, all openings in fire barriers should be provided with fire door assemblies, fire dampers, through penetration seals(fire stops), or other approved means having a fire protection rating consistent with the designated fire resistance rating of the barrier.

Windows in fire barriers (e.g., control rooms or computer rooms) should be provided with a fire shutter or automatic water curtain.

Fire door assemblies, fire dampers, and fire shutters used in 2 hour rated fire barriers should be rated not less than 1 1/2 hour (See *NFPA 80 Standard for Fire Doors and Fire Windows*).

4.2.4 DETACHED STRUCTURES

If a fire area is defined as a detached structure, it should be separated from other structures by a minimum of 15 m or a greater distance as defined in NFPA 80A *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*.

4.2.5 BUILDING CONSTRUCTION MATERIALS

As per NFPA 850 sec. 5.3, construction materials used in the boiler, engine, or turbine-generator buildings or other buildings critical to power generation or conversion should meet the definition of noncombustible or limited combustible, except for the following:

(1) Roof coverings, which should be as outlined in 5.3.4;
(2) Limited use of translucent reinforced plastic panels;
5.3.3 The use of material that does not meet the definition of noncombustible or limited combustible, such as translucent reinforced plastic panels, is permitted in limited applications if the fire risk evaluation demonstrate that the material is acceptable;
5.3.4 Roof covering should be Class A in accordance with ASTM E108, Standard Test Methods for Fire Tests of Roof Coverings, or UL 790, Tests for Fire Resistance of Roof Covering Materials. Metal roof deck construction, where used, should be "Class I" or "fire classified."

Regarding the interior finish, according to NFPA 850 sec. 5.3.5:
5.3.5.1 Cellular or foamed plastic materials (as defined in Annex A of NFPA 101) should not be used as interior finish.
5.3.5.2 Interior finish in buildings critical to power generation or conversion should be Class A.
5.3.5.3 Interior finish in buildings not critical to power generation or conversion should be Class A or Class B.

4.3 MEANS OF EGRESS

For the identification of the means of egress and of the main egress paths and of the plant refer to Annex (3)

Means of egress of the buildings are dimensioned and arranged in accordance with NFPA 101, both in terms of general requirements and in terms of specific provisions related to the different occupancies as per sec 2. of this document.

4.3.1 SPECIAL PURPOSE INDUSTRIAL OCCUPANCY

For the general areas (including boiler and fuel treatment main area and turbine hall) classified as special purpose industrial occupancies as per sec. 2 of the current document, according to NFPA 101 the following distances have to be fulfilled for sprinklered[2] facilities:

- Common path limit: 30 m
- Dead-end limit: 15 m
- Travel distance limit: 122 m

4.3.2 ANCILLARY FACILITIES IN SPECIAL PURPOSE INDUSTRIAL OCCUPANCY

[2]As per NFPA 850 2015 Ed. Sec. A.5.2.2 "It generally is recognized that boiler and turbine buildings, protected in accordance with this document, meet the intent of NFPA 101 for additional travel distances for fully sprinklered facilities."

In accordance with NFPA 850 and NFPA 101, in the event of a plant fire, egress of occupants in control facilities can be delayed due to emergency shutdown procedures. Control facilities should have a means of egress that is separated from other plant areas to facilitate a delayed egress.

4.3.3 HIGH HAZARD AREAS

For the ATEX zones location refer to Annex (1) containing the ATEX zones layout drawing by Hitachi.

For the high hazard areas, according to NFPA 101 the following distances have to be fulfilled for industrial sprinklered facilities:

- Common path limit: 0 m
- Dead-end limit: 0 m
- Travel distance limit: 23 m

4.3.4 TRAVEL DISTANCES, COMMON PATH AND DEAD-END LIMITS

In the table below a complete set of travel distance, common path and dead end limits based on the different occupancy in accordance with NFPA 101.

Special-Purpose Industrial Occupancy 40.2.5 and 40.2.6	**Dead-End Corridor:**	**m**
	Protected throughout by an approved, supervised automatic sprinkler system	**15**
	Not protected throughout by an approved, supervised automatic sprinkler system	**15**
	Common Path of Travel:	
	Protected throughout by an approved, supervised automatic sprinkler system	**30**
	Not protected throughout by an approved, supervised automatic sprinkler system	**15***
	* According to NFPA 130 7.12.2 b), 30 m for mechanical equipment room in rooms with no fuel-fired equipment	**30**
	Maximum Travel Distance to Exit:	
	Protected throughout by an approved, supervised automatic sprinkler system	**122**
	Not protected throughout by an approved, supervised automatic sprinkler system	**91**
High Hazard Industrial Occupancy	**Dead-End Corridor:**	**m**
	Protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
	Not protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
	Common Path of Travel:	
	Protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
	Not protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
	Maximum Travel Distance to Exit:	
	Protected throughout by an approved, supervised automatic sprinkler system	**23**
	Not protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
Low Hazard Storage Occupancy 42.2.5 and 42.2.6	**Dead-End Corridor:**	**m**
	Protected throughout by an approved, supervised automatic sprinkler system	**NR**
	Not protected throughout by an approved, supervised automatic sprinkler system	**NR**
	Common Path of Travel:	
	Protected throughout by an approved, supervised automatic sprinkler system	**NR**

	Not protected throughout by an approved, supervised automatic sprinkler system	**NR**
	Maximum Travel Distance to Exit:	
	Protected throughout by an approved, supervised automatic sprinkler system	**NR**
	Not protected throughout by an approved, supervised automatic sprinkler system	**NR**
Ordinary Hazard Storage Occupancy 42.2.5 and 42.2.6	**Dead-End Corridor:**	**m**
	Protected throughout by an approved, supervised automatic sprinkler system	**30**
	Not protected throughout by an approved, supervised automatic sprinkler system	**15**
	Common Path of Travel:	
	Protected throughout by an approved, supervised automatic sprinkler system	**30**
	Not protected throughout by an approved, supervised automatic sprinkler system	**15**
	Maximum Travel Distance to Exit:	
	Protected throughout by an approved, supervised automatic sprinkler system	**122**
	Not protected throughout by an approved, supervised automatic sprinkler system	**61**
High Hazard Storage Occupancy 42.2.5 and 42.2.6	**Dead-End Corridor:**	**m**
	Protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
	Not protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
	Common Path of Travel:	
	Protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
	Not protected throughout by an approved, supervised automatic sprinkler system	**Forbidden**
	Maximum Travel Distance to Exit:	
	Protected throughout by an approved, supervised automatic sprinkler system	**30**
	Not protected throughout by an approved, supervised automatic sprinkler system	**23**
Business Occupancy 38.2.5 and 38.2.6	**Dead-End Corridor:**	**m**
	Protected throughout by an approved, supervised automatic sprinkler system	**15**
	Not protected throughout by an approved, supervised automatic sprinkler system	**6,1**
	Common Path of Travel:	
	Protected throughout by an approved, supervised automatic sprinkler system	**30**
	Not protected throughout by an approved, supervised automatic sprinkler system	**23**

	Maximum Travel Distance to Exit:	
	Protected throughout by an approved, supervised automatic sprinkler system	**91**
	Not protected throughout by an approved, supervised automatic sprinkler system	**61**

4.3.5 EXCLUSION

Spaces internal to equipment and machinery are excluded from the requirements of NFPA 101. Examples of these spaces include but are not limited to the internals of the following:

(1) Boilers

(2) Scrubbers

(3) Pulverizers

(4) Combustion turbine enclosures

(5) Cooling towers

(6) Bunkers, silos, and hoppers

(7) Conveyor pulley takeupareas

(8) Electrostatic precipitators

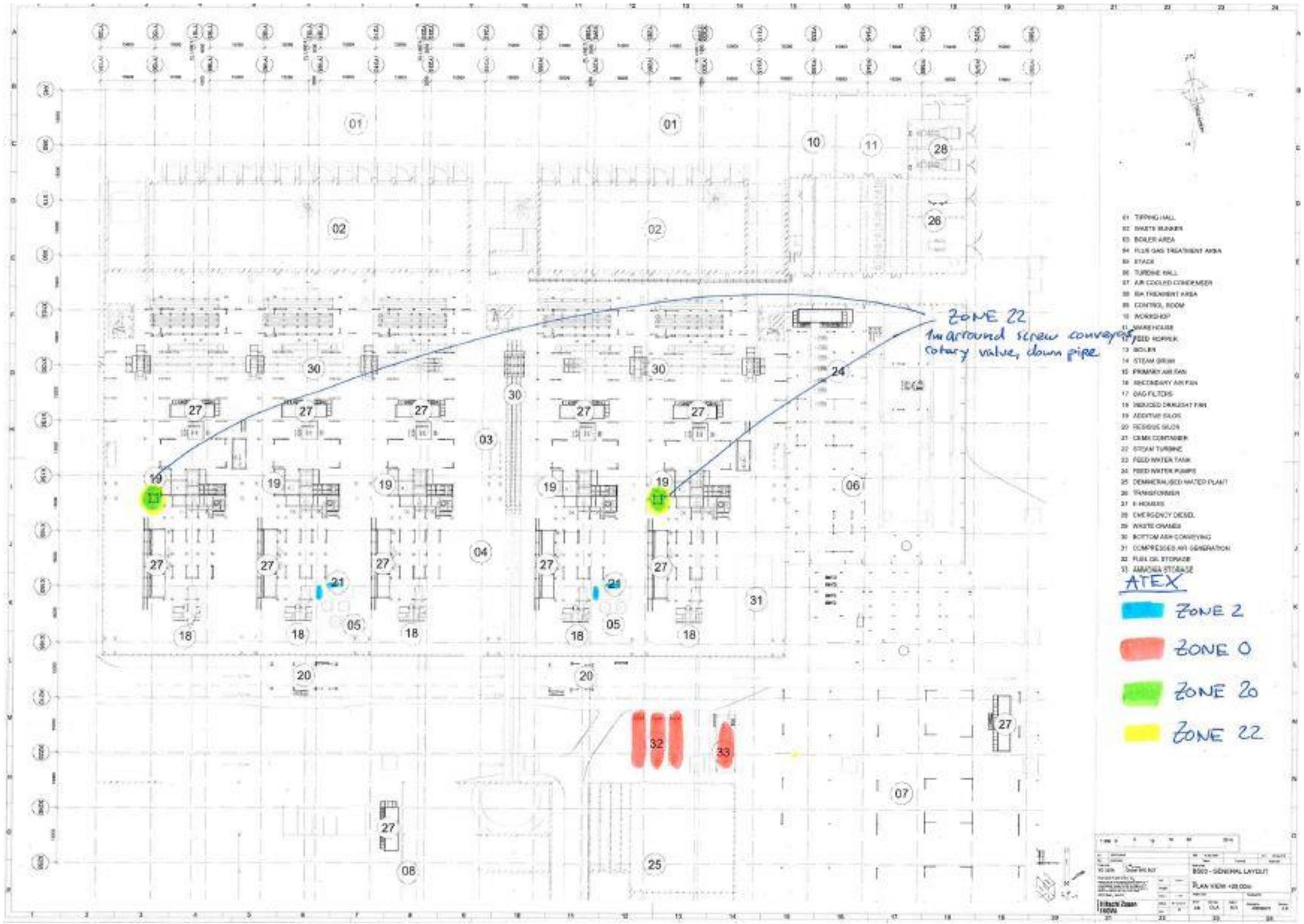
4.4 FIRE PROTECTION

Fire protection systems should be installed in accordance with NFPA 850, in particular with Chapter 9, Alternative Fuels.

