



Exploration & Production

GENERAL SPECIFICATION

CIVIL WORKS

GS EP CIV 204

Design of airports and helicopters areas

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1. Scope

The specification covers airports and helicopter areas to be used by the COMPANY.

All the works concerned by this specification are subject to the general contract conditions.

The specification stipulates what the COMPANY considers as an acceptable minimum.

However, the COMPANY may consider that certain aspects of the studies may be of a particular nature.

In this case the COMPANY reserves the right to make supplementary requirements.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

When local national standards, regulations and codes exist, all design, engineering, materials and construction shall conform to their latest requirements, which complete or modify the present specifications.

In case of lack of obligatory local national standards, international norms and standards will be applied.

In case of lack of international norms and standards, national norms and standards listed hereafter will be applied.

In all cases the system adopted shall be coherent, i.e. the various texts shall present no incompatibility. Any dispute shall be resolved by basing works on the most stringent text for the CONTRACTOR and at his expense.

The list of specifications and norms quoted is not exhaustive: the CONTRACTOR shall respect the secondary standards and regulations, which cover the works described in the present specification.

Certain specifications and norms may be indicated with an issue date. This is for information only and on the understanding that the most recent issue shall be used.

Standards

American standards and codes

Reference	Title
ASTM D1195 - 93 (1997)	Test Method for Repetitive Static Plate Load Tests of Soils and Flexible Pavement Components, for Use in Evaluation and Design of Airport and Highway Pavements
ASTM D1196 - 93 (1997)	Test Method for Nonrepetitive Static Plate Load Tests of Soils and Flexible Pavement Components, for Use in Evaluation and Design of Airport and Highway Pavements
ASTM D2940 - 98	Specification for Graded Aggregate Material for Bases or Subbases for Highways and Airports
ASTM D5340 - 98	Test Method for Airport Pavement Condition Index Surveys

Reference	Title
ASTM F758 - 95	Specification for Smooth-Wall Poly (Vinyl Chloride)(PVC) Plastic Underdrain Systems for Highway, Airport and Similar Drainage
ACI 325.5R - 90	Design of Continuously Reinforced Pavement for Airports

English standards and codes

Reference	Title
BS6100- 2.4.3: 1992	Glossary of building and civil engineering terms. Civil engineering. Highway, railway and airport engineering. Airport engineering
BS6213: 1982	Guide to selection of constructional sealants
BS7941-1: 1999	Methods for measuring the skid resistance of pavements surfaces. Side-way force coefficient routine investigation machine
BS7941-2: 2000	Methods for measuring the skid resistance of pavements surfaces. Test method for measurement of surface skid resistance using the Grip Tester braked wheel fixed slip device
BS3224-1: 1988	Lighting fittings for civil land aerodromes. Specification for lighting units for use in precision approach path indicator systems
BS3224-4: 1988	Lighting fittings for civil land aerodromes. Specification for elevated lighting units
BS3224-5: 1988	Lighting fittings for civil land aerodromes. Specification for inset lighting units
BS3224-6: 1988	Lighting fittings for civil land aerodromes. Specification for obstacle lighting units

Professional Documents

International Conventions and Agreements

Reference	Title
ICAO	Convention on International Civil Aviation and related acts Annex 10: Aeronautical Telecommunications Annex 14: Aerodromes Annex 16: Environmental Protection

International technical publications

Reference	Title
ICAO	Aerodrome Design Manual (Doc 9157) Airport Planning Manual (Doc 9184)

Reference	Title
ICAO	Airport Services Manual (Doc 9137) Heliport Manual (Doc 9261) Manual of the Aeronautical Telecommunication Network (Doc 9578)

French documents

Reference	Title
ITAC	Chapitre 2: Classification des aérodromes, 1998 (Chapter 2: Classification of aerodromes) Chapitre 3: Aire de manœuvre, 1998 (Chapter 3: Manoeuvring area) Chapitre 4: Aire de trafic, 1998 (Chapter 4: Traffic area) Chapitre 5: Conception des chaussées aéronautiques, 1999 (Chapter 5: Design of aeronautical pavements) Chapitre 6: Construction des chaussées aéronautiques, 1999 (Chapter 6: Construction of aeronautical pavements) Chapitre 7: Suivi et auscultation des chaussées aéronautiques, 1999 (Chapter 7: Survey of aeronautical pavements) Chapitre 8: Gestion des chaussées aéronautiques - Méthode ACN-PCN, 1999 (Chapter 8: Management of aeronautical pavements) Chapitre 12: Dégagements aéronautiques, 2001 (Chapter 12: Aeronautical clearances) Chapitre 13: Aérodromes à caractéristiques spéciales, 2000 (Chapter 13: Aerodromes with special characteristics)
STBA STBA - LCPC	Guide du bruit aéronautique - 1987 (Aeronautic noise guide) Chaussées aéronautiques en béton hydraulique. Guide technique, 2000 (Airports pavements in concrete - Technical guide)