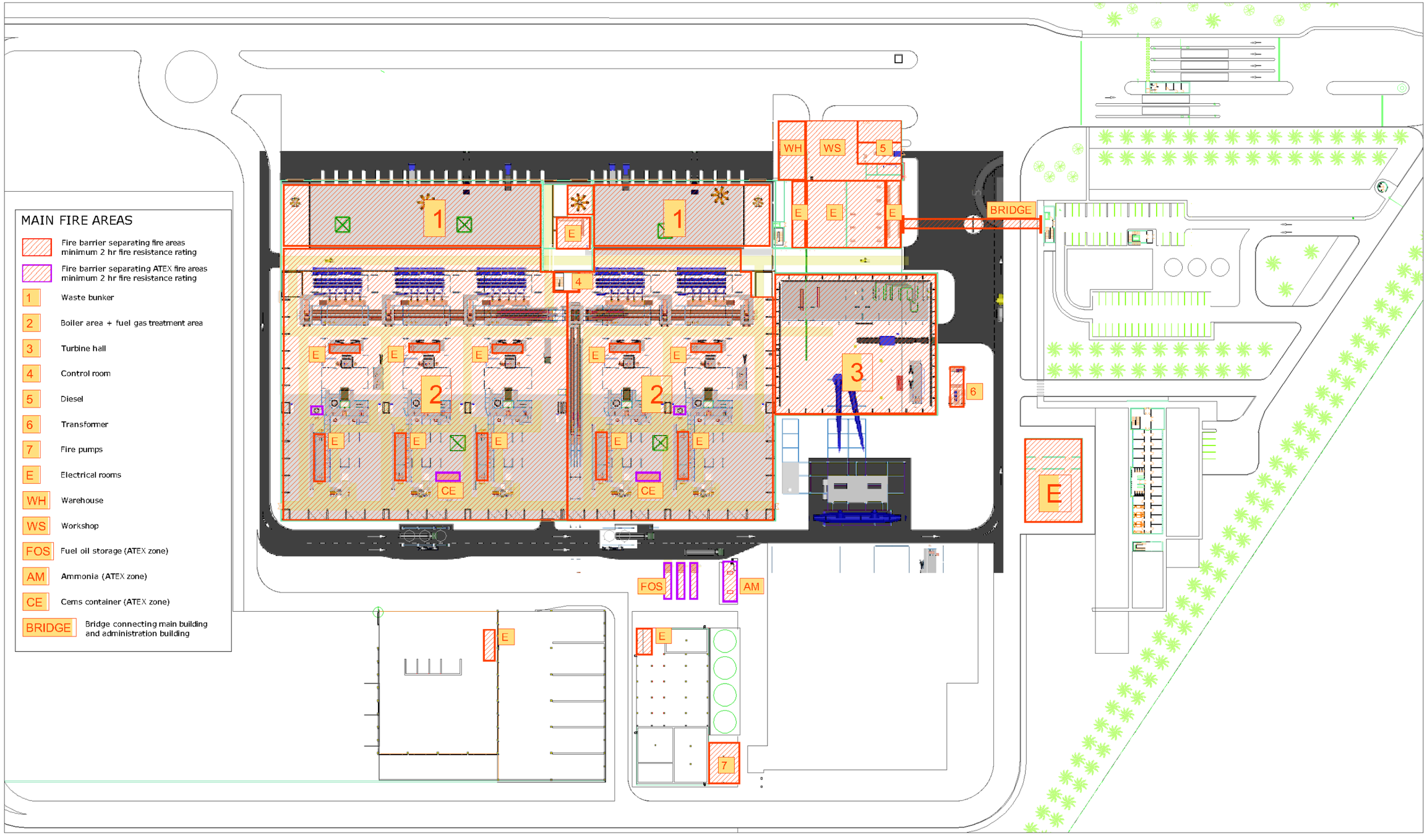
5 APPENDIX

- Appendix 1: Hitachi ATEZ zones layout
- Appendix 2: Plant main Fire Compartments – principles and base scheme
- Appendix 3: Plant main Means of Egress – principles and base scheme

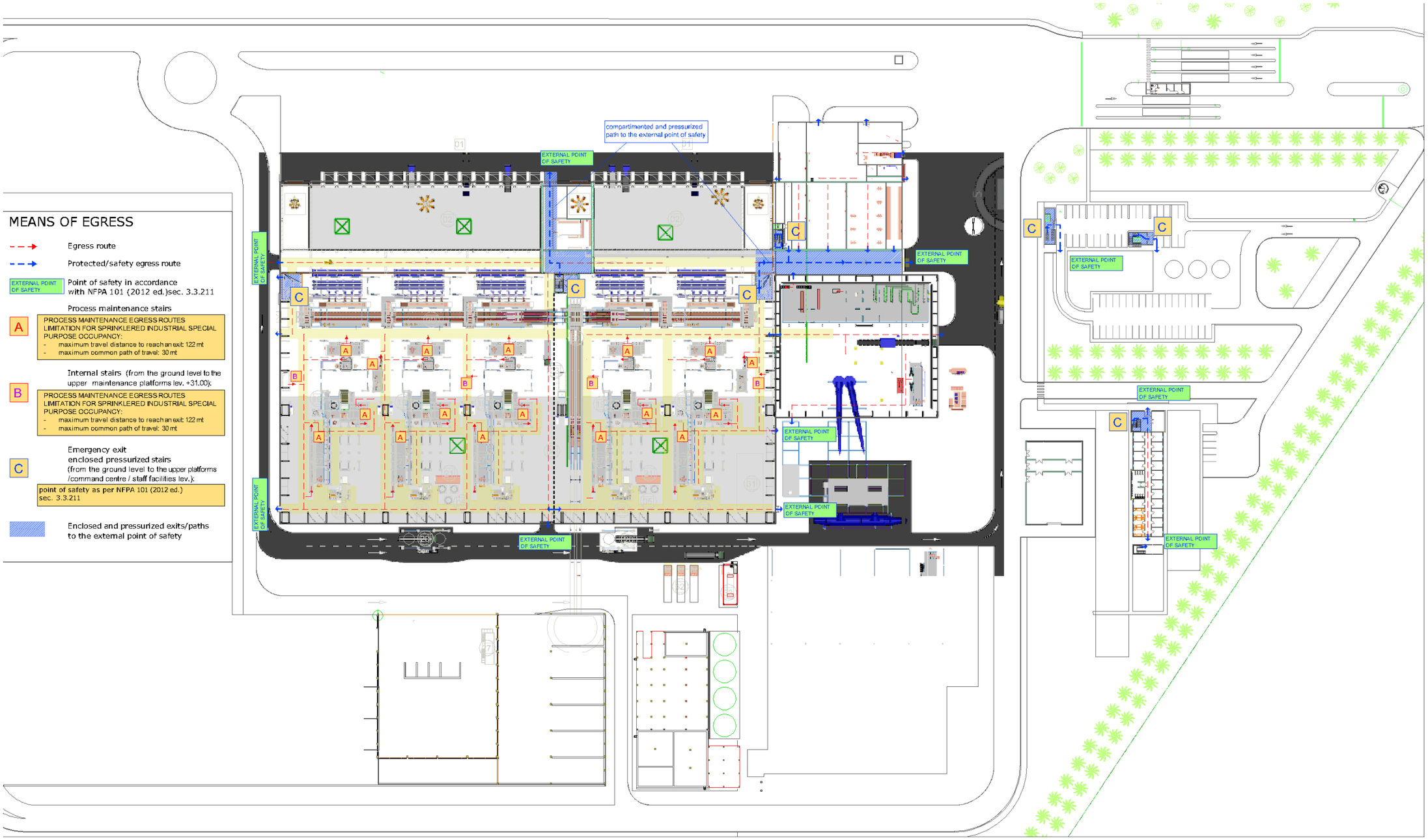
APPENDIX 1 - Hitachi ATEZ zones layout

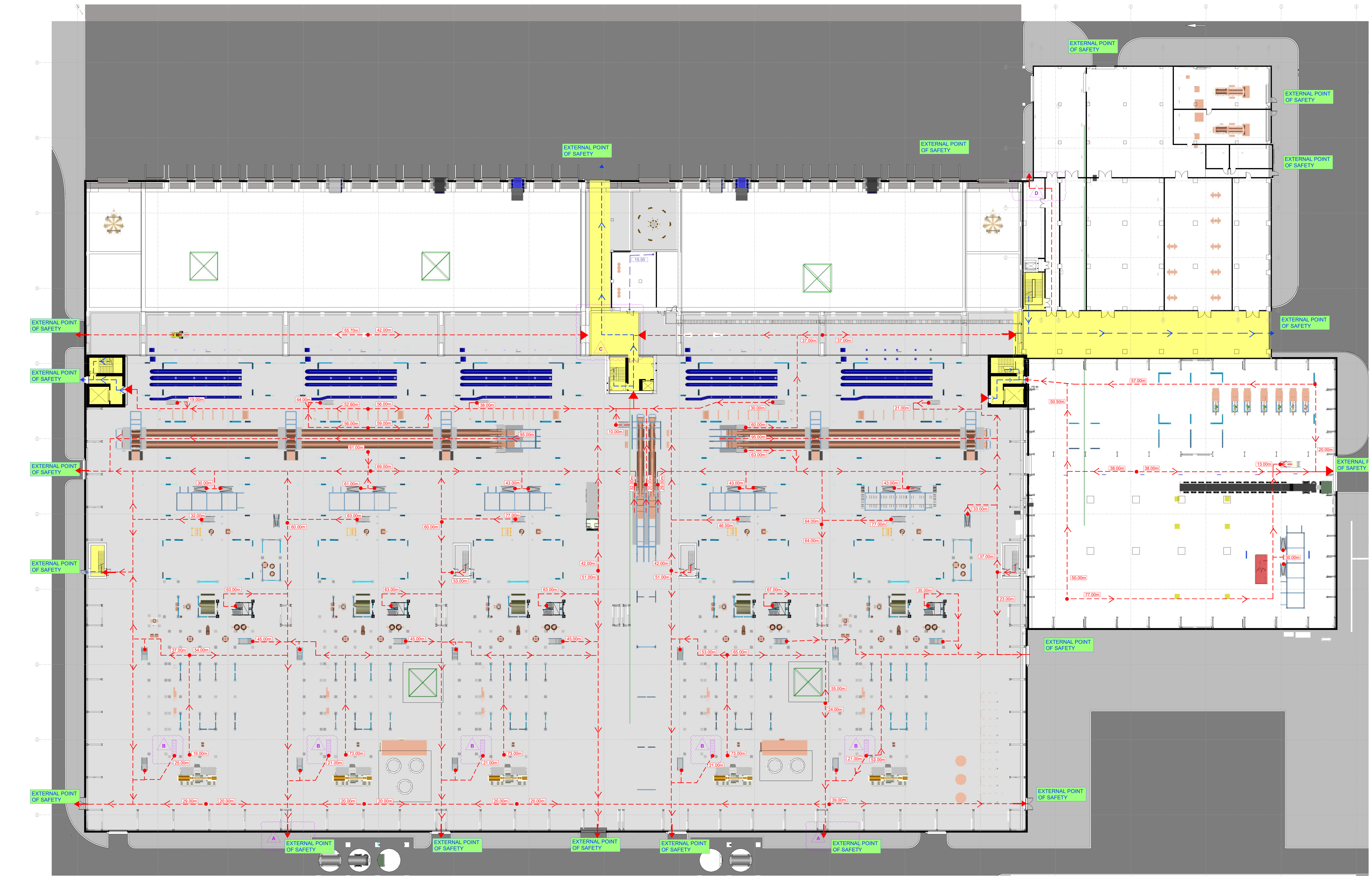

ZONE 22
In ground screw conveyor
rotary valve, down pipe
ATEX
ZONE 2
ZONE 0
ZONE 20
ZONE 22