American documents

Reference	Title
Asphalt Institute MS11 NFPA 415-1977	Thickness design - Asphalt pavements for Air Carrier Airports Standard on Airport terminal Building, Fuelling Ramp Drainage and Loading Walkways

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP ENV 500	Noise abatement in production units
GS EP CIV 101	General earthworks
GS EP CIV 103	Fences
GS EP CIV 201	Design and construction of roads and stabilised areas
GS EP CIV 202	Drainage and underground networks

3. General

3.1 Applicable areas

This specification is meant for the air access to the industrial facilities owned by the COMPANY or organisations operating under contract with the COMPANY.

On an exceptional basis this airport may be used by third parties that have no direct relationship with the COMPANY.

Air transport activities, which have the airport as origin or destination point, should conform to the related country regulations.

In case this country joined the Chicago Convention of December 7, 1944, the airport equipment should satisfy the Convention stipulations, its subsequent acts and its annexes particularly annexes no. 10, 14 and 16 (including most recent modifications). Modifications possibly made in the country shall be taken into account.

Aeronautical navigation aids and telecommunication equipment shall comply with the requirements from the International Telecommunication Union and the International Radiocommunication Committee. They shall also comply with the COMPANY telecommunication specifications.

4. Needs to be satisfied

The COMPANY shall inform the Engineering CONTRACTOR about the way in which the study shall be performed.

4.1 Local airports

First the CONTRACTOR shall establish a list of international or national airports situated in the area of the world where the industrial facility to be connected is located. The CONTRACTOR shall complete this list with civil and military airports that exist or are planned in the area. This list indicates the geographical location of the aerodromes, their general characteristics (length and resistance of landing strips, conditions of use) and information about the air traffic that they are technically capable of dealing with.

This information will allow the COMPANY to make a choice of airports for long and medium distance flights between the existing airports and projected airport.

The list shall also give information about diversions to other airports. It shall also include indications related to the possible airflow traffic problems involved between transit airports and the projected airport.

4.2 Forecast airport traffic

The CONTRACTOR makes up a liaison programme, which, depending on the COMPANY requirements, shall ensure connections between the airport and the transit airports as mentioned in Section 4.1. This programme indicates the amount of air traffic: daily (or weekly, monthly) number of passengers, nature and amount of weekly or monthly freight tonnage. It indicates the conditions in which this traffic is likely to vary depending on projected airport operation. Taking into consideration the time schedule to be used for long distance or semi-long distance flights using the transit airports, this programme will give information on the desired time schedule for connections with the projected airport. In particular, it will indicate if the airport needs to be equipped for night operation. It will also give information on the impact on traffic if the airport can not be used due to poor visibility.

4.3 Characteristics and reference codes of airport

The CONTRACTOR shall make up a list of types of aircraft economically suitable to carry out the liaison programme.

The determination of the type of aircraft allows defining for the airport a reference code as defined by ITAC (Instruction Technique sur les Aérodomes Civils), Section 2.

The airports covered by this specification correspond to letter codes ranging from A to D.

Having determined the reference code for the airport, the basic dimensions of runways shall be defined.

5. Selection of aeronautical site

5.1 General characteristics of installation site

5.1.1 General topography

The COMPANY will provide to the CONTRACTOR the basic topographic documents. These documents will generally consist of a map (1/20,000, 1/25,000 or 1/50,000) and meteorological surveys.

The CONTRACTOR will pick out on this map strips of land, relatively horizontal and oriented as far as possible in the direction of dominant winds, likely to be used for the runways.

The CONTRACTOR shall select in the meteorological survey information about distribution of wind direction and intensity in order to define the global coefficient of use of the airport.

This coefficient depends on the intensity of transverse winds.

The coefficient shall be set to a minimum value of 95%.

In case no direction fits with this criterion for lighter planes, a second direction shall be selected in order to take the global coefficient up to 95%. A secondary runway shall be installed in that direction.

Around these runways, the CONTRACTOR shall arrange the areas required for secondary installations (traffic area, installation areas, helicopter station, etc.) and areas to be used for necessary clearances, aircraft movements.

The whole arrangement shall aim at minimizing the approach manoeuvres.