APPENDIX 2 - Plant main Fire Compartments – principles and base scheme


MAIN FIRE AREAS
Fire barrier separating fire areas minimum 2 hr fire resistance rating
Fire barrier separating ATEX fire areas minimum 2 hr fire resistance rating
1 Waste bunker
2 Boiler area + fuel gas treatment area
3 Turbine hall
4 Control room
5 Diesel
6 Transformer
7 Fire pumps
E Electrical rooms
WH Warehouse
WS Workshop
FOS Fuel oil storage (ATEX zone)
AM Ammonia (ATEX zone)
CE Cems container (ATEX zone)
BRIDGE Bridge connecting main building and administration building
BRIDGE
WH
WS
FOS
AM
CE

APPENDIX 3 - Plant main Means of Egress – principles and base scheme


MEANS OF EGRESS
Egress route
Protected/safety egress route
EXTERNAL POINT OF SAFETY
Point of safety in accordance with NFPA 101 (2012 ed.)sec. 3.3.211
Process maintenance stairs
A
PROCESS MAINTENANCE EGRESS ROUTES LIMITATION FOR SPRINKLERED INDUSTRIAL SPECIAL PURPOSE OCCUPANCY:
- maximum travel distance to reach an exit: 122 mt
- maximum common path of travel: 30 mt
Internal stairs (from the ground level to the upper maintenance platforms lev. +31.00).
B
PROCESS MAINTENANCE EGRESS ROUTES LIMITATION FOR SPRINKLERED INDUSTRIAL SPECIAL PURPOSE OCCUPANCY:
- maximum travel distance to reach an exit: 122 mt
- maximum common path of travel: 30 mt
Emergency exit enclosed pressurized stairs (from the ground level to the upper platforms /command centre / staff facilities lev.):
C
point of safety as per NFPA 101 (2012 ed.) sec. 3.3.211
Enclosed and pressurized exits/paths to the external point of safety
compartimented and pressurized path to the external point of safety
EXTERNAL POINT OF SAFETY



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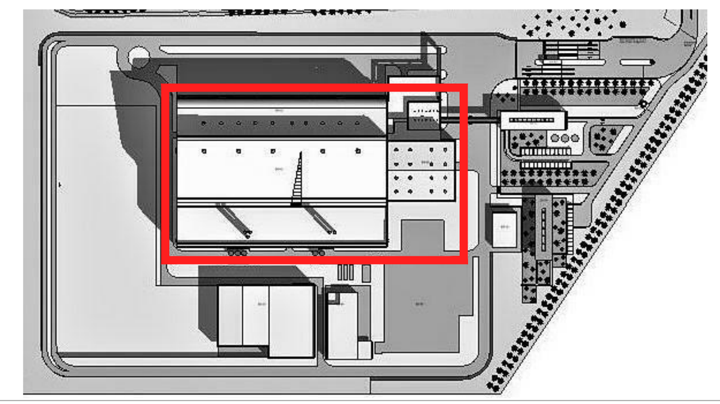
1 : 400

APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
DATE REVIEWED				
REVIEWED BY				

KEYPLAN :



LEGEND:

MEANS OF EGRESS

- 55.00m — LENGTH OF TRAVEL DISTANCE IN METERS (MAX 121 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- 55.00m — PARTIAL LENGTH OF TRAVEL DISTANCE IN METERS
- EMERGENCY ROUTE LINE (TRAVEL DISTANCE)
- TRAVEL DISTANCE
- 20.00m — LENGTH OF COMMON PATH IN METERS (MAX 30 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- EMERGENCY ROUTE LINE (COMMON PATH)
- COMMON PATH OF TRAVEL
- 5.00m — LENGHT OF DEAD END CORRIDOR (MAX 15 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- DEAD END CORRIDOR
- 0.00m — LENGTH OF POINT OF SAFETY ROUTE IN METERS
- EMERGENCY ROUTE LINE
- TOTAL POINT OF SAFETY ROUTE DISTANCE

SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

NOTES:

COMMENT NOTES: Z

A. TO INSERT A EXIT DOOR
B. HZI TO INSERT AN ADDITIONAL STIARCASE TO THE TOP OF THE SGT (COMMON PATH OF TRAVEL LIMIT 30 MT)
C. COMPATIMENTED AND PRESSURIZED SPACE . TO ADD WALL AND SLAB PLUS FR SHATTER AND DOORS
D. ADVISABLE TO PROVIDE AN INTERNAL CORRIDOR AND EXIT DOOR
E. HZI TO ADD A STIR FLIGHT TO THE BELOW LEVEL(DEAD END CORRIDOR LIMIT 15 METER)
F. HZI TO ADD A LADDER OR ADDITIONAL SPACE . (DEAD END CORRIDOR LIMIT 15 METER)
G. ACCESS SYSTEM UNCLEAR
H. HZI: MISSING THE CONNECTION TO THE STAIR 4 5 6 7. TO PROVIDE ACCORDING TO THE INPUT RECIEVED

Q. TO ADD A DOOR? - ACE TO CONFIRM. COMMON PATH OF TRAVEL VERIFIED IN ANY CASE
R. HZI TO PROVIDE 1 MORE WAY OUT (STAICASE). COMMON PATH OF TRAVEL NOT VERIFIED
S. HZI TO PROVIDE STAIRCASE TO THE OTHER SIDE OF THE ASH TAPES . TO RESPECT THE TRAVEL DISTANCE
T. ACCESS DOOR TO BE MOVED IN COMPLIANCE WITH THE WALKWAYS BRIDGE
U. HZI TO PROVIDE WALKWAYS FOR CONNECTION WITH STAIRCASE
V. HZI TO CLARIFY CONNECTION BETWEEN STAIRCASES AND WALKWAYS
Z. HZI TO UPDATE CONNECTION BETWEEN STAIRCASES AND WALKWAYS

REV	DATE	DESCRIPTION	DRN	CHK	APP
00	30/06/2018	CONCEPT DESIGN ISSUED FOR REVIEW	VRA	PMR	BME

PROJECT TITLE :

DUBAI SOLID WASTE ENERGY PROJECT

بلدية دبي
DUBAI MUNICIPALITY

ARCHITECT & MEP CONSULTANT :

CREW CREMONESI WORKSHOP

BOGAERT ARCHITECTURE

CONTRACTOR :

Hitachi Zosen INOVA

SixConstruct

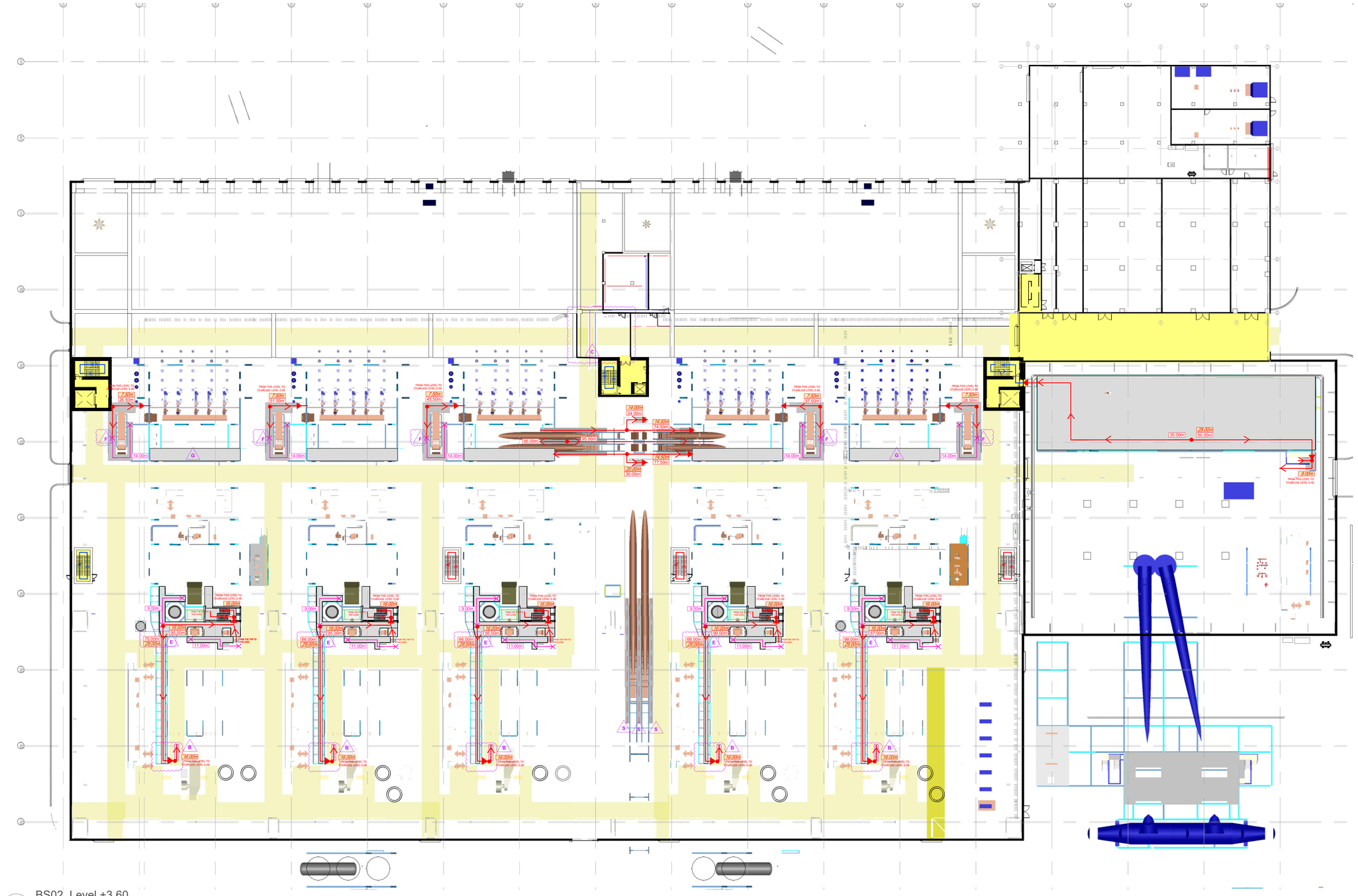
DRAWING TITLE :

Life and Safety design
Main hall and Turbine hall plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:400

PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
02801_1	00	BS-02/03/04/05/06



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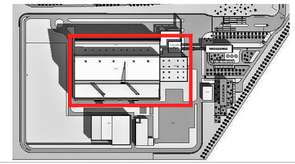
APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
DATE REVIEWED				
REVIEWED BY				

KEYPLAN :



LEGEND:

MEANS OF EGRESS

- 55.00m — LENGTH OF TRAVEL DISTANCE IN METERS (MAX 121 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- 55.00m — PARTIAL LENGTH OF TRAVEL DISTANCE IN METERS
- EMERGENCY ROUTE LINE (TRAVEL DISTANCE)
- TRAVEL DISTANCE
- 20.00m — LENGTH OF COMMON PATH IN METERS (MAX 30 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- EMERGENCY ROUTE LINE (COMMON PATH)
- COMMON PATH OF TRAVEL
- 5.00m — LENGHT OF DEAD END CORRIDOR (MAX 15 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- DEAD END CORRIDOR
- 0.00m — LENGTH OF POINT OF SAFETY ROUTE IN METERS
- EMERGENCY ROUTE LINE
- TOTAL POINT OF SAFETY ROUTE DISTANCE

SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

NOTES:

COMMENT NOTES: 2

A. TO INSERT A EXIT DOOR
B. HZI TO INSERT AN ADDITIONAL STIARCASE TO THE TOP OF THE SGT (COMMON PATH OF TRAVEL LIMIT 30 MT)
C. COMPATIMENTED AND PRESSURIZED SPACE . TO ADD WALL AND SLAB PLUS FR SHATTER AND DOORS
D. ADVISABLE TO PROVIDE AN INTERNAL CORRIDOR AND EXIT DOOR
E. HZI TO ADD A STIR FLIGHT TO THE BELOW LEVEL(DEAD END CORRIDOR LIMIT 15 METER)
F. HZI TO ADD A LADDER OR ADDITIONAL SPACE . (DEAD END CORRIDOR LIMIT 15 METER)
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REV	DATE	DESCRIPTION	DRN	CHK	APP
00	30/06/2018	CONCEPT DESIGN ISSUED FOR REVIEW	VRA	PMR	BME

PROJECT TITLE :

DUBAI SOLID WASTE ENERGY PROJECT

DUBAI MUNICIPALITY

ARCHITECT & MEP CONSULTANT :

CREW CREMONESI WORKSHOP

BOGAERT ARCHITECTURE
33,rue Hawrt Barbusse 75005 Paris FRANCE
tel 33 (0)1 43 26 05 78 / fax 33 (0)1 46 34 63 94
info@bogaert-architecture.com
www.bogaert-architecture.com

CONTRACTOR :

Hitachi Zosen INOVA

Six Construct

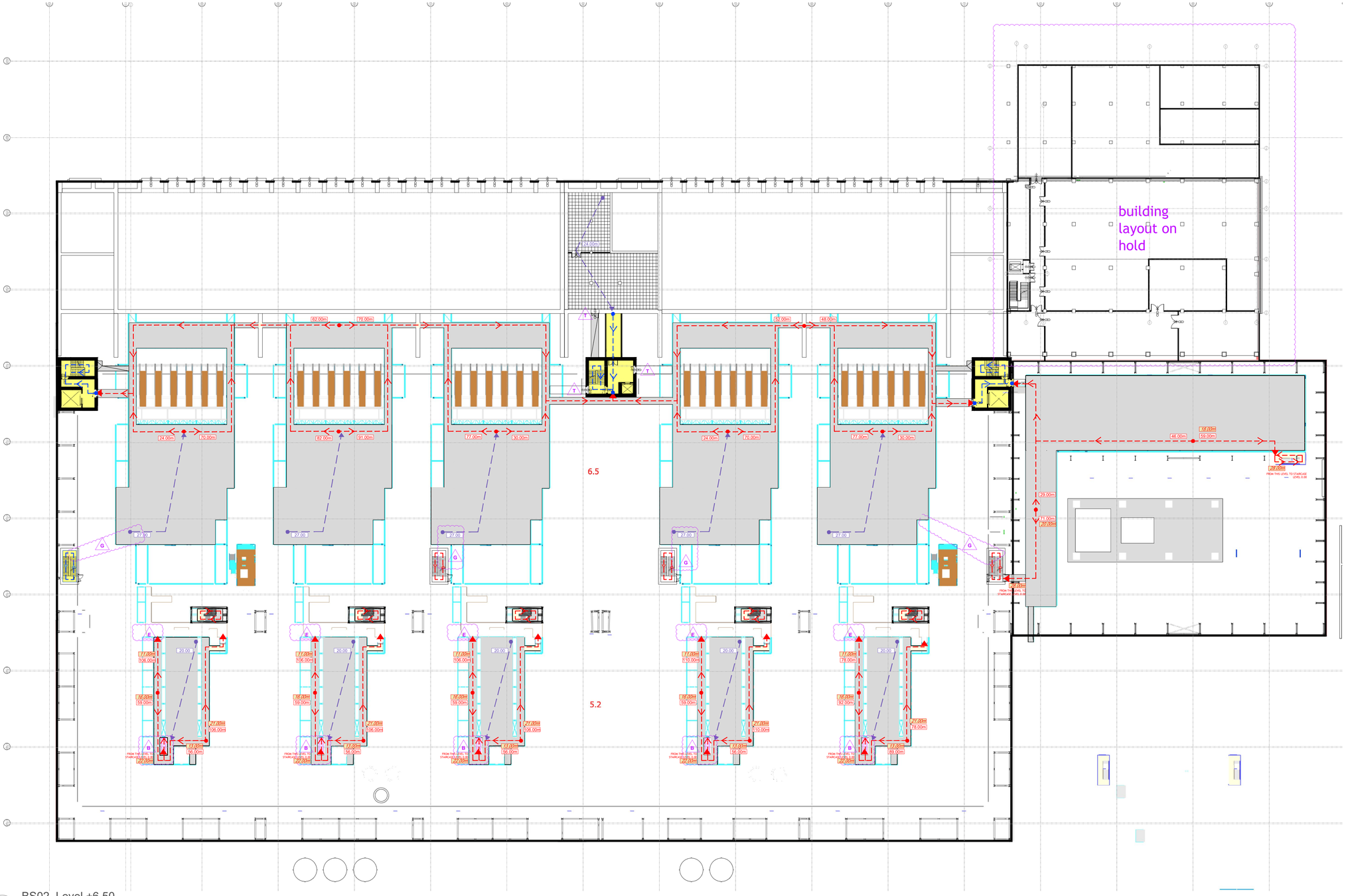
DRAWING TITLE :

Life and Safety design
Main hall and Turbine hall plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:400

PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
02801_2	00	BS-02/03/04/05/06



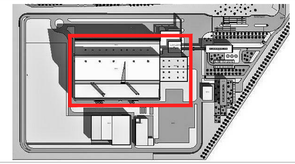
3 BS02_Level +6.50

1 : 400

APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
DATE REVIEWED				
REVIEWED BY				

KEYPLAN :



LEGEND:

MEANS OF EGRESS

- 55.00m — LENGTH OF TRAVEL DISTANCE IN METERS (MAX 121 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- 45.00m — PARTIAL LENGTH OF TRAVEL DISTANCE IN METERS
- EMERGENCY ROUTE LINE (TRAVEL DISTANCE)
- TRAVEL DISTANCE
- 20.00m — LENGTH OF COMMON PATH IN METERS (MAX 30 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- EMERGENCY ROUTE LINE (COMMON PATH)
- COMMON PATH OF TRAVEL
- 5.00m — LENGHT OF DEAD END CORRIDOR (MAX 15 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- DEAD END CORRIDOR
- 0.00m — LENGTH OF POINT OF SAFETY ROUTE IN METERS
- EMERGENCY ROUTE LINE
- TOTAL POINT OF SAFETY ROUTE DISTANCE

SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

NOTES:

COMMENT NOTES: 2

A. TO INSERT A EXIT DOOR
B. HZI TO INSERT AN ADDITIONAL STIARCASE TO THE TOP OF THE SGT (COMMON PATH OF TRAVEL LIMIT 30 MT)
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CONTRACTOR :

Hitachi Zosen INOVA

Six Construct

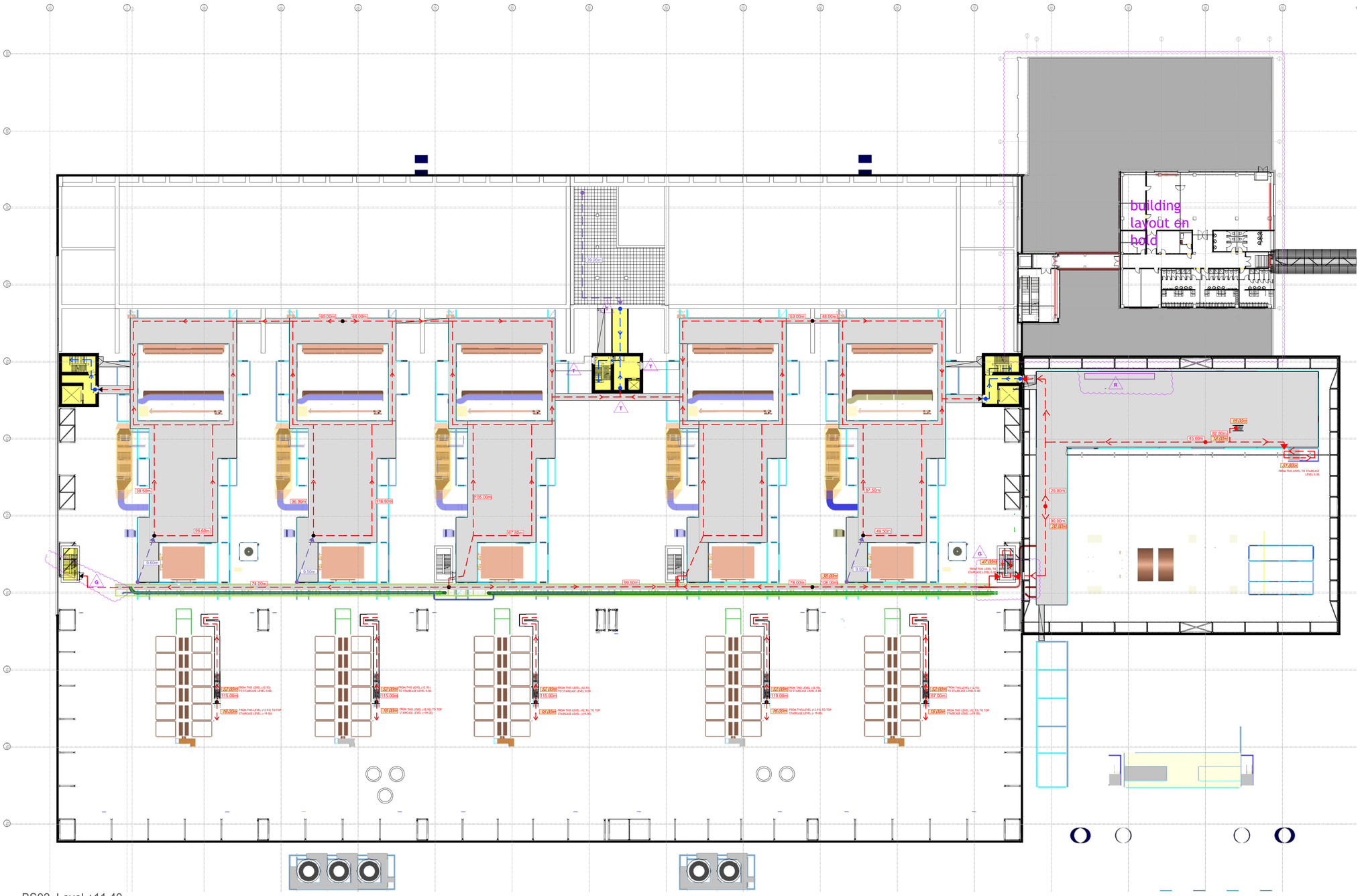
DRAWING TITLE :