The meteorological survey will allow the CONTRACTOR to define the visual and radio-electrical aids needed for aircraft approach and landing.

This zone will be represented on a map 1/5000 with 0.50 m or 1.00 m spaced contours. The COMPANY supplies the topographic base plan.

5.1.2 Obstacles

The CONTRACTOR will look for any information related to natural or artificial obstacles (current, future or likely to exist), which might impact the airport activity or have an influence on equipment.

5.2 Selection of site

From the information the CONTRACTOR has collected he will propose site installation area to the COMPANY.

Clearance and horizontal aspect of the area selected shall be considered so as to ensure correct topographical conditions for the operation of the aeronautical radio navigational system.

5.3 Arrangement

5.3.1 Project description

The drawing showing project arrangement will be 1/10,000 or 1/5,000, it will include:

- Landing strips
- Taxiways

- Aircraft parking area
- Installation zone location
- Approach run location
- ILS, VOR, DME, etc., location (Instrument Landing System, VHF Omnidirectional Range, Distance Measuring Equipment)
- Ground clearance areas
- Airport access roads
- Alterations incurred by airport to roads, pathways, watercourse, etc.

This drawing will have an explanatory footnote.

5.3.2 Determination of runway length

The total length of the runway will be calculated by taking into account the aircraft types increased to take into account safety coefficients related to emergency situations and local conditions.

If such a runway on one of the acceptable sites should prove to be too expensive, the CONTRACTOR shall adjust his design by means of correction coefficients, taking into account the specific conditions (airport altitude, slope of runway, airport temperature) in order to define a shorter length. He shall, in such a case, supply the COMPANY with the required propositions.

5.3.3 Aeronautical clearances

The aeronautical clearances for the airport shall be defined in compliance with Chapter 12 of ITAC depending on the airport reference code.

The CONTRACTOR shall present the clearances on a 1/10,000 map or on a small-scale map for zones far away from the airport.

A special survey shall be made in order to decide whether obstacles should be marked during the day or at night. This survey shall apply to any obstacle, large, small or tiny, which overlap the clearance area or which are situated at less than 10 m from it.

Roads and lanes used for moving obstacles under the clearance area should have a free height of 2 m more than that required for fixed obstacles in the area.

5.3.4 Marking

For approach and landing, the CONTRACTOR will propose installation of visual aids (markers, approach lines, approach tilt indicators, etc.) and radio electrical aids (radio beacons, etc.). These installations will be arranged according to relevant codes.

5.3.5 Environmental impact survey

The CONTRACTOR will perform a survey of the impact of the new airport on the environment, analysing disturbances, which could be caused by the project.

The main topics to examine are the following:

- Air pollution
- Water pollution and effects of civil works on water flow conditions and hydrology

- Effects on animals and botanical life. Fowl pest risks for aircraft should be examined at the same time
- Noise from aircraft (specification **GS EP ENV 500**)
- Effects on surrounding area

These effects may be direct and involve topographical, natural structure (watercourse, etc.) or equipment (road and pathway) modifications.

They may also be indirect and induced by creation of the airport and connected works (quarry site location): effects from land point of view or ground occupation and social impact, etc.

These points shall be analysed by specific studies.

6. General layout

The general layout will be shown on a map scale 1/5,000 to 1/2,000. The whole works involved in the airport along with arrangements and main equipment necessary shall be shown. This map will have explanatory foot note.

6.1 Runway

As a rule, the airport will have only one runway in use for landing and take-off, except in case another strip is required for light aircraft.

Sections 4.3 and 5.3.2 define the way to design runway length(s).

The width of the runway ranges from 18 m for airports dedicated to light planes and equipped with visual aids only, up to 45 m airports receiving large planes and equipped with radio-electrical aids.

Where the runway is to be used by jets, the shoulders on both sides shall be specially treated in order to avoid the free aggregate absorption by the jet engines. Moreover this area shall be able to support ground traffic.

The runway shall be included in a cleared strip, i.e. a rectangular area, having the same longitudinal axis as the runway, without obstacles, levelled and protected against erosion.

- Its length will be equal to that of the runway increased by 60 m at each end, except for airfields dedicated to light planes (minimum take-off distance smaller than 800 m) where it may be 30 m
- Its width will be between 60 m and 300 m.

Longitudinal and transversal slopes of runway and cleared strip shall be defined in compliance with ICAO regulations.

6.2 Taxiways

Taxiways shall be designed with a width extending from 7.50 m to 23 m depending on the width of the landing gear of the most critical aircraft.