Life and Safety design
Main hall and Turbine hall plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:400

PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
02801_3	00	BS-02/03/04/05/06



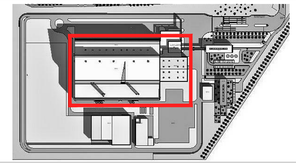
4 BS02_Level +11.40

1 : 400

APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
DATE REVIEWED				
REVIEWED BY				

KEYPLAN :



LEGEND:

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- 45.00m — PARTIAL LENGTH OF TRAVEL DISTANCE IN METERS
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SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

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www.bogaert-architecture.com

CONTRACTOR :

Hitachi Zosen INOVA

Six Construct

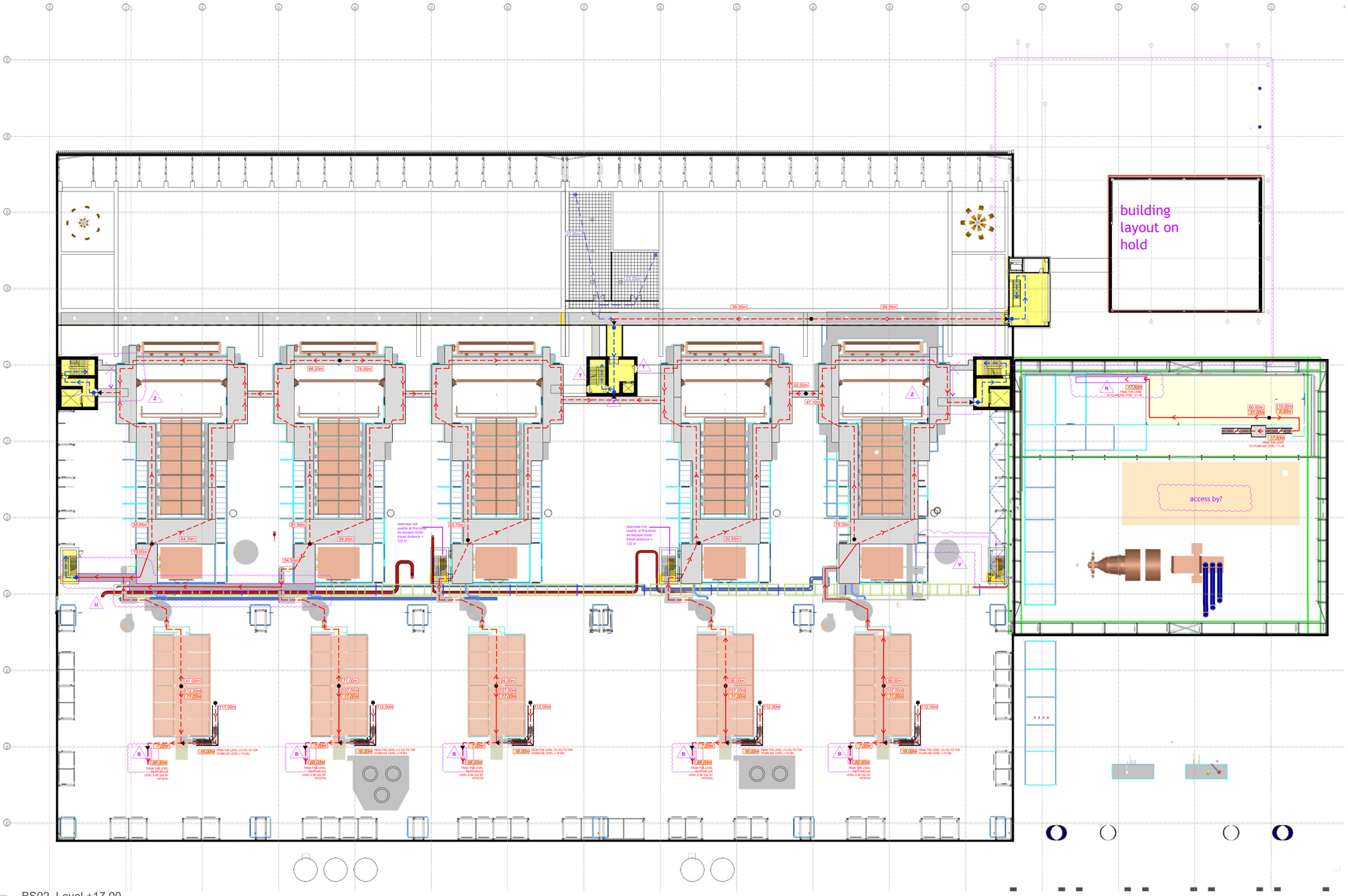
DRAWING TITLE :

Life and Safety design
Main hall and Turbine hall plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:400

PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
02801_4	00	BS-02/03/04/05/06



5 BS02_Level +17.00

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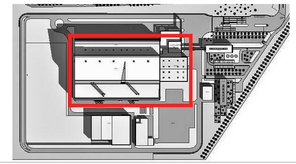
APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
DATE REVIEWED				
REVIEWED BY				

KEYPLAN :



LEGEND:

MEANS OF EGRESS

- 55.00m — LENGTH OF TRAVEL DISTANCE IN METERS (MAX 121 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- 47.00m — PARTIAL LENGTH OF TRAVEL DISTANCE IN METERS
- EMERGENCY ROUTE LINE (TRAVEL DISTANCE)
- TRAVEL DISTANCE
- 20.00m — LENGTH OF COMMON PATH IN METERS (MAX 30 m ACCORDING TO NFPA 101 TABLE 40.2.5)
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- 0.00m — LENGTH OF POINT OF SAFETY ROUTE IN METERS
- EMERGENCY ROUTE LINE
- TOTAL POINT OF SAFETY ROUTE DISTANCE

SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

NOTES:

COMMENT NOTES: A

A. TO INSERT A EXIT DOOR
B. HZI TO INSERT AN ADDITIONAL STIARCASE TO THE TOP OF THE SGT (COMMON PATH OF TRAVEL LIMIT 30 MT)
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REV	DATE	DESCRIPTION	DRN	CHK	APP
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PROJECT TITLE :

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DUBAI MUNICIPALITY

ARCHITECT & MEP CONSULTANT :

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tel 33 (0)1 43 26 05 78 / fax 33 (0)1 46 34 63 94
info@bogaert-architecture.com
www.bogaert-architecture.com

CONTRACTOR :

Hitachi Zosen INOVA — Six Construct

DRAWING TITLE :

Life and Safety design
Main hall and Turbine hall plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:400

PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
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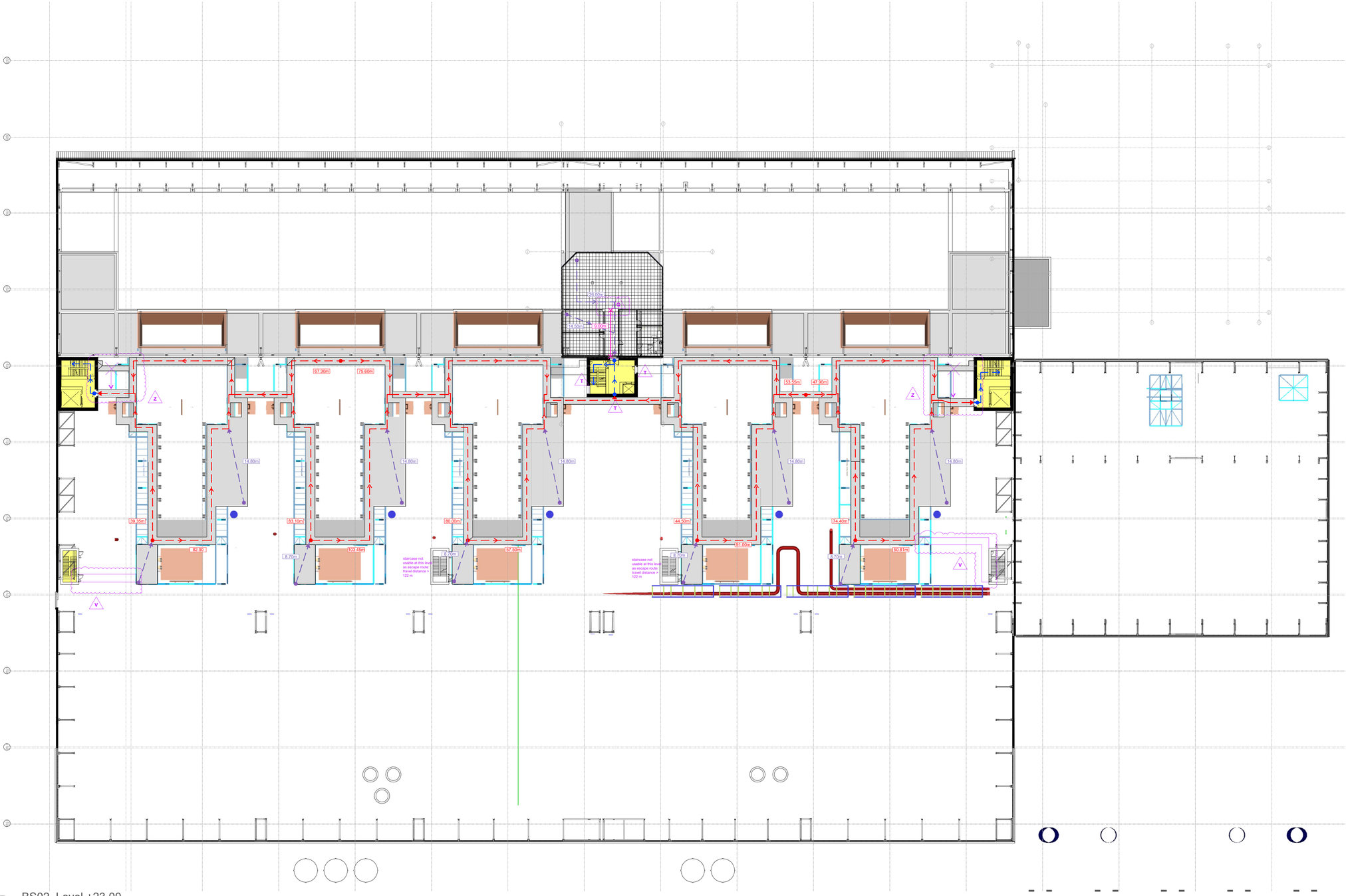