Longitudinal and transversal slopes of taxiways shall be defined in compliance with ICAO regulations.

6.3 Traffic area

The surface of parking areas shall be sufficient to allow self-manoeuve of aircraft. It shall be in accordance with the geometrical characteristics of the critical aircraft, the degree of lock, the safe distance between aircraft and any obstacle, the area necessary for passenger circulation and ground equipment (transport vehicles) and the possible protection area against engine thrust.

6.4 Helicopters areas

The airport may be associated with a helicopter area.

Helicopters areas can also be planned separately.

This helicopter area includes the Final Approach and Take Off area (FATO), the Touch down and Lift Off area (TLOF), the safety area, parking areas and taxiways.

Arrangements for helicopter areas and clearance areas shall comply with Chapter 13 of ITAC.

In the case of a helicopter area associated with an airport, the helicopter area entrance will be parallel to the axis of the runway and its clearance will correspond to visibility norms. In case where helicopter has to perform an approach with instruments, it will use the runway landing aids and get out of the runway as soon as visibility is adequate.

6.4.1 Final Approach and Take Off area (FATO)

The minimum dimension of the FATO must be at least 1.5 times the overall length of the largest helicopter supposed to use the area.

The FATO shall be marked out with a white discontinuous line and signalled with the letter H, oriented towards the preferred direction of approach.

The FATO shall be surrounded by safety area, which allows a helicopter accidentally out of the FATO without any danger. This area shall be treated in order to clear it from any obstacle, make it able to sustain thrust from engines and eliminate stones and dust likely to be thrown up.

The safety area shall extend at least 3 m away from the FATO in case of helicopter area equipped for visual operation or 45 m laterally and 60 m longitudinally in case of operation with radio electrical instruments.

The slope shall be smaller than 2% in any direction.

Areas to be used at night shall be equipped with a proper marking and lighting.

6.4.2 Parking areas

The parking area dimensions will be calculated taking into account the maximum number of helicopters likely to be parked. Each spot shall have a size equal to a circle whose diameter is equal to the length of the helicopter, with a clear distance (to neighbouring helicopter or obstacle) equal to half of the largest rotor diameter.

As far as possible, the parking area shall be located close to the aircraft parking area when there is an airport.

The link between the FATO and the parking area shall be assured by taxiways.

6.5 Area reserved for aircraft services

Airplanes using the airport shall have an area reserved to stock the necessary equipment for the daily operation (access to aircraft, luggage trolleys, aircraft cleaning equipment, tools for minor maintenance jobs, etc.).

6.6 Supplementary traffic

The CONTRACTOR shall obtain information from the COMPANY about the nature and importance of supplementary use of airport, that is to say, other than COMPANY or organizations working for the COMPANY.

This may involve planning an airport, which would be likely to ensure a public, national or regional, commercial, general or military aviation service.

The general layout and installations of the airport shall be established so as to take into account the implications involved in satisfying these needs.

6.7 Road access

The COMPANY shall provide to the CONTRACTOR information related to road link projects for the airport.

6.8 Accommodation and living quarters

The COMPANY shall provide to the CONTRACTOR information from related to living quarter and accommodation requirements to be included in the airport project.

6.9 Communication centres

The CONTRACTOR shall define with the COMPANY specialists the needs related to ground-ground, ground-air, air-ground liaisons required for the airport. The CONTRACTOR shall carry out the design of the communication centres.

6.10 Right of way and boundary fence

The rights of way and bounding fence arrangement will be decided upon with the COMPANY (specification [GS EP CIV 103](#)).

6.11 Safety

Safety regulations shall be applied in compliance with the COMPANY's GS SEC specifications.

7. Aeronautical infrastructure

7.1 Topographical survey of site installation area

The topographical survey of the installation area shall be carried out in compliance with the COMPANY general specifications and ITAC requirements.

7.2 Geological and geotechnical survey

The COMPANY shall supply a geological/geotechnical report about the installation area. The contents of this survey shall be defined in agreement with the COMPANY and in compliance with the COMPANY general specifications.

7.3 Investigation for natural materials to be used in construction.

The geological and geotechnical documents supplied by the COMPANY shall enable the identification of natural material deposits in the area surrounding the airport (stone and gravel pits).

The CONTRACTOR shall decide, in compliance with the general specification **GS EP CIV 101**, if their deposits are economically useful.

7.4 Design of pavements

Design of pavements shall be carried out using the actual load from the landing gear of the most critical aircraft to be considered.

Calculations shall be made applying the method presented in the Aerodrome Design Manual - Third part - Pavements - Edition 1983) published by ICAO. An equivalent basis of 10 movements a day for 10 years shall be used for design.

7.5 Drainage of surface and shallow water

The collection of water from the aircraft areas shall be performed as follows:

- Either by covered channels (perforated slabs or equivalent) placed along the edges of pavements
- Or, when the importance of the flow and the nature of the ground do not lead to material being swept away by superficial stream, by channels and gullies located along the lateral shoulders, a few meters from the runways.

To protect roads, runways and traffic areas from underground water it shall be checked that, the water table level stays underneath the foundation base.

If this foundation platform is made of materials likely to induce a capillary reaction of water seeping, a thin layer of granulous material shall isolate the surface of this platform, in order to avoid this. For values to be taken into account for slopes, levelling and bearing capacities reference shall be made to IACO regulations.

Drainage system shall integrate the complete anticipated arrangement.

7.6 Earthworks

Earthworks shall be carried out in compliance with the general specification **GS EP CIV 101** and **GS EP CIV 201**.

7.7 Aeronautical pavements

Pavements shall be:

- Either flexible type: their total thickness shall be defined according to the imposed bearing capacity and the CBR index
- Or rigid type, made of a concrete slab: the thickness shall be determined from the load to be supported, the acceptable tensile stress of the concrete and the K reaction modulus of the foundation.

The pavements shall be made up in compliance with specification **GS EP CIV 201**.

Surrounding areas shall be treated so as to avoid causing the projection of any objects onto the aeronautical pavement.

Pavements shall be resistant to fuels (particularly on parking areas) and hot exhaust fumes (particularly on take-off zones).

Special attention shall be paid by the CONTRACTOR to tangential stresses generated by wheels on impact zones, punching effects under wheels, pavement slip and flatness, pavement joints design.

7.8 Airfield markings and aids

The airport shall have equipment in accordance with the Aerodrome Design Manual-Part 4-Visual Aids-Edition 1993 from ICAO.

7.9 Radio electrical aids

The CONTRACTOR shall make propositions, which shall be submitted to the relevant authorities via the COMPANY.

7.9.1 Aerial navigation aids

- NDB: Non Directional Beacon
- VOR: VHF Omnidirectional Range
- DME: Distance Measuring Equipment
- SSR: Secondary Surveillance Radar
- GNSS: Global Navigation Satellite System.

7.9.2 Landing aids

- ILS: Instrument Landing System composed of:
 - Localizer placed on the landing strip axis about 300 m from its extremity
 - Glide slope: 15 m high mast, placed 150 m lateral to landing strip
 - Markers placed respectively at 7 km, 2 km and 300 m from the landing strip and in its axis.
- DME: Distance Measuring Equipment
- MLS: Microwave Landing System.

7.9.3 Aeronautical radiocommunication equipment

VHF aeronautical transmitter/receiver design and installation shall be decided upon with the COMPANY.

8. Installations

Airport installations shall include:

- Technical block - Control tower
- Meteorological equipment
- Safety, fire and rescue services
- General services: garage, workshop

- Electricity supply installations
- Passengers building
- Freight building
- Refuelling installations
- Internal road system
- Water and telephone networks
- Housing area (living quarters).

Works that are to be carried out by the CONTRACTOR shall be dealt with in a particular specification issued by the COMPANY for each of the above items.

Some of these installations (control tower, safety, and fire services) are part of aerial security, and therefore, plans shall be submitted to the relevant aeronautical authority.

As far as the organization and operation of fire safety and rescue services are concerned, arrangements shall be made in compliance the Airport Service Manual - Part 1 - Rescue and Fire Fighting-Edition 1990 from ICAO.

The particular specifications drawn up by the CONTRACTOR shall specify the nature and importance of furnishings and administrative equipment.

9. Financial and economical project aspects

9.1 Detailed investment evaluation

In accordance with the pre-project described in previous Sections, the CONTRACTOR shall draw up a preliminary estimate of quantities for the various project installations. He shall then make a cost estimate, including, if necessary, the price of any land that has to be purchased. He shall also estimate the availability date of the projected airport.

9.2 Airport operation

The CONTRACTOR shall supply a document stipulating arrangements and precautions involved to ensure correct operation and maintenance of the technical and commercial airport installations. In particular, the following shall be dealt with:

- Airport command
- Aeronautical information
- Control of air traffic approach for landing
- Alarm
- Telecommunication
- Weather
- Fire and safety
- Maintenance of installations (including preventive maintenance)
- Maintenance of equipment
- Use of passenger building and freight



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- Airport assistance
- Security guard for installation and airport areas.