6 BS02_Level +23.00

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APPROVAL :

REVIEW STATUS	☐ A	☐ B	☐ C	☐ C
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DATE REVIEWED				
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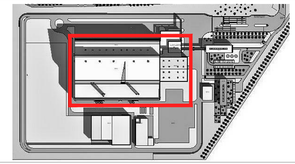
KEYPLAN :



LEGEND:

MEANS OF EGRESS

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- 0.00m — LENGTH OF POINT OF SAFETY ROUTE IN METERS
- EMERGENCY ROUTE LINE
- TOTAL POINT OF SAFETY ROUTE DISTANCE

SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

NOTES:

COMMENT NOTES: (Z)

A. TO INSERT A EXIT DOOR
B. HZI TO INSERT AN ADDITIONAL STIARCASE TO THE TOP OF THE SGT (COMMON PATH OF TRAVEL LIMIT 30 MT)
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Six Construct

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Life and Safety design
Main hall and Turbine hall plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
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PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
02801_6	00	BS-02

7 BS02_Level +31.00

1 : 400

APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
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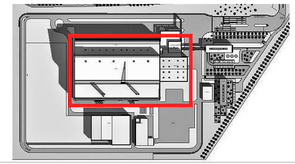
KEYPLAN :



LEGEND:

MEANS OF EGRESS

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02801_7	00	BS-02/03/04/05/06

8 BS02_Level +36.50

1 : 400

APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
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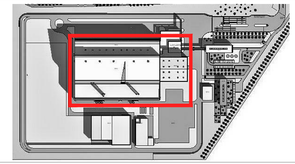
REVIEWED BY				

KEYPLAN :



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B. HZI TO INSERT AN ADDITIONAL STIARCASE TO THE TOP OF THE SGT (COMMON PATH OF TRAVEL LIMIT 30 MT)
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D. ADVISABLE TO PROVIDE AN INTERNAL CORRIDOR AND EXIT DOOR
E. HZI TO ADD A STIR FLIGHT TO THE BELOW LEVEL(DEAD END CORRIDOR LIMIT 15 METER)
F. HZI TO ADD A LADDER OR ADDITIONAL SPACE . (DEAD END CORRIDOR LIMIT 15 METER)
G. ACCESS SYSTEM UNCLEAR
H. HZI: MISSING THE CONNECTION TO THE STAIR 4 5 6 7. TO PROVIDE ACCORDING TO THE INPUT RECIEVED

Q. TO ADD A DOOR? - ACE TO CONFIRM. COMMON PATH OF TRAVEL VERIFIED IN ANY CASE
R. HZI TO PROVIDE 1 MORE WAY OUT (STAICASE). COMMON PATH OF TRAVEL NOT VERIFIED
S. HZI TO PROVIDE STAIRCASE TO THE OTHER SIDE OF THE ASH TAPES . TO RESPECT THE TRAVEL DISTANCE
T. ACCESS DOOR TO BE MOVED IN COMPLIANCE WITH THE WALKWAYS BRIDGE
U. HZI TO PROVIDE WALKWAYS FOR CONNECTION WITH STAIRCASE
V. HZI TO CLARIFY CONNECTION BETWEEN STAIRCASES AND WALKWAYS
Z. HZI TO UPDATE CONNECTION BETWEEN STAIRCASES AND WALKWAYS

REV	DATE	DESCRIPTION	DRN	CHK	APP
00	30/06/2018	CONCEPT DESIGN ISSUED FOR REVIEW	VRA	PMR	BME

PROJECT TITLE :

DUBAI SOLID WASTE ENERGY PROJECT

DUBAI MUNICIPALITY

ARCHITECT & MEP CONSULTANT :

CREW CREMONESI WORKSHOP

BOGAERT ARCHITECTURE
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info@bogaert-architecture.com
www.bogaert-architecture.com

CONTRACTOR :

Hitachi Zosen INOVA

SixConstruct

DRAWING TITLE :

Life and Safety design
Main hall and Turbine hall plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:400

PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
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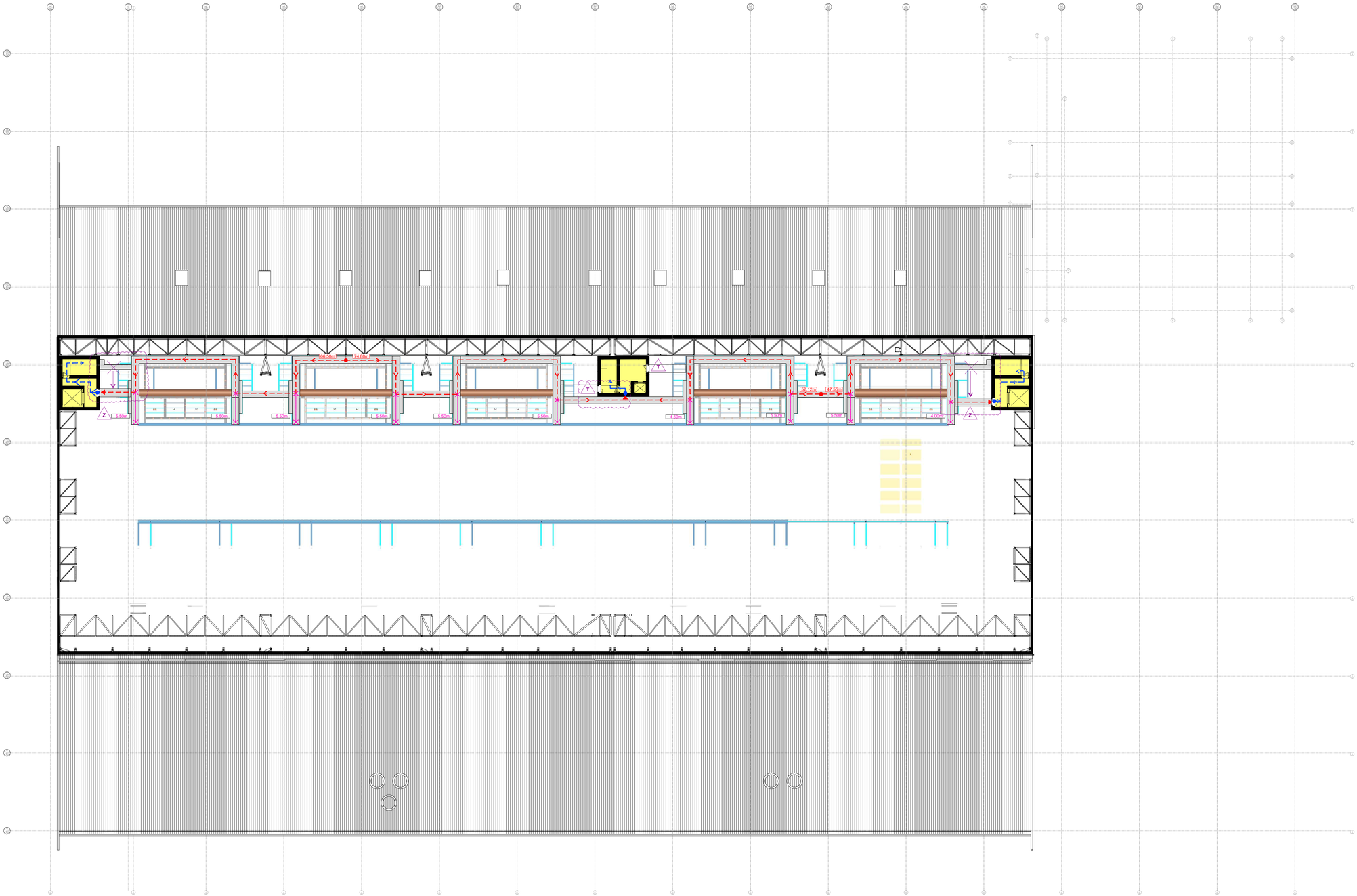


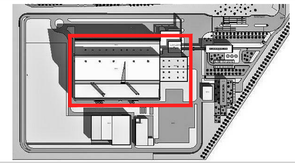
9 BS02_Level +45.50

1 : 400

APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
DATE REVIEWED				
REVIEWED BY				

KEYPLAN :



LEGEND:

MEANS OF EGRESS

- 55.00m — LENGTH OF TRAVEL DISTANCE IN METERS (MAX 121 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- 45.48m — PARTIAL LENGTH OF TRAVEL DISTANCE IN METERS
- EMERGENCY ROUTE LINE (TRAVEL DISTANCE)
- TRAVEL DISTANCE
- 20.00m — LENGTH OF COMMON PATH IN METERS (MAX 30 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- EMERGENCY ROUTE LINE (COMMON PATH)
- COMMON PATH OF TRAVEL
- 5.00m — LENGHT OF DEAD END CORRIDOR (MAX 15 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- DEAD END CORRIDOR
- 9.00m — LENGTH OF POINT OF SAFETY ROUTE IN METERS
- EMERGENCY ROUTE LINE
- TOTAL POINT OF SAFETY ROUTE DISTANCE

SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

NOTES:

COMMENT NOTES: 2

A. TO INSERT A EXIT DOOR
B. HZI TO INSERT AN ADDITIONAL STIARCASE TO THE TOP OF THE SGT (COMMON PATH OF TRAVEL LIMIT 30 MT)
C. COMPATIMENTED AND PRESSURIZED SPACE . TO ADD WALL AND SLAB PLUS FR SHATTER AND DOORS
D. ADVISABLE TO PROVIDE AN INTERNAL CORRIDOR AND EXIT DOOR
E. HZI TO ADD A STIR FLIGHT TO THE BELOW LEVEL(DEAD END CORRIDOR LIMIT 15 METER)
F. HZI TO ADD A LADDER OR ADDITIONAL SPACE . (DEAD END CORRIDOR LIMIT 15 METER)
G. ACCESS SYSTEM UNCLEAR
H. HZI: MISSING THE CONNECTION TO THE STAIR 4 5 6 7. TO PROVIDE ACCORDING TO THE INPUT RECIEVED

Q. TO ADD A DOOR? - ACE TO CONFIRM. COMMON PATH OF TRAVEL VERIFIED IN ANY CASE
R. HZI TO PROVIDE 1 MORE WAY OUT (STAICASE). COMMON PATH OF TRAVEL NOT VERIFIED
S. HZI TO PROVIDE STAIRCASE TO THE OTHER SIDE OF THE ASH TAPES . TO RESPECT THE TRAVEL DISTANCE
T. ACCESS DOOR TO BE MOVED IN COMPLIANCE WITH THE WALKWAYS BRIDGE
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Z. HZI TO UPDATE CONNECTION BETWEEN STAIRCASES AND WALKWAYS

REV	DATE	DESCRIPTION	DRN	CHK	APP
00	30/06/2018	CONCEPT DESIGN ISSUED FOR REVIEW	VRA	PMR	BME

PROJECT TITLE :

DUBAI SOLID WASTE ENERGY PROJECT

DUBAI MUNICIPALITY

ARCHITECT & MEP CONSULTANT :

CREW CREMONESI WORKSHOP

BOGAERT ARCHITECTURE
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tel 33 (0)1 43 26 05 78 / fax 33 (0)1 46 34 63 94
info@bogaert-architecture.com
www.bogaert-architecture.com

CONTRACTOR :

Hitachi Zosen INOVA

SixConstruct

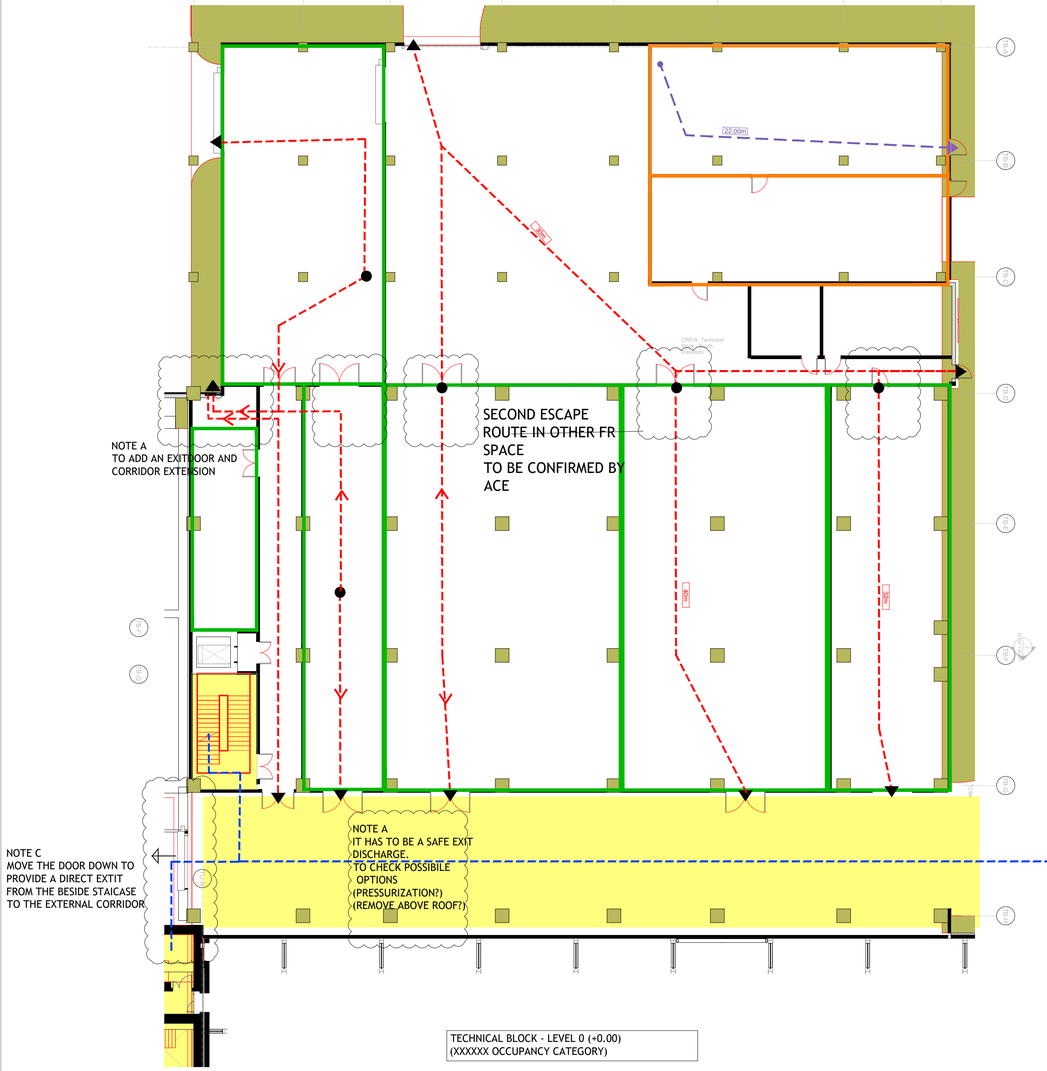
DRAWING TITLE :

Life and Safety design
Main hall and Turbine hall plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:400

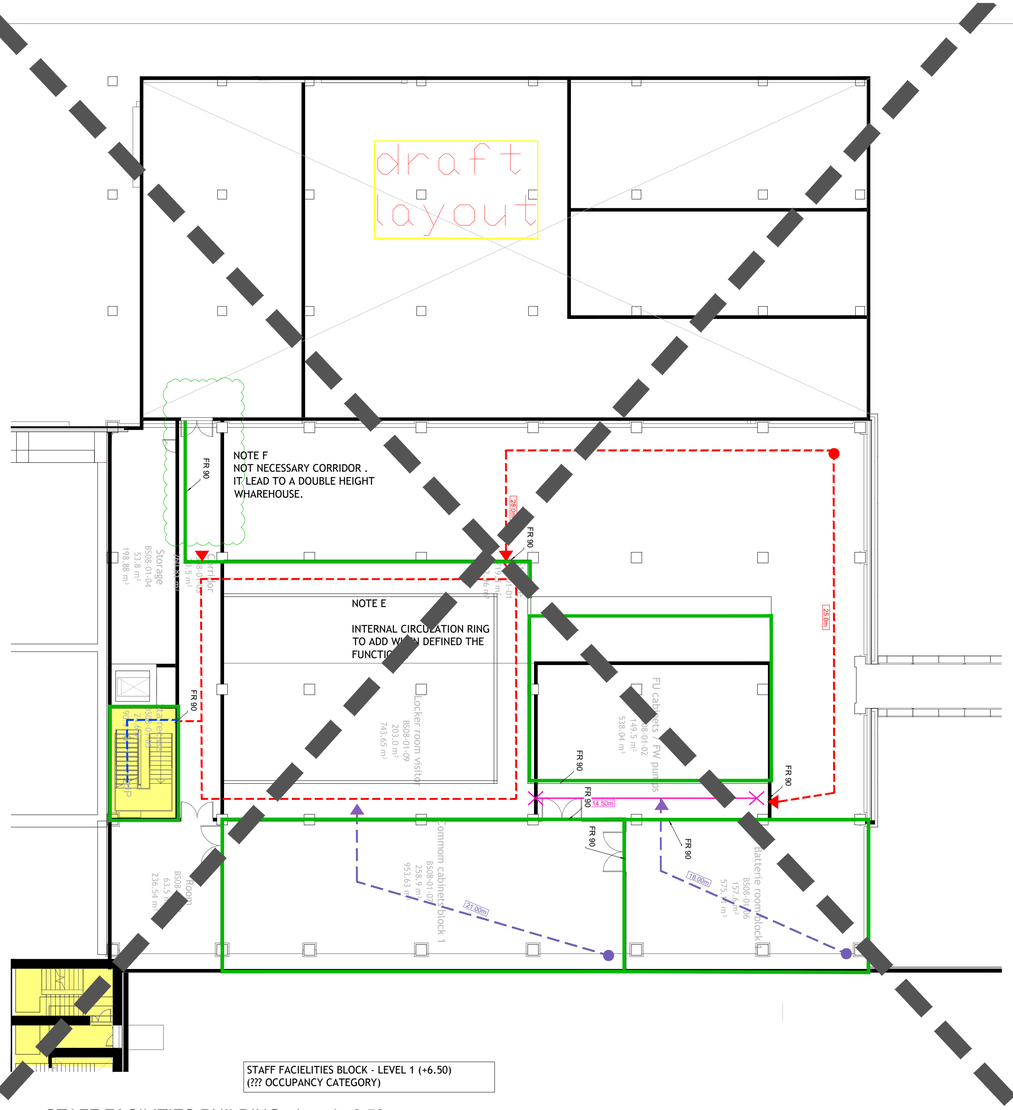
PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
02801_9	00	BS-02/03/04/05/06



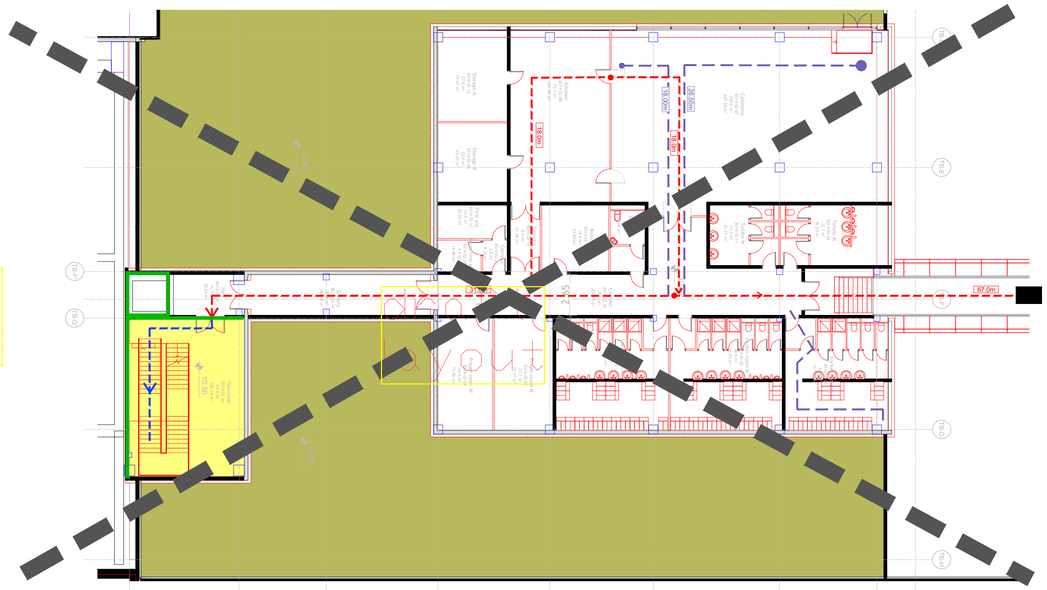
1 TECHNICAL BUILDING - Level +0.00

1 : 200



2 STAFF FACILITIES BUILDING - Level +6.50

1 : 200



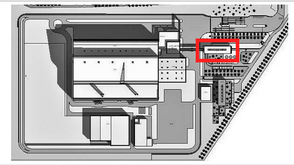
.3 STAFF FACILITIES BUILDING - Level +10.50

1 : 200

APPROVAL :

REVIEW STATUS	A	B	C	C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
DATE REVIEWED				
REVIEWED BY				

KEYPLAN :



LEGEND:

MEANS OF EGRESS

- 50.00m — LENGTH OF TRAVEL DISTANCE IN METERS (MAX 121 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- 45.00m — PARTIAL LENGTH OF TRAVEL DISTANCE IN METERS
- EMERGENCY ROUTE LINE (TRAVEL DISTANCE)
- TRAVEL DISTANCE
- 20.00m — LENGTH OF COMMON PATH IN METERS (MAX 30 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- EMERGENCY ROUTE LINE (COMMON PATH)
- COMMON PATH OF TRAVEL
- 5.00m — LENGHT OF DEAD END CORRIDOR (MAX 15 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- DEAD END CORRIDOR
- 0.00m — LENGTH OF POINT OF SAFETY ROUTE IN METERS
- EMERGENCY ROUTE LINE
- TOTAL POINT OF SAFETY ROUTE DISTANCE

SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE
- FIRE FIGHTING LIFT
- FIRE FIGHTING LOBBY
- AREA OF REFUGE
- AREA COVERED BY SPRINKLER
- ELECTRICAL AREA COVERED BY FM200 SYSTEM

FIRE COMPARTMENT

- FIRE COMPARTMENT FR 60
- FIRE COMPARTMENT FR 120
- FIRE COMPARTMENT FR 180
- FR 000 — DOORS FR NFPA 101. TABLE 8.3.4.2

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

NOTES:

REV	DATE	DESCRIPTION	DRN	CHK	APP
00a	5/07/2018	CONCEPT DESIGN ISSUED FOR REVIEW	VRA	PMR	BME

PROJECT TITLE :

DUBAI SOLID WASTE ENERGY PROJECT

DUBAI MUNICIPALITY

ARCHITECT & MEP CONSULTANT :

CREW CREMONESI WORKSHOP draft

BOGAERT ARCHITECTURE
33,rue Hawrt Barbusse 75005 Paris FRANCE
tel 33 (0)1 43 26 05 78 / fax 33 (0)1 46 34 63 94
info@bogaert-architecture.com
www.bogaert-architecture.com

CONTRACTOR :

Hitachi Zosen INOVA — Six Construct

DRAWING TITLE :

Life and Safety design
Staff facilities building plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:200

PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
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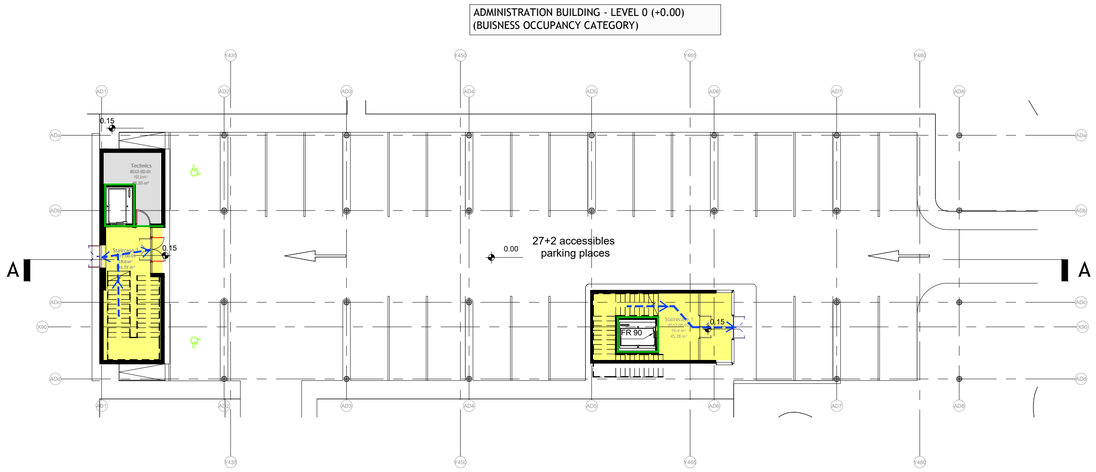
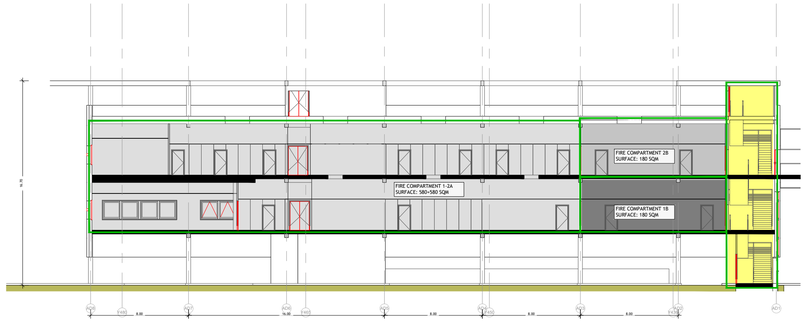


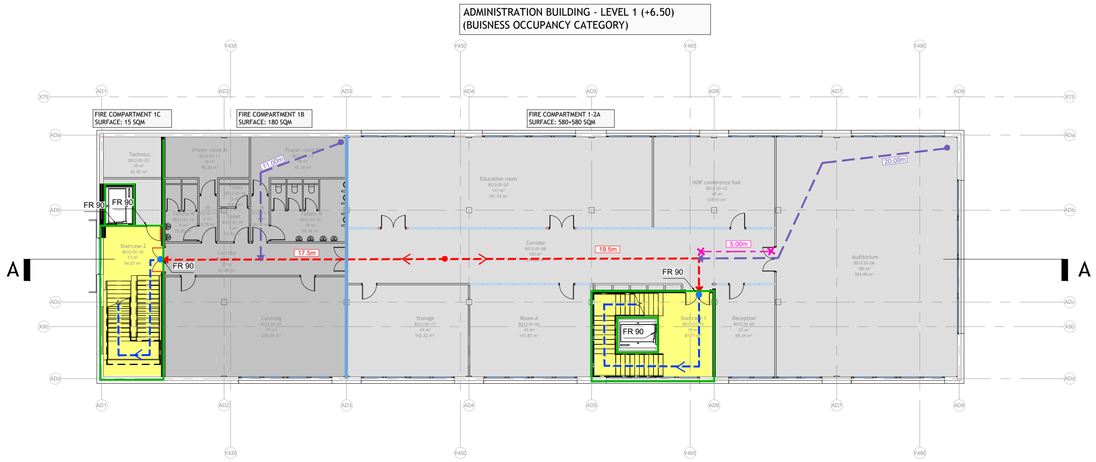
1 ADMINISTRATION BUILDING - Level +0.00

1 : 200



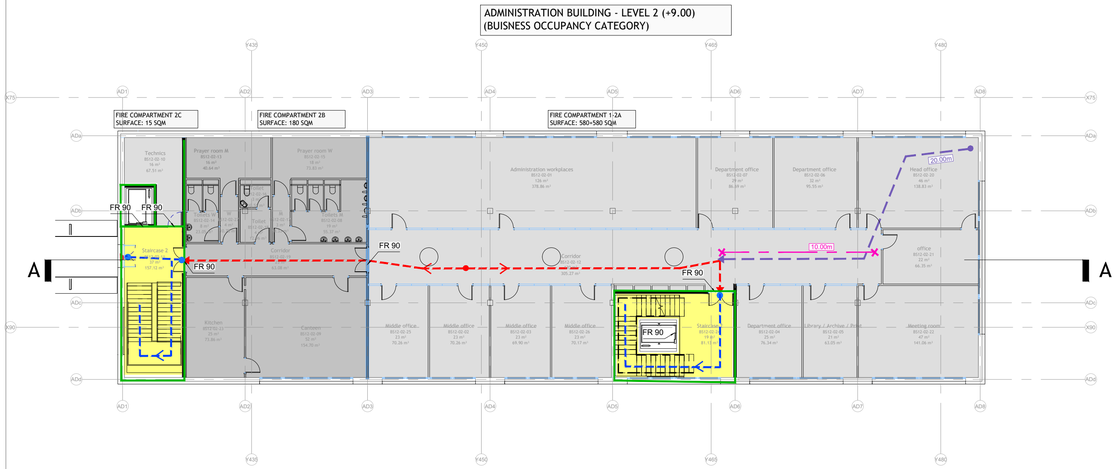
4 ADMINISTRATION BUILDING - Longitudinal section A-A

1 : 200



2 ADMINISTRATION BUILDING - Level +4.50

1 : 200



1 ADMINISTRATION BUILDING - Level +9.00

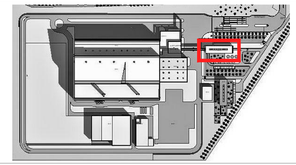
1 : 200

draft
layout

APPROVAL :

REVIEW STATUS	☐ A	☐ B	☐ C	☐ C
	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	REJECTED
DATE REVIEWED				
REVIEWED BY				

KEYPLAN :



LEGEND:

MEANS OF EGRESS

- 55.00m — LENGTH OF TRAVEL DISTANCE IN METERS (MAX 121 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- 20.00m — PARTIAL LENGTH OF TRAVEL DISTANCE IN METERS
- EMERGENCY ROUTE LINE (TRAVEL DISTANCE)
- TRAVEL DISTANCE
- 20.00m — LENGTH OF COMMON PATH IN METERS (MAX 30 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- EMERGENCY ROUTE LINE (COMMON PATH)
- COMMON PATH OF TRAVEL
- 5.00m — LENGHT OF DEAD END CORRIDOR (MAX 15 m ACCORDING TO NFPA 101 TABLE 40.2.5)
- DEAD END CORRIDOR
- 8.00m — LENGTH OF POINT OF SAFETY ROUTE IN METERS
- EMERGENCY ROUTE LINE
- TOTAL POINT OF SAFETY ROUTE DISTANCE

SPACES TYPE

- EMERGENCY STAIR - PRESSURIZED
- EXIT DISCHARGE

FIRE COMPARTMENT

- FIRE COMPARTMENT FR 60
- FIRE COMPARTMENT FR 120
- FIRE COMPARTMENT FR 180
- FR 000 — DOORS FR NFPA 101. TABLE 8.3.4.2

RELATED DOCUMENTS

REFERENCE NUMBER	TITLE

NOTES:

REV	DATE	DESCRIPTION	DRN	CHK	APP
00	30/06/2018	CONCEPT DESIGN ISSUED FOR REVIEW	VRA	PMR	BME

PROJECT TITLE :

DUBAI SOLID WASTE ENERGY PROJECT

DUBAI MUNICIPALITY

ARCHITECT & MEP CONSULTANT :

CREW CREMONESI WORKSHOP

BOGAERT ARCHITECTURE
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tel 33 (0)1 43 26 05 78 / fax 33 (0)1 46 34 63 94
info@bogaert-architecture.com
www.bogaert-architecture.com

CONTRACTOR :

Hitachi Zosen INOVA — Six Construct

DRAWING TITLE :

Life and Safety design
Administration building plans
Means of egress

DATE :	DRAWN :	CHECKED :	FORMAT :	SCALE :
30/06/2018	AMS	PMR	A1	1:200

PRO :	ORG :	ACTIVITY :	DOC :
DWE	CRW	ARCH	DWG

DWG. NO :	REV :	ZONE :
02803	00	BS-